

**Residential Development
School Road
Hurst
Berkshire**

Drainage Strategy Report

Rev	Date	Purpose/Status	Document Ref.	QA
A	12.07.2025	For approval	First issue	RAC/STC
B				
C				
D				
E				

Disclaimer

This report is for the use of the Client only and is not for the use of any other parties without the express permission of the Client. All calculations and related quantified assumptions are indicative for planning purposes only and are based solely on the available design proposals and must be reassessed during detailed design with the appropriate compliance methodology.

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Executive Summary

RCD Consultants Ltd has been appointed to design the surface water and foul water drainage aspects of the proposed development at School Road, Hurst, Berkshire.

The site is an undeveloped plot of land with an approximate area of 1.16Ha. To the north is Hurst Road, to the east there is the primary school and residential curtilage, to the south there is Orchard Road and to the west there is residential curtilage.

The report outlines the strategy for the surface water and foul water drainage for the proposed development with reference to the NPPF (National Planning Policy Framework), Ciria 753 (The SUDS Manual) and the Wokingham SUDS strategy 2017.

The proposed development includes the construction of seventeen houses and six apartments with a total roof area of 1,720m² (including 10% urban creep), an impermeable access road with an area of 530m² and permeable paved drives and access road with a total area of 1,570m². A porous paved carpark with an area of 430m² is to be provided for school dropping off as well as general public use.

The Flood Warning Information Services website confirms that the site is in flood zone 1 and that there is low risk of surface water flooding in the rear garden of the apartment block where levels will remain as existing.

The British Geological Society website indicates that the site is underlain superficial deposits of the Kempton Park Gravel Member over bedrock of the Lambeth group (Clay, silt, sand) to the north and London Clay to the south. Soakage testing was completed in July 2025 with worst-case infiltration values in each test location ranging between 1.8x10⁻⁶m/s to 5.9x10⁻⁶m/s.

There are public foul sewers in Church Road. There are no public surface water sewers.

Roof drainage discharges to the porous paved drives and the impermeable access road discharges to soakaways.

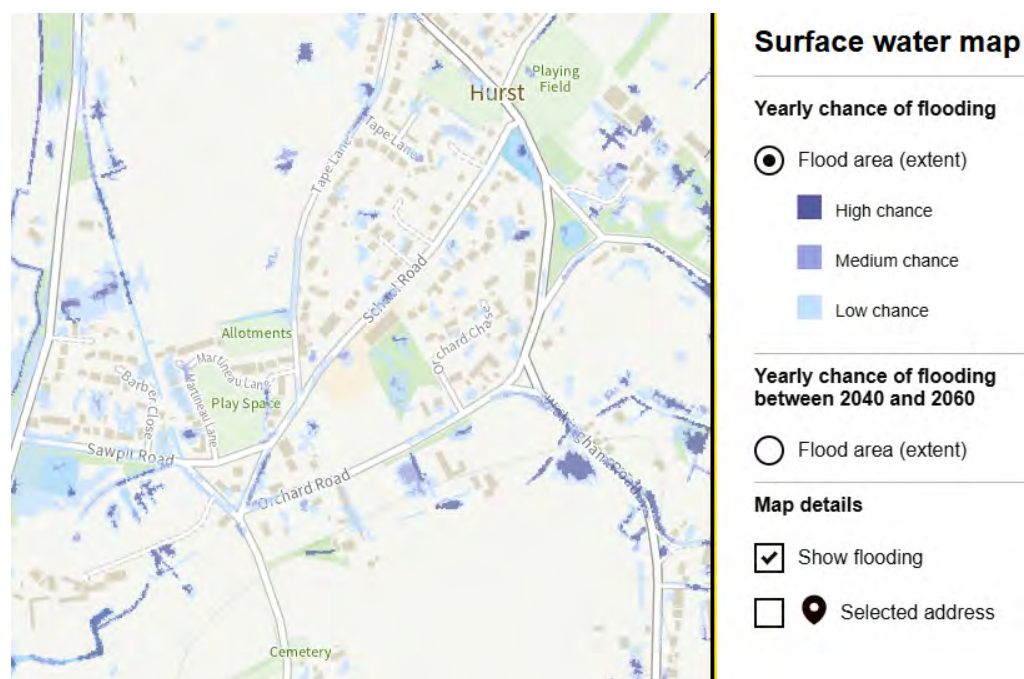
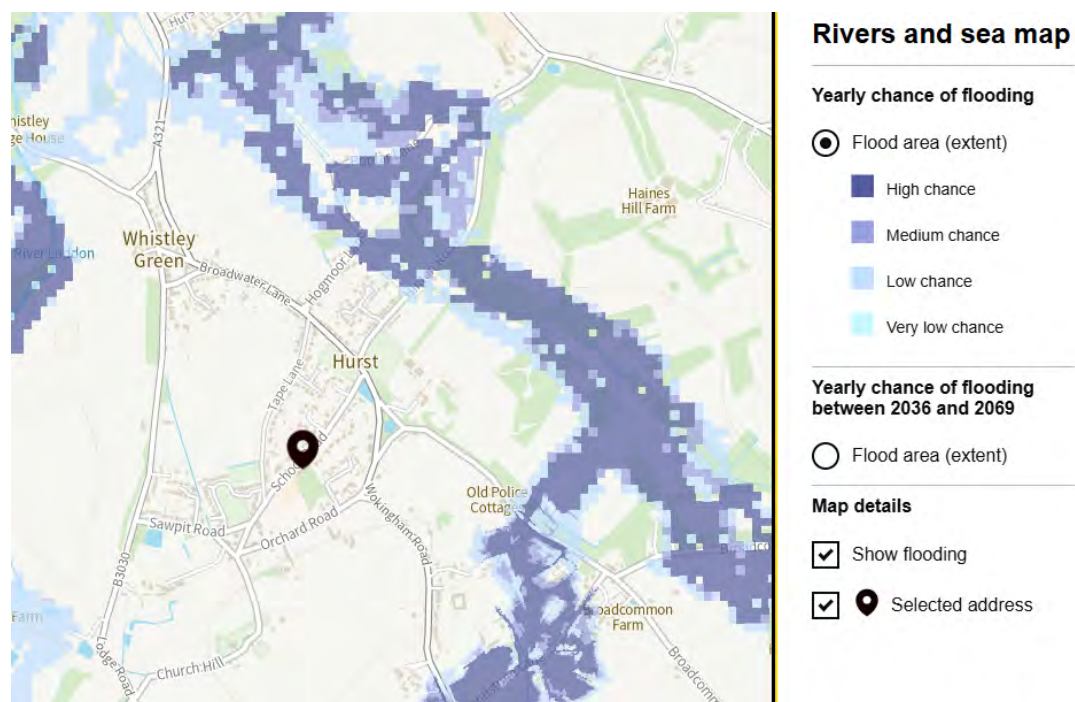
To accord with the Environment Agency climate change allowances 40% has been added to the 1 in 100 year storm event and 35% has been added to the 1 in 30 year storm event.

To accord with LLFA drainage requirements a flood exceedance plan is provided showing the route flood water will take in the unlikely event of SUDS failure.

1.0 Flooding

1.1 Pluvial and Fluvial Flooding

The Flood Warning Information Services website confirms that the site is in flood zone 1 and that there is low risk of surface water flooding in the rear garden of the apartment block where levels will remain as existing.



2.0 Existing Drainage

The site is an undeveloped plot of land with an approximate area of 1.16Ha. To the north is Hurst Road, to the east there is the primary school and residential curtilage, to the south there is Orchard Road and to the west there is residential curtilage.

A copy of the topographical survey is shown in Appendix A.

The British Geological Society website indicates that the site is underlain superficial deposits of the Kempton Park Gravel Member over bedrock of the Lambeth group (Clay, silt, sand) to the north and London Clay to the south.

Soakage testing was completed in July 2025 with worst-case infiltration values in each test location ranging between $1.8 \times 10^{-6} \text{m/s}$ to $5.9 \times 10^{-6} \text{m/s}$.

A copy of the soakage testing results is shown in Appendix A.

There are public foul sewers in Church Road. There are no public surface water sewers.

A copy of the sewer records is shown in Appendix A.

The nearest watercourse is the River Loddon approximately 1.0Km north of the development.

HR Wallingford Greenfield surface water calculations are shown in Appendix B.

3.0 Proposed Drainage Strategy

The proposed development includes the construction of seventeen houses and six apartments with a total roof area of $1,720 \text{m}^2$ (including 10% urban creep), an impermeable access road with an area of 530m^2 and permeable paved drives and access road with a total area of $1,570 \text{m}^2$. A porous paved carpark with an area of 430m^2 is to be provided for school dropping off as well as general public use.

Surface drainage discharges to the porous paved drives and the impermeable access road discharges to soakaways.

The Drainage Layout is shown in Appendix C.

3.1 Surface Water Drainage

In accordance with Ciria 753, SUDS Manual, flooding is permitted above ground during the 1 in 100 year storm event + climate change allowance but all flood water is to be contained within the site boundaries. No flooding is permitted during the 1 in 30 year storm event.

Post-development surface water calculations are shown in Appendix D.

The calculations confirm that no flooding occurs during the worst-case 1 in 100 year storm event with a 40% climate change allowance.

The half drain time during the 1 in 10 year storm event is less than 24 hours.

3.1.2 Surface water flows and volumes

Pre-development and post-development surface water discharges via infiltration so the flows and volumes have not been summarized as we are not increasing the volume of rainfall landing on the site.

3.1.4 Standards

The performance of the surface water drainage system will be designed to BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations.

The materials specification for the scheme will be in accordance with the Highways Agency Specification for Highway Works. For the purposes of the indicative design, the following material types have been assumed:

- Drainage pipes up to 300mm diameter – Vitrified clayware, plastic pipes will be permitted subject to ground conditions.
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in hard paved areas.
- Pipe bedding - Imported granular material.
- Pipe Trench backfill - Selected as dug or imported material.
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at every junction of a public sewer.

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 1.0m/s for self-cleansing
- Standard pipe roughness “Ks” of 0.6.

3.2 Foul Water Drainage

3.2.1 Proposed Infrastructure

Foul drainage from the buildings will be collected via pipes and will be discharged to the public foul sewer in Church Road.

Average Water flows will be 1.06l/s in accordance with sewers for adoption.

3.2.2 Standards

The performance of the foul drainage system has been designed to BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations. The main criteria used are as follows.

- Drainage pipes up to 100mm diameter – Vitrified clayware, plastic pipes will be permitted subject to ground conditions.
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in higher quality paved areas.
- Class D400 standard type in all other road / parking areas
- Class C250 standard type in all footpath areas
- Pipe bedding - Imported granular
- Pipe Trench backfill - Selected as dug or imported material
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at every junction of a public sewer

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 0.75m/s for self-cleansing
- Standard pipe roughness “Ks” of 1.5.

4.0 Attenuation

It is proposed that Sustainable Urban Drainage Systems (SUDS) will be the primary consideration for surface water management. There are several different methods that may be used to provide sufficient attenuation of the surface water described in Section 5 below.

Attenuation should be positioned as close to the outfall as possible and would control the surface water discharge from the site. Implementation of one or all of the SUDS methods outlined in Section 5 of this report is highly recommended to reduce the requirement for below ground storage.

The proposed drainage design includes surface water from the roof discharging to the porous paved drives where water will be attenuated in the stone voids. The impermeable road will discharge a suitably sized soakaway. The surface water calculations confirm that no flooding occurs during the worst-case storm event with a 40% climate change allowance.

5.0 Sustainable Urban Drainage Systems (SUDS)

The objective of SUDS is to minimise the impacts of the development on the quantity and quality of site runoff and maximise amenity and biodiversity opportunities. Surface water SUDS will be designed and installed in accordance with NPPF and associated technical guidance March 2012 and associated CIRIA documents.

The mix of SUDS to be used is determined by the conditions on site, in this case a development with areas of external space which can be utilised for SUDS. The methodology of surface water control is to slow the entry of the surface water into the system by using flow control devices, in this instance infiltration will limit the flow of water into the ground and the voids within the stone layer will provide attenuation as the soakaway.

5.1 Infiltration Devices

Infiltration devices drain water directly into the ground. Infiltration trenches and soakaways are more practicable for urban sites with limited space available. Infiltration devices can be integrated into and form part of the landscaped areas.

Infiltration trenches are completely below ground, and water should not occur on the surface.

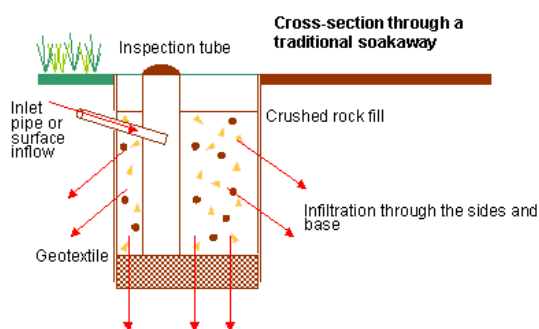


Figure 1 – Typical cross section through infiltration trench

Advantages – Reduces the volume of runoff, effective at pollutant removal, contributes to ground water recharge, simple and cost effective.

Disadvantages – Potentially high failure rates, comprehensive ground investigations required, offset from foundations (min. 5m away), risk of ground water pollution, reduced performance during prolonged wet periods.

Suitable for use – Yes, a soakaway is proposed for the impermeable section of the access road.

5.2 Brown/Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping over a drainage layer. They are designed to intercept and retain precipitation, increasing the time of concentration and reducing the volume of runoff and attenuation peak flows. Green roofs can be anything from a thin growing layer of sedums and mosses to plants, shrubs and large trees.

These roofs vary in specification and can be designed to attract bird and invertebrate species. Referring to CIRIA document C644, green and brown roofs also participate in attenuating rainwater. This would reduce the requirement for below ground storage attenuation on the site.

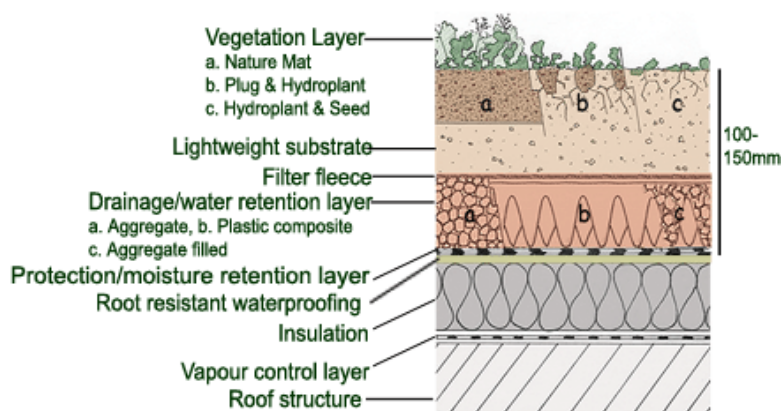


Figure 2 – Typical section through green roof build up

Advantages – Mimic greenfield state of building footprint, good removal of pollutants, ecological and amenity benefits, improve air quality, insulates building.

Disadvantages – Costs, increased structural loading, roof height, design, maintenance and exposure may preclude use.

Suitable for use – **No**, the roofs will be pitched and unable to provide support for green roofs.

5.3 Rainwater Harvesting

These tanks act as mini-storage chambers for surface water, reducing the extent of underground storage required. They provide a source of water for plant irrigation, washing machines and for flushing toilets.

Harvested rainwater is stored below ground and pumped to provide a substitute for potable mains water reducing both the site discharge and water consumption.



Figure 4 – Rainwater Harvesting

Advantages – Provided source control of storm water runoff, reduces demand on mains water.

Disadvantages – Costs, Risk to public health, use dependant on demand requirements and seasonal rainfall characteristics, maintenance of pumps & control systems.

Suitable for use – **Yes**, rainwater butts are proposed for each house. The low demand for each dwelling and the low average rainfall for the area makes installation of rainwater harvesting tanks unviable.

5.4 Porous Paving

Porous pavement is an alternative to conventional paving in which water permeates through the paved structure rather than draining off it. The surface water will be held in a reservoir structure (high void content sub-base) under the pavement for subsequent delayed discharge or infiltration into the sub-strata below.

The porous paving can be materials such as gravel, grasscrete, porous (no fines) concrete, concrete blocks or porous asphalt. Pollutant removal rates have been shown to be high, as the majority of the removal occurs as a result of the filtration of the water through the aggregate sub-base.

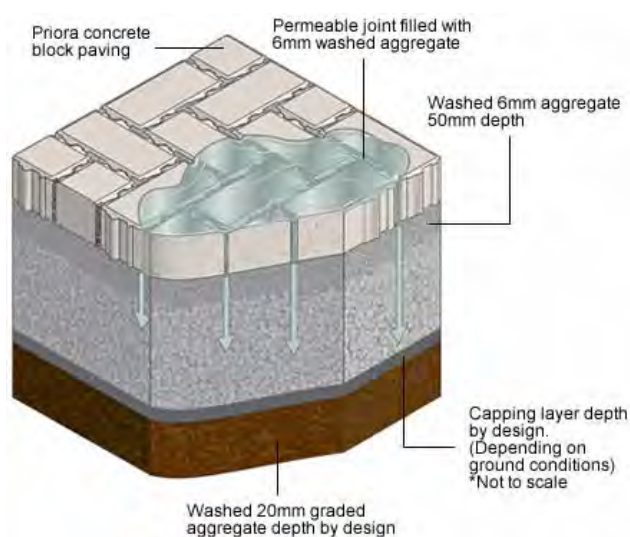


Figure 3 – Typical section through porous paving

Advantages – Effective in removing pollutants, lined systems can be used to avoid infiltration, reduces volume and rate of surface water runoff, suitable for high density developments. Mimics existing Greenfield conditions by filtering into the surrounding soft landscaped areas.

Disadvantages – Costs, used for low traffic volumes, low axle loads and speeds, risk of long-term clogging due to poor maintenance.

Suitable for use – **Yes**, permeable paving is proposed for the drives and southern half of the access road to mimic existing greenfield conditions.

5.5 Below Ground Attenuation

Attenuation involves the storing of surface water within pipework or underground tanks prior to controlled discharge into the public system. Attenuation tanks can also provide off line storage.

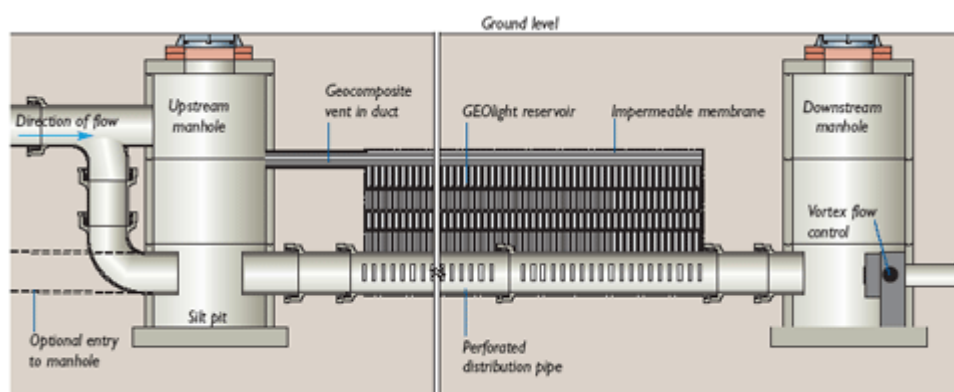


Figure 5 – Typical section through below ground attenuation chamber (cellular storage)

Advantages – Effective storage of surface water, can be used below trafficked areas, can be used below public open areas, minimum maintenance.

Disadvantages – No water quality treatment.

Suitable for use – **Yes**, the current design shows pre-cast concrete soakaways that could be change to cellular storage tanks.

5.6 Wetlands

Wetlands provide both stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands provide settlement of sediment and remove contaminants.

Advantages – Effective storage of surface water, good pollutant removal, ecological and amenity benefits.

Disadvantages – Requires large surface area. Health & Safety issues associated with large bodies of water.

Suitable for use – **No**, there is no space available.

5.7 Swales

Swales are vegetated drainage structures up to 500mm deep and used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits the extent of trees used in landscaping. Health & Safety issues are associated with large bodies of water following heavy rainfall.

Suitable for use – **No**, there is no space available.

5.8 Ponds/Rain gardens

Ponds or rain gardens are irregular shaped vegetated drainage structures used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits the extent of trees used in landscaping. Health & Safety issues are associated with large bodies of water following heavy rainfall.

Suitable for use – **No**, there is no space available.

6.0 Proposed SUDS solution

It is advised that a combination of Sustainable Drainage Systems (SUDS) is used to increase the time of concentration of the water before it from the development.

In this instance we are using the permeable paved drives to discharge all roof drainage to. The impermeable access road will discharge to a soakaway.

7.0 Management and Maintenance of SUDS

The owners will be responsible for maintenance of their individual permeable paved drives.

A management company will be appointed to maintain all those SUDS features not offered for adoption.

The catchpits and soakaways are to be inspected and cleaned out on an annual basis.

The permeable paving shall be weeded monthly during the growing season, swept clean and all debris removed.

Every twenty-five year or at a period specified by the manufacturer the blocks shall be lifted and the laying course cleaned or replaced.

8.0 Contamination mitigation

The British Geological Society website indicates that the site is underlain superficial deposits of the Kempton Park Gravel Member over bedrock of the Lambeth group (Clay, silt, sand) to the north and London Clay to the south.

The site lies above a principal bedrock aquifer and the Groundwater vulnerability is high.

Ciria 753 Chapter 26 Mitigation indices:

Pre-development pollution indices:

Greenfield use is not identified in Table 26.2 however it is classed as very low pollution hazard level due to fertilisers being used and increased vehicular activity;

Roofs: Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore $MI = 0.2 + 0.5 \times 0.2 + 0.5 \times 0.05 = 0.325$

Post-development

Residential use is identified in Table 26.2 as very low pollution hazard level;

Roofs: Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore $MI = 0.2 + 0.5 \times 0.2 + 0.5 \times 0.05 = 0.325$

The post-development mitigation indices are the same as pre-development.

Mitigation is provided using the porous paving and rainwater butts.

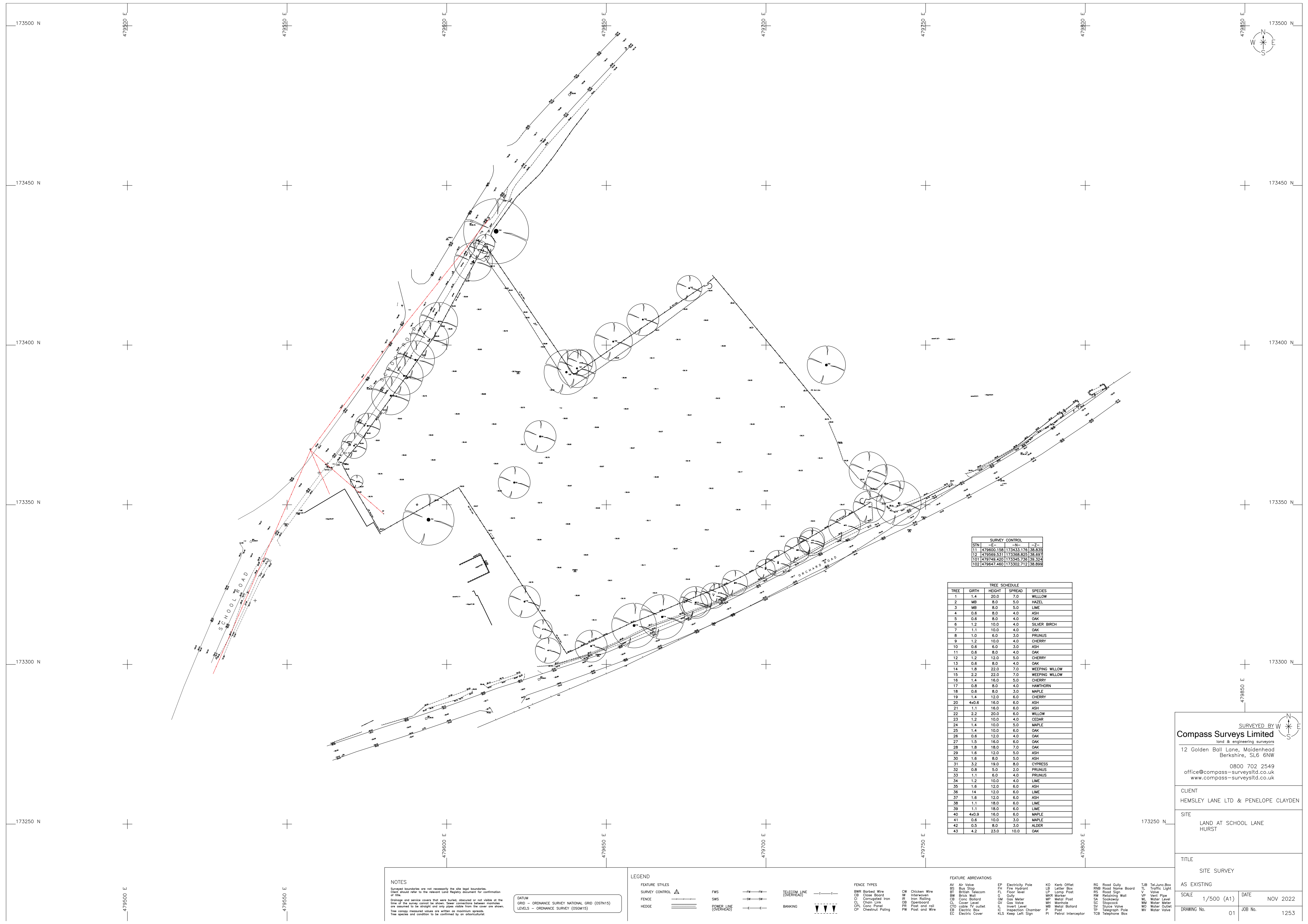
Table 26.5 Risk matrix

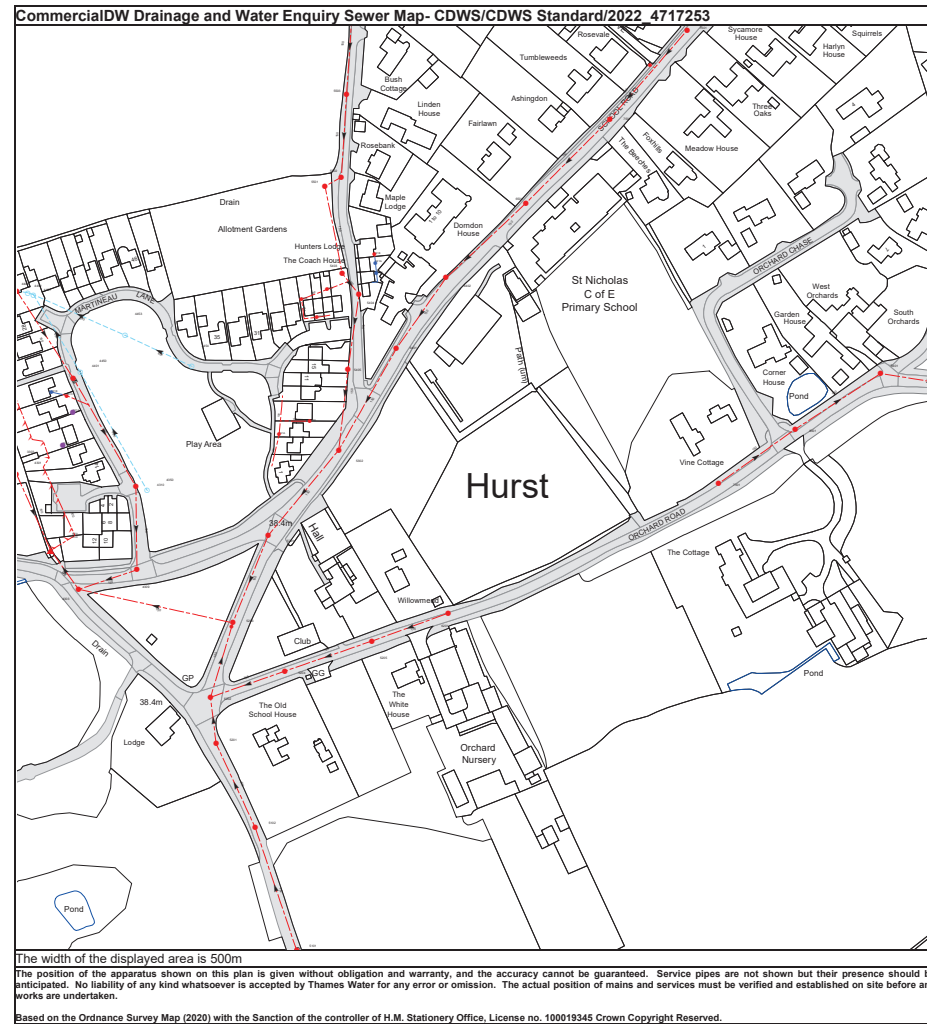
Element Number	Description	Risk Score	Weighting Factor	Score
1	Pollution Hazard Traffic Density	1	15	15
2	Average annual rainfall	1	15	30
3	Type of SUDS	2	15	30
4	Unsaturated zone depth	1	20	20
5	Flow through sub-soils	2	20	40
6	Unsaturated zone material	2	10	20
7	Soil organic matter	1	5	5
8	Unsaturated zone ph	1	5	5
Total				165

Based upon the above table the risk to groundwater is low as the total value is less than 180.

Appendix A

Topographical Survey
Sewer Records
Soakage testing results





NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no survey information is available.

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5404	38.5	36.02
541F	n/a	n/a
6402	38.62	36.18
541A	n/a	n/a
5403	38.7	36.08
541G	n/a	n/a
531A	n/a	n/a
541E	n/a	n/a
541C	n/a	n/a
541D	n/a	n/a
5302	38.53	35.54
5405	38.59	35.71
6401	38.74	36.1
5301	38.44	35.24
5204	38.42	36.71
5205	38.56	37.04
6201	38.8	37.28

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.



Con29DW Commercial Drainage and Water Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Meter
	Dam Chase
	Vent
	Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary
	Drop Pipe
	Control Valve
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet
	Outfall
	Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator
	Public / Private Pumping Station
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

Ducts may contain high voltage cables. Please check with Thames Water.

	Casement
	Conduit Bridge
	Subway
	Tunnel

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

- 5) 'na' or '0' on a manhole indicates that data is unavailable.
- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.



Con29DW Commercial Drainage and Water Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

- Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
- Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
- Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
- Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
- Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
- Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
- Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm – 600mm (12" – 24")	1100mm (3' 6")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger
- Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

- Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
- Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

KP HOLDING GROUP LTD

LAND SOUTH OF SCHOOL ROAD, HURST, BERKSHIRE RG10 0DB

**INFILTRATION TEST REPORT REV_2
STATUS FINAL**

Reference: 1753/IR_2

4th July 2025

**CLIENT: KP Holding Group Ltd
3 Lloyd Road, Broadstairs,
Kent, United Kingdom,
CT10 1HY**

**SITE: Land South of School Road,
Hurst, RG10 0DB**

INFILTRATION TEST REPORT Rev2

Reference: 1753/IR2_

4th July 2025

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FOREWORD

1. This document has been prepared by Peter Baxter Associates Ltd with all reasonable skill, care, and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it by agreement with the client.
2. This document is confidential to the Client and Peter Baxter Associates Ltd accepts no responsibility whatsoever to third parties to whom this document, or any part thereof, is made known. Any such party relies upon the document at their own risk.
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1.0 SUMMARY TEXT

1.1 Summary and Infiltration Test Results

1.1.1 Peter Baxter Associates (PBA) were commissioned by the Client: KP Holding Group Ltd, to carry out infiltration tests, denoted INFL1A to INFL4A, at their proposed development site at School Road, Hurst, near Reading, to the procedure detailed in BRE365 (1). INFL01A was excavated to 2.0m, and INFL 2A to 4A were excavated to 0.6 to 0.7m. The locations were specified by the Client's advisers. The subsoils were a clayey sand and a gravely sand, which was consistent with geological maps of the Site. The test locations are shown in Figure 1, and the pits logs are presented in Appendix B1.

1.1.2 The infiltration tests are denoted on the table below:

Reference	Test depth (m)	Infiltration rates		
		Cycle 1	Cycle 2	Cycle 3
INFL01A	2	1.8×10^{-6}	2.4×10^{-6}	-
INFL02A	0.7	2.4×10^{-6}	-	-
INFL03A	0.5	1.2×10^{-5}	5.9×10^{-6}	9.9×10^{-6}
INFL04A	0.75	2.1×10^{-6}	2.1×10^{-6}	-

Table 1 Infiltration test summary

The test reports are presented in Appendix B 2.

1.2 Site Location, Description, and Geology

1.2.1 The Site is a 1.2 ha plot of land situated at Hurst, School Road, in Reading. The postcode of the Site is RG10 0DB, and the National Grid coordinates of the centroid of the Site are 479650, 173370.

1.2.2 The Site is a green field that appeared to have been used as a pasture. The area was flat, grassed, with occasional mature trees. It is surrounded to the three sides by houses, and to the east by a primary school.

The site is illustrated in photos in APPENDIX C 1 *Photographs*. It is proposed to develop the Site for housing with 23 units.

1.2.3 Geological maps obtained from Reference (2) indicated that the Site geology in the areas of the infiltration tests was Kempton Park Gravel Member over Lambeth Group in

the north of the site and London Clay to the south. Geological maps are included in Appendix A1.

1.3 Test Dates, Locations and Methodology

- 1.3.1 The tests were started on 21st May 2025 and completed on 22nd May 2025.
- 1.3.2 The test's locations and depth were specified with the Client's engineer and are shown in Figure 1. The locations were set out with a GPS using a mobile phone app from a sketch provided by the client.
- 1.3.3 Each location pit was excavated to specified depth with a minidigger and flooded with mains water. The water level was recorded with time at each pit. The pits were fenced with safety fencing and backfilled on completion of the tests. Due to the low permeability, less than three cycles of flooding was carried out at some of the pits. The infiltration rates were calculated as defined in BRE365 (1).

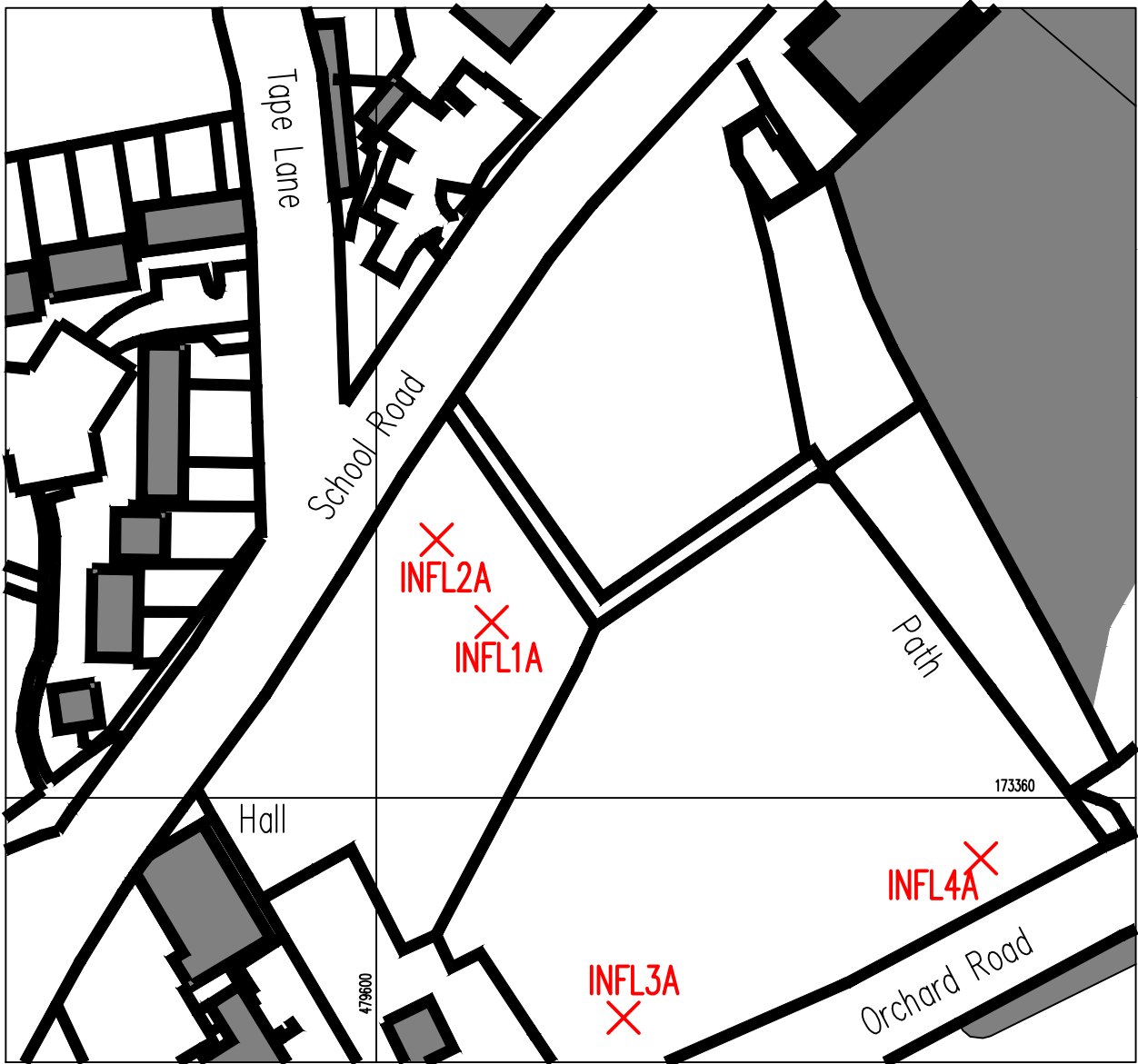
1.4 Results and Comparison with Reference Values

- 1.4.1 The infiltration tests, denoted INFL01A, INFL03A, INFL04A, INFL05A and INFL06A, gave lowest infiltration rates of 1.8×10^{-6} m/s, 2.4×10^{-6} m/s, 1.2×10^{-5} m/s, and 2.1×10^{-6} m/s, respectively. The test reports are presented in Appendix B 2.
- 1.4.2 These infiltrations were within the range of 1×10^{-5} m/s to 1×10^{-7} quoted in literature for fine sands and coarse silts and are therefore considered representative of the geology tested.

Peter Baxter MSc BEng CEng MICE (Director)

For and on behalf of Peter Baxter Associates Ltd

Figure 1 Test Locations



Ordnance Survey, (c) Crown Copyright 2025. All rights reserved. Licence number 100022432

Location	Easting	Northing
INFL1A	479621	173392
INFL2A	479611	173407
INFL3A	479645	173320
INFL4A	479710	173349



Peter Baxter Associates Ltd, Kestner Works,
Bredgar Road, Gillingham, Kent ME8 6PL
Tel: 01634 717974

Client
KP Holding Group Ltd

Project
Test Location Plan

Title
TRIAL PIT LOCATION PLAN

A	20.06.25	CD	PB	
Rev.	Date	Drn.	App.	Revision
Drawn				Checked
CH				PB
Size	CD	Scale	1:1250	Status
				Information
Drawing No.				Rev.
1753/Fig 1				B

Appendix B 1 Trial Pit Logs



Trial Pit Log

Project Name: Hurst School Road		Client: KP Holding Group Ltd		Date: 21/05/2025	
Location: Land South of School Road, Hurst, Berkshire RG10 0DB		Contractor: CK Drilling		Co-ords: E479611.00 N173407.00	
Project No. : 1753		Crew Name:		Equipment: Minidigger	
Location Number INFL2A	Location Type TP	Level 39.00m AoD	Logged By PB	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50	38.50		Topsoil with rootlets	1
								Yellow brown clayey fine SAND	
					0.70	38.30		End of Borehole at 0.700m	
									2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.30	0.30	Stable	None				

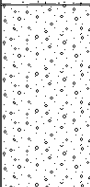
Remarks	
No groundwater. Ground level interpolated from client's PDF survey	





Trial Pit Log

Project Name: Hurst School Road		Client: KP Holding Group Ltd		Date: 21/05/2025	
Location: Land South of School Road, Hurst, Berkshire RG10 0DB		Contractor: CK Drilling		Co-ords: E479710.00 N173349.00	
Project No. : 1753		Crew Name:		Equipment: Minidigger	
Location Number INFL4A	Location Type TP	Level 39.50m AoD	Logged By PB	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30	39.20		Topsoil	1
								Orange brown clayey SAND	
					0.50	39.00		Orange brown sandy GRAVEL	
					0.75	38.75		End of Borehole at 0.750m	
									2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.20	0.30	Stable	None				

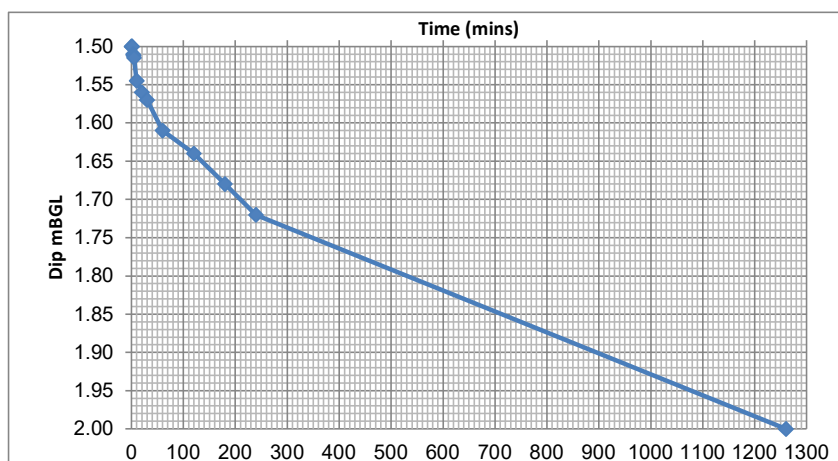
Remarks No groundwater. Ground level interpolated from client's PDF survey							
---	--	--	--	--	--	--	---

Appendix B 2 Infiltration Test Reports

Soakaway Test Cycle 1

Location: INFL1A

<u>Trial Pit Details</u>	Depth (m)	Length (m)	Width (m)	Effective Storage Volume 2.416167		
Dimensions	2.00	1.30	0.30	0.20		
Minimum dip to water (mbgl)	Volume (m3)			Depth (m)		
1.5						
75% Full	0.14625			1.63		
25% Full	0.04875			1.88		
Volume Outflowing	0.0975					
	Area (m2)			Time (24hr)	Elapsed Time (mins)	Dip to water (mbGL)
Mean surface Area	1.19			0 1.50 1 1.50 3 1.51		
Time (mins) 75% full	60			4 1.51 5 1.52 10 1.55		
Time (mins) 25% full	830			20 1.56 30 1.57 60 1.61 120 1.64 180 1.68 240 1.72 1260 2.00		

Soil Infiltration Rate F (m/s)

1.8E-06

Remarks:



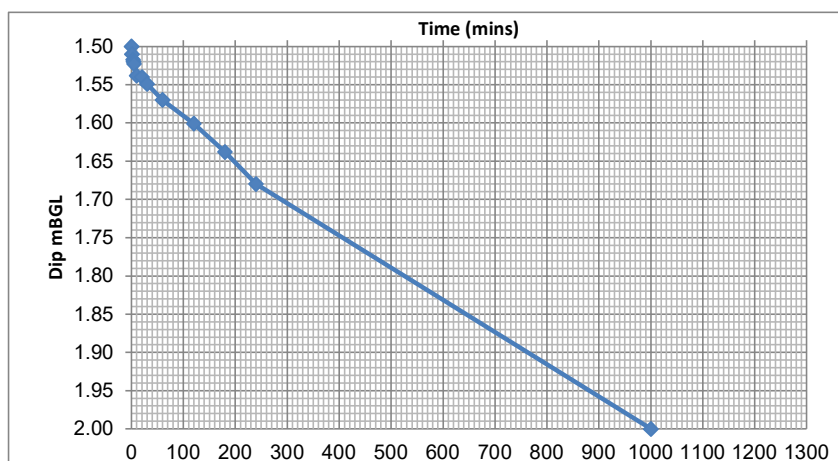
Project: Hurst School Road
Client: KP Holding Group Ltd

Job No. 1753
Date: 22/05/2025

Soakaway Test Cycle 2

Location: INFL1A

<u>Trial Pit Details</u>	Depth (m)	Length (m)	Width (m)	Effective Storage Volume 2.416167		
Dimensions	2.00	1.30	0.30	0.20		
Minimum dip to water (mbgl)	Volume			Depth		
1.5	(m3)			(m)		
75% Full	0.14625			1.63		
25% Full	0.04875			1.88		
Volume Outflowing	0.0975					
	Area			Time (24hr)	Elapsed Time	Dip to water
	(m2)				(mins)	(mbGL)
Mean surface Area	1.19			0 1.50		
				1 1.51		
				3 1.52		
				4 1.52		
Time (mins) 75% full	180			5 1.52		
				10 1.54		
Time (mins) 25% full	740			20 1.54		
				30 1.55		
				60 1.57		
				120 1.60		
				180 1.64		
				240 1.68		
				extrapolated	1000	2.00



Soil Infiltration Rate F (m/s)

2.4E-06

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

APPENDIX C 1 Photographs



Excavation INFL1A, top, view to south bottom





View northeast to INFL1A top, view to east bottom





View southwest to INFL3A top, view north along footpath bottom





INFL 1A



INFL 2A



INFL 3A



INFL 4A

Appendix B

HR Wallingford Greenfield calculations

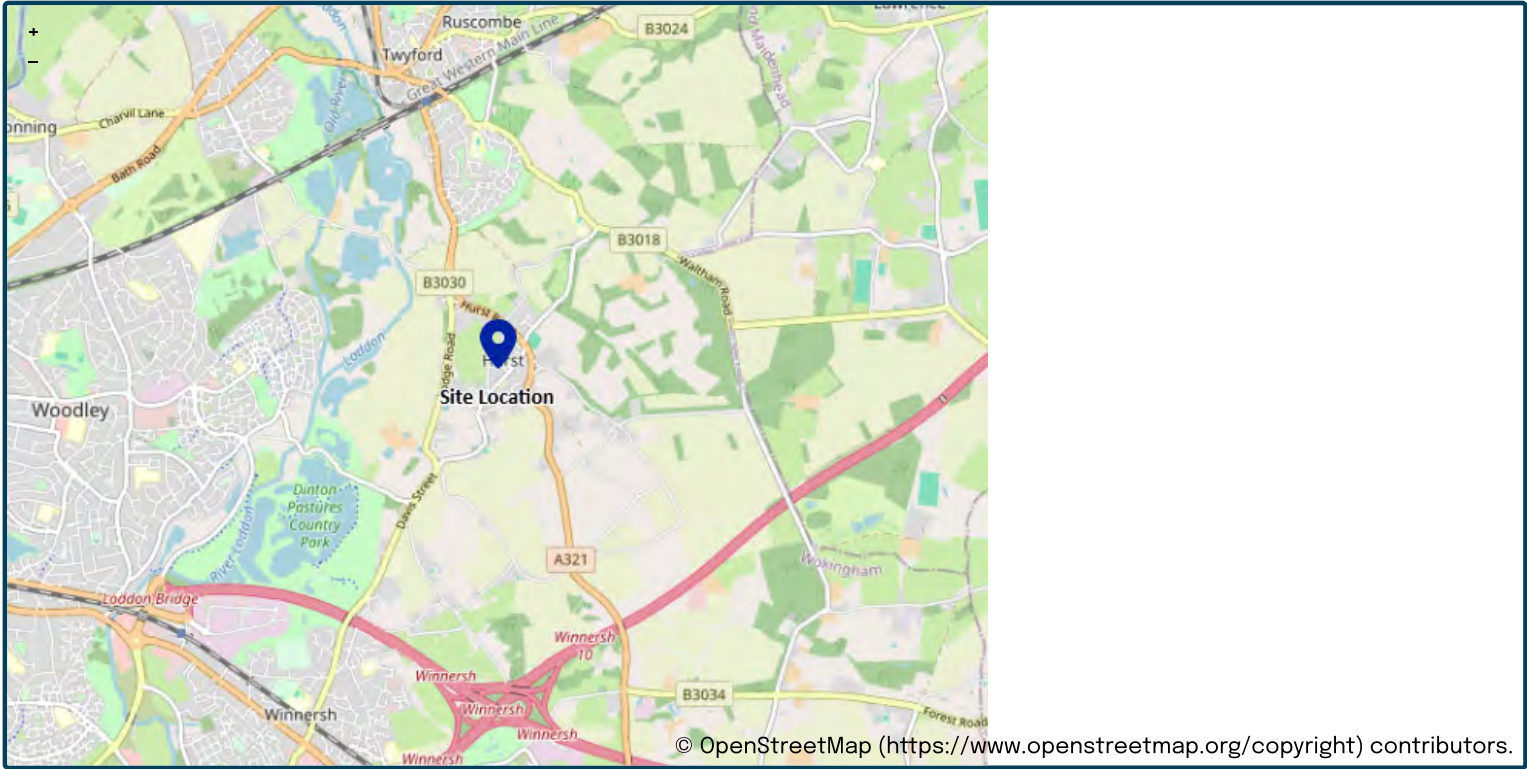
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	30/06/2025
Calculated by	Ray Clark
Reference	1111-2530
Model version	2.0.1

Location

Site name	SCHOOL ROAD
Site location	HURST



Site easting	479661
Site northing	173451

Site details

Total site area (ha)	0.421	ha
----------------------	------------------------------------	----

Greenfield runoff

Method

Method	FEH statistical
--------	-----------------

FEH statistical

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	650	mm	650
BFIHOST	0.492		
QMed-QBar conversion	1.136		1.136
QMed (l/s)	1.03	l/s	
QBar (FEH statistical) (l/s)	1.2	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	6		6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	FEH statistical	
Flow rate 1 year (l/s)	1	l/s
Flow rate 2 year (l/s)	1	l/s
Flow rate 10 years (l/s)	1.9	l/s
Flow rate 30 years (l/s)	2.7	l/s
Flow rate 100 years (l/s)	3.7	l/s
Flow rate 200 years (l/s)	4.4	l/s

Disclaimer

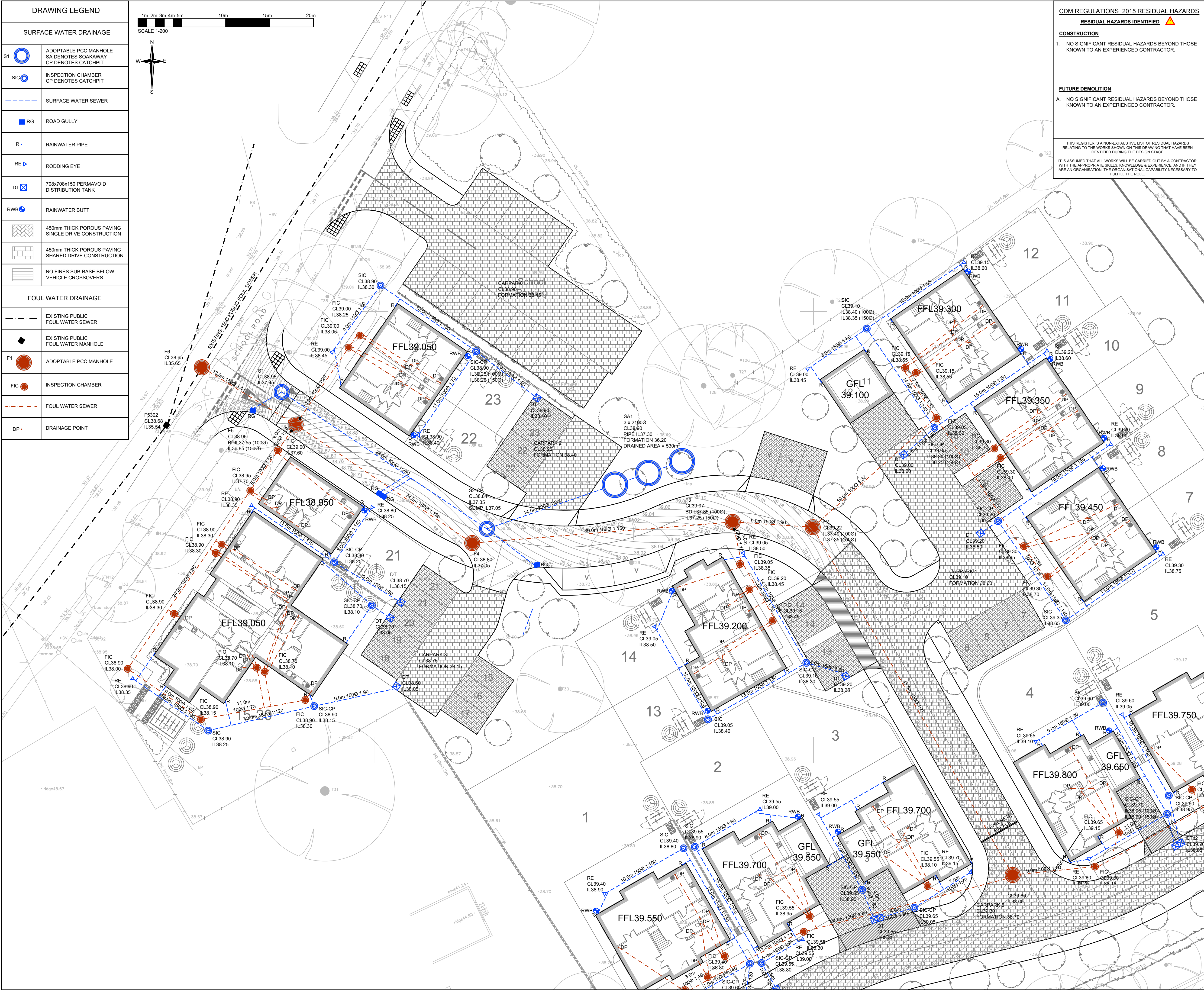
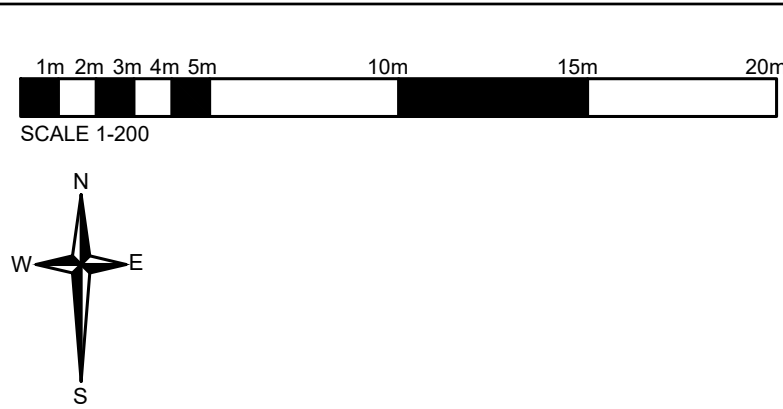
This report was produced using the Greenfield runoff rate estimation tool (2.0.1) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>).

The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix C

Drainage Layout

DRAWING LEGEND	
SURFACE WATER DRAINAGE	
S1	ADOPTABLE PCC MANHOLE SA DENOTES SOAKAWAY CP DENOTES CATCHPIT
SIC	INSPECTION CHAMBER CP DENOTES CATCHPIT
---	SURFACE WATER SEWER
■	ROAD GULLY
R	RAINWATER PIPE
RE	RODDING EYE
DT	708x708x150 PERMAVOID DISTRIBUTION TANK
RWB	RAINWATER BUTT
	450mm THICK POROUS PAVING SINGLE DRIVE CONSTRUCTION
	450mm THICK POROUS PAVING SHARED DRIVE CONSTRUCTION
	NO FINES SUB-BASE BELOW VEHICLE CROSSOVERS
FOUL WATER DRAINAGE	
---	EXISTING PUBLIC FOUL WATER SEWER
◆	EXISTING PUBLIC FOUL WATER MANHOLE
F1	ADOPTABLE PCC MANHOLE
FIC	INSPECTION CHAMBER
---	FOUL WATER SEWER
DP	DRAINAGE POINT



CDM REGULATIONS 2015 RESIDUAL HAZARDS	
RESIDUAL HAZARDS IDENTIFIED	
CONSTRUCTION	
1. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.	
FUTURE DEMOLITION	
A. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.	
THIS REGISTER IS A NON-EXHAUSTIVE LIST OF RESIDUAL HAZARDS RELATING TO THE WORKS SHOWN ON THIS DRAWING THAT HAVE BEEN IDENTIFIED DURING THE DESIGN STAGE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A CONTRACTOR WITH THE APPROPRIATE SKILLS, KNOWLEDGE & EXPERIENCE AND IF THEY ARE AN ORGANISATION, THE ORGANISATIONAL CAPABILITY NECESSARY TO FULFILL THE ROLE.	

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3. ALL COMPONENTS AND MATERIALS ARE TO BE MANUFACTURED AND SUPPLIED IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, AND LAID AND BACKFILLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THE RELEVANT BRITISH STANDARDS.	
4. THE CONTRACTOR SHALL, BEFORE COMMENCING THE WORKS, VERIFY ALL SITE AND SETTING OUT DIMENSIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRUE AND PROPER SETTING OUT OF THE WORKS AND FOR THE CORRECTNESS OF THE POSITION, LEVELS, DIMENSIONS, AND ALIGNMENT OF ALL PARTS OF THE WORKS.	
5. ALL BUILDING DRAINAGE TO BE INSTALLED AND TESTED IN COMPLIANCE WITH THE BUILDING REGULATIONS 2000 DRAINAGE AND WASTE DISPOSAL APPROVED DOCUMENT H 2002 EDITION.	
6. SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.	
7. ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.	
8. INSITU CONCRETE FOR USE IN GENERAL DRAINAGE WORKS, GRADE TO BS: 5328.	
9. FOR INTERNAL DRAINAGE POSITIONS REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.	
10. FOR LANDSCAPING SURFACE MATERIAL FINISHES REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.	
11. ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.	

P4	RAINWATER BUTTS ADDED	12.07.2025	RAC
P3	SA1 AND POROUS PAVING FORMATIONS AMENDED.	24.06.2025	RAC
P2	PRELIMINARY ISSUE	23.05.2025	RAC
P1	PRELIMINARY ISSUE	13.05.2025	RAC
REV	AMENDMENT	DATE	CHKD

DRAWING STATUS

PRELIMINARY

RCD

RCD CONSULTANTS LTD
EMAIL: ray@rcd-consultants.com

CLIENT	
PROJECT	
PROPOSED RESIDENTIAL DEVELOPMENT SCHOOL ROAD HURST	
DRAWING TITLE	
DRAINAGE LAYOUT SHEET 1 OF 2	

CIVILS			
SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1 1:400 @ A3	STC	RAC	MAY 2025
DRAWING NUMBER			REVISION
1111-2530-CIV-10			P4



NOTES

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2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERING DRAWINGS AND CALCULATIONS ASSOCIATED WITH THIS PROJECT.

3. ALL COMPONENTS AND MATERIALS ARE TO BE MANUFACTURED AND SUPPLIED IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, AND LAID AND BACKFILLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THE RELEVANT BRITISH STANDARDS.

4. THE CONTRACTOR SHALL, BEFORE COMMENCING THE WORKS, VERIFY ALL SITE AND SETTING OUT DIMENSIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRUE AND PROPER SETTING OUT OF THE WORKS AND FOR THE CORRECTNESS OF THE POSITION, LEVELS, DIMENSIONS, AND ALIGNMENT OF ALL PARTS OF THE WORKS.

CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED

CONSTRUCTION

1. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

FUTURE DEMOLITION

A. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

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P3	RAINWATER BUTTS ADDED.	12.07.2025	RAC
P2	PRELIMINARY ISSUE	23.05.2025	RAC
P1	PRELIMINARY ISSUE	19.05.2025	RAC
REV	AMENDMENT	DATE	CHKD

DRAWING STATUS

PRELIMINARY

RCD

RCD CONSULTANTS LTD

EMAIL: ray@rcd-consultants.com

CLIENT

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT

SCHOOL ROAD

HURST

DRAWING TITLE

DRAINAGE LAYOUT

SHEET 2 OF 2

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1	STC	RAC	MAY 2025
1:400 @ A3			

DRAWING NUMBER	REVISION
1111-2530-CIV-11	P3

Appendix D

Post Development surface water calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.043	5.00	38.950	1200	1.500
S2	0.010	5.00	38.840	1200	1.490
SOAKAWAY			38.900	300	1.600
DUMMY	0.000	5.00	38.900	100	0.400
CARPARK 1	0.039		38.900	100	0.450
SIC2	0.000	5.00	38.900	100	0.400
CARPARK 2	0.023		38.900	100	0.450
SIC3	0.000	5.00	38.750	100	0.400
CARPARK 3	0.044		38.750	100	0.450
SIC4	0.000	5.00	39.100	100	0.400
CARPARK 4	0.108		39.100	100	0.450
SIC5	0.000	5.00	39.300	100	0.400
CARPARK 5	0.154		39.300	100	0.450

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	28.000	0.600	37.450	37.350	0.100	280.0	300	5.50	0.0
1.001	S2	SOAKAWAY	14.000	0.600	37.350	37.300	0.050	280.0	300	5.75	0.0
2.000	DUMMY	CARPARK 1	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
3.000	SIC2	CARPARK 2	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
4.000	SIC3	CARPARK 3	5.000	0.600	38.350	38.300	0.050	100.0	150	5.08	0.0
5.000	SIC4	CARPARK 4	5.000	0.600	38.700	38.650	0.050	100.0	150	5.08	0.0
6.000	SIC5	CARPARK 5	5.000	0.600	38.900	38.850	0.050	100.0	150	5.08	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.934	66.0	0.0	1.200	1.190	0.043	0.0	0	0.000
1.001	0.934	66.0	0.0	1.190	1.300	0.053	0.0	0	0.000
2.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
3.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
4.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
5.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
6.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.000	280.0	300	Circular	38.950	37.450	1.200	38.840	37.350	1.190
1.001	14.000	280.0	300	Circular	38.840	37.350	1.190	38.900	37.300	1.300
2.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
3.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
4.000	5.000	100.0	150	Circular	38.750	38.350	0.250	38.750	38.300	0.300
5.000	5.000	100.0	150	Circular	39.100	38.700	0.250	39.100	38.650	0.300
6.000	5.000	100.0	150	Circular	39.300	38.900	0.250	39.300	38.850	0.300

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	SOAKAWAY	300	Manhole	Adoptable
2.000	DUMMY	100	Manhole	Adoptable	CARPARK 1	100	Manhole	Adoptable
3.000	SIC2	100	Manhole	Adoptable	CARPARK 2	100	Manhole	Adoptable
4.000	SIC3	100	Manhole	Adoptable	CARPARK 3	100	Manhole	Adoptable
5.000	SIC4	100	Manhole	Adoptable	CARPARK 4	100	Manhole	Adoptable
6.000	SIC5	100	Manhole	Adoptable	CARPARK 5	100	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	38.950	1.500	1200				
				0	1.000	37.450	300
S2	38.840	1.490	1200				
				0	1.001	37.350	300
SOAKAWAY	38.900	1.600	300				
				1	1.001	37.300	300
DUMMY	38.900	0.400	100				
				0	2.000	38.500	150
CARPARK 1	38.900	0.450	100				
				1	2.000	38.450	150
SIC2	38.900	0.400	100				
				0	3.000	38.500	150
CARPARK 2	38.900	0.450	100				
				1	3.000	38.450	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SIC3	38.750	0.400	100					
				0	4.000	38.350	150	
CARPARK 3	38.750	0.450	100		1	4.000	38.300	150
SIC4	39.100	0.400	100					
				0	5.000	38.700	150	
CARPARK 4	39.100	0.450	100		1	5.000	38.650	150
SIC5	39.300	0.400	100					
				0	6.000	38.900	150	
CARPARK 5	39.300	0.450	100		1	6.000	38.850	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0

Node SOAKAWAY Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.300

Head
(m)
0.001

Flow
(l/s)
0.000

Node CARPARK 2 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.450

Head Flow
(m) (l/s)
0.001 0.000

Node CARPARK 3 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.300

Head Flow
(m) (l/s)
0.001 0.000

Node SOAKAWAY Lined Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Invert Level (m)	36.150	Pit Length (m)	2.400
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	0	Depth (m)	
Safety Factor	2.0	Ring Diameter (m)	2.100	Inf Depth (m)	
Porosity	1.00	Pit Width (m)	2.400	Number Required	3

Node CARPARK 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.450	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	409	Depth (m)	
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node CARPARK 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.400	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	0	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	24.000		

Node CARPARK 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.150	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	0	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	19.000		

Node CARPARK 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.600	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	542	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	57.000		

Node CARPARK 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.700	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	804	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	69.000		

Other (defaults)

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

Approval Settings

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

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	37.508	0.058	5.6	0.0658	0.0000	OK
15 minute winter	S2	11	37.416	0.066	6.8	0.0752	0.0000	OK
10080 minute winter	SOAKAWAY	6660	37.010	-0.290	0.1	14.8679	0.0000	OK
15 minute summer	DUMMY	1	38.500	0.000	0.0	0.0000	0.0000	OK
240 minute winter	CARPARK 1	184	38.496	0.046	1.3	4.8882	0.0000	OK
15 minute summer	SIC2	1	38.500	0.000	0.0	0.0000	0.0000	OK
600 minute winter	CARPARK 2	435	38.496	0.046	0.4	3.3727	0.0000	OK
15 minute summer	SIC3	1	38.350	0.000	0.0	0.0000	0.0000	OK
480 minute winter	CARPARK 3	440	38.270	-0.030	0.9	6.7326	0.0000	OK
15 minute summer	SIC4	1	38.700	0.000	0.0	0.0000	0.0000	OK
360 minute winter	CARPARK 4	288	38.696	0.046	2.7	15.3532	0.0000	OK
15 minute summer	SIC5	1	38.900	0.000	0.0	0.0000	0.0000	OK
360 minute winter	CARPARK 5	336	38.817	-0.033	3.8	22.7808	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	5.5	0.532	0.084	0.2933	
15 minute winter	S2	1.001	SOAKAWAY	6.7	0.614	0.101	0.1529	
10080 minute winter	SOAKAWAY	Head/Flow		0.0				0.0
10080 minute winter	SOAKAWAY	Infiltration		0.0				
15 minute summer	DUMMY	2.000	CARPARK 1	0.0	0.000	0.000	0.0036	
240 minute winter	CARPARK 1	Infiltration		0.3				
15 minute summer	SIC2	3.000	CARPARK 2	0.0	0.000	0.000	0.0000	
600 minute winter	CARPARK 2	Head/Flow		0.0				0.0
600 minute winter	CARPARK 2	Infiltration		0.1				
15 minute summer	SIC3	4.000	CARPARK 3	0.0	0.000	0.000	0.0000	
480 minute winter	CARPARK 3	Head/Flow		0.0				0.0
480 minute winter	CARPARK 3	Infiltration		0.2				
15 minute summer	SIC4	5.000	CARPARK 4	0.0	0.000	0.000	0.0000	
360 minute winter	CARPARK 4	Infiltration		0.5				
15 minute summer	SIC5	6.000	CARPARK 5	0.0	0.000	0.000	0.0000	
360 minute winter	CARPARK 5	Infiltration		0.6				



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.043	5.00	38.950	1200	1.500
S2	0.010	5.00	38.840	1200	1.490
SOAKAWAY			38.900	300	1.600
DUMMY	0.000	5.00	38.900	100	0.400
CARPARK 1	0.039		38.900	100	0.450
SIC2	0.000	5.00	38.900	100	0.400
CARPARK 2	0.023		38.900	100	0.450
SIC3	0.000	5.00	38.750	100	0.400
CARPARK 3	0.044		38.750	100	0.450
SIC4	0.000	5.00	39.100	100	0.400
CARPARK 4	0.108		39.100	100	0.450
SIC5	0.000	5.00	39.300	100	0.400
CARPARK 5	0.154		39.300	100	0.450

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	28.000	0.600	37.450	37.350	0.100	280.0	300	5.50	0.0
1.001	S2	SOAKAWAY	14.000	0.600	37.350	37.300	0.050	280.0	300	5.75	0.0
2.000	DUMMY	CARPARK 1	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
3.000	SIC2	CARPARK 2	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
4.000	SIC3	CARPARK 3	5.000	0.600	38.350	38.300	0.050	100.0	150	5.08	0.0
5.000	SIC4	CARPARK 4	5.000	0.600	38.700	38.650	0.050	100.0	150	5.08	0.0
6.000	SIC5	CARPARK 5	5.000	0.600	38.900	38.850	0.050	100.0	150	5.08	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.934	66.0	0.0	1.200	1.190	0.043	0.0	0	0.000
1.001	0.934	66.0	0.0	1.190	1.300	0.053	0.0	0	0.000
2.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
3.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
4.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
5.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
6.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.000	280.0	300	Circular	38.950	37.450	1.200	38.840	37.350	1.190
1.001	14.000	280.0	300	Circular	38.840	37.350	1.190	38.900	37.300	1.300
2.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
3.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
4.000	5.000	100.0	150	Circular	38.750	38.350	0.250	38.750	38.300	0.300
5.000	5.000	100.0	150	Circular	39.100	38.700	0.250	39.100	38.650	0.300
6.000	5.000	100.0	150	Circular	39.300	38.900	0.250	39.300	38.850	0.300

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	SOAKAWAY	300	Manhole	Adoptable
2.000	DUMMY	100	Manhole	Adoptable	CARPARK 1	100	Manhole	Adoptable
3.000	SIC2	100	Manhole	Adoptable	CARPARK 2	100	Manhole	Adoptable
4.000	SIC3	100	Manhole	Adoptable	CARPARK 3	100	Manhole	Adoptable
5.000	SIC4	100	Manhole	Adoptable	CARPARK 4	100	Manhole	Adoptable
6.000	SIC5	100	Manhole	Adoptable	CARPARK 5	100	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	38.950	1.500	1200	0	1.000	37.450	300
S2	38.840	1.490	1200		1.000	37.350	300
SOAKAWAY	38.900	1.600	300	0	1.001	37.350	300
				1	1.001	37.300	300
DUMMY	38.900	0.400	100	0	2.000	38.500	150
CARPARK 1	38.900	0.450	100		2.000	38.450	150
SIC2	38.900	0.400	100	0	3.000	38.500	150
				1	3.000	38.450	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SIC3	38.750	0.400	100					
				0	4.000	38.350	150	
CARPARK 3	38.750	0.450	100		1	4.000	38.300	150
SIC4	39.100	0.400	100					
				0	5.000	38.700	150	
CARPARK 4	39.100	0.450	100		1	5.000	38.650	150
SIC5	39.300	0.400	100					
				0	6.000	38.900	150	
CARPARK 5	39.300	0.450	100		1	6.000	38.850	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node SOAKAWAY Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.300

Head
(m)
0.001

Flow
(l/s)
0.000

Node CARPARK 2 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.450

Head Flow
(m) (l/s)
0.001 0.000

Node CARPARK 3 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.300

Head Flow
(m) (l/s)
0.001 0.000

Node SOAKAWAY Lined Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Invert Level (m)	36.150	Pit Length (m)	2.400
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	1080	Depth (m)	
Safety Factor	2.0	Ring Diameter (m)	2.100	Inf Depth (m)	
Porosity	1.00	Pit Width (m)	2.400	Number Required	3

Node CARPARK 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.450	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	409	Depth (m)	
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node CARPARK 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.400	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	480	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	24.000		

Node CARPARK 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.150	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	424	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	19.000		

Node CARPARK 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.600	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	542	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	57.000		

Node CARPARK 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.700	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	804	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	69.000		

Other (defaults)

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

Approval Settings

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

Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	37.538	0.088	12.4	0.0997	0.0000	OK
2880 minute winter	S2	2760	37.473	0.123	0.4	0.1394	0.0000	OK
2880 minute winter	SOAKAWAY	2760	37.473	0.173	0.4	22.8774	0.0000	OK
240 minute winter	DUMMY	228	38.537	0.037	0.0	0.0003	0.0000	OK
240 minute winter	CARPARK 1	228	38.537	0.087	2.3	9.5598	0.0000	OK
360 minute winter	SIC2	344	38.587	0.087	0.0	0.0007	0.0000	OK
360 minute winter	CARPARK 2	344	38.587	0.137	1.0	6.6416	0.0000	OK
360 minute winter	SIC3	352	38.378	0.028	0.0	0.0002	0.0000	OK
360 minute winter	CARPARK 3	352	38.378	0.078	1.9	12.9090	0.0000	OK
360 minute winter	SIC4	352	38.784	0.084	0.0	0.0007	0.0000	OK
360 minute winter	CARPARK 4	352	38.784	0.134	4.6	30.3257	0.0000	OK
360 minute winter	SIC5	352	38.925	0.025	0.0	0.0002	0.0000	OK
360 minute winter	CARPARK 5	352	38.925	0.075	6.6	45.0845	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	12.2	0.648	0.185	0.5298	
2880 minute winter	S2	1.001	SOAKAWAY	0.4	0.279	0.006	0.4856	
2880 minute winter	SOAKAWAY	Head/Flow		0.0				0.0
2880 minute winter	SOAKAWAY	Infiltration		0.0				
240 minute winter	DUMMY	2.000	CARPARK 1	0.0	-0.010	-0.001	0.0350	
240 minute winter	CARPARK 1	Infiltration		0.4				
360 minute winter	SIC2	3.000	CARPARK 2	0.0	-0.012	-0.002	0.0686	
360 minute winter	CARPARK 2	Head/Flow		0.0				0.0
360 minute winter	CARPARK 2	Infiltration		0.1				
360 minute winter	SIC3	4.000	CARPARK 3	0.0	-0.005	-0.001	0.0291	
360 minute winter	CARPARK 3	Head/Flow		0.0				0.0
360 minute winter	CARPARK 3	Infiltration		0.2				
360 minute winter	SIC4	5.000	CARPARK 4	0.0	-0.015	-0.002	0.0667	
360 minute winter	CARPARK 4	Infiltration		0.5				
360 minute winter	SIC5	6.000	CARPARK 5	0.0	-0.007	-0.001	0.0267	
360 minute winter	CARPARK 5	Infiltration		0.7				

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.043	5.00	38.950	1200	1.500
S2	0.010	5.00	38.840	1200	1.490
SOAKAWAY			38.900	300	1.600
DUMMY	0.000	5.00	38.900	100	0.400
CARPARK 1	0.039		38.900	100	0.450
SIC2	0.000	5.00	38.900	100	0.400
CARPARK 2	0.023		38.900	100	0.450
SIC3	0.000	5.00	38.750	100	0.400
CARPARK 3	0.044		38.750	100	0.450
SIC4	0.000	5.00	39.100	100	0.400
CARPARK 4	0.108		39.100	100	0.450
SIC5	0.000	5.00	39.300	100	0.400
CARPARK 5	0.154		39.300	100	0.450

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	28.000	0.600	37.450	37.350	0.100	280.0	300	5.50	0.0
1.001	S2	SOAKAWAY	14.000	0.600	37.350	37.300	0.050	280.0	300	5.75	0.0
2.000	DUMMY	CARPARK 1	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
3.000	SIC2	CARPARK 2	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
4.000	SIC3	CARPARK 3	5.000	0.600	38.350	38.300	0.050	100.0	150	5.08	0.0
5.000	SIC4	CARPARK 4	5.000	0.600	38.700	38.650	0.050	100.0	150	5.08	0.0
6.000	SIC5	CARPARK 5	5.000	0.600	38.900	38.850	0.050	100.0	150	5.08	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.934	66.0	0.0	1.200	1.190	0.043	0.0	0	0.000
1.001	0.934	66.0	0.0	1.190	1.300	0.053	0.0	0	0.000
2.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
3.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
4.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
5.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
6.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.000	280.0	300	Circular	38.950	37.450	1.200	38.840	37.350	1.190
1.001	14.000	280.0	300	Circular	38.840	37.350	1.190	38.900	37.300	1.300
2.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
3.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
4.000	5.000	100.0	150	Circular	38.750	38.350	0.250	38.750	38.300	0.300
5.000	5.000	100.0	150	Circular	39.100	38.700	0.250	39.100	38.650	0.300
6.000	5.000	100.0	150	Circular	39.300	38.900	0.250	39.300	38.850	0.300

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	SOAKAWAY	300	Manhole	Adoptable
2.000	DUMMY	100	Manhole	Adoptable	CARPARK 1	100	Manhole	Adoptable
3.000	SIC2	100	Manhole	Adoptable	CARPARK 2	100	Manhole	Adoptable
4.000	SIC3	100	Manhole	Adoptable	CARPARK 3	100	Manhole	Adoptable
5.000	SIC4	100	Manhole	Adoptable	CARPARK 4	100	Manhole	Adoptable
6.000	SIC5	100	Manhole	Adoptable	CARPARK 5	100	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	38.950	1.500	1200				
				0	1.000	37.450	300
S2	38.840	1.490	1200				
				0	1.001	37.350	300
SOAKAWAY	38.900	1.600	300				
				1	1.001	37.300	300
DUMMY	38.900	0.400	100				
				0	2.000	38.500	150
CARPARK 1	38.900	0.450	100				
				1	2.000	38.450	150
SIC2	38.900	0.400	100				
				0	3.000	38.500	150
CARPARK 2	38.900	0.450	100				
				1	3.000	38.450	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SIC3	38.750	0.400	100					
				0	4.000	38.350	150	
CARPARK 3	38.750	0.450	100		1	4.000	38.300	150
SIC4	39.100	0.400	100					
				0	5.000	38.700	150	
CARPARK 4	39.100	0.450	100		1	5.000	38.650	150
SIC5	39.300	0.400	100					
				0	6.000	38.900	150	
CARPARK 5	39.300	0.450	100		1	6.000	38.850	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	35	0	0

Node SOAKAWAY Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.300

Head (m) 0.001
Flow (l/s) 0.000

Node CARPARK 2 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.450

Head Flow
(m) (l/s)
0.001 0.000

Node CARPARK 3 Online Head/Flow Control

Flap Valve x Replaces Downstream Link ✓ Invert Level (m) 38.300

Head Flow
(m) (l/s)
0.001 0.000

Node SOAKAWAY Lined Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Invert Level (m)	36.150	Pit Length (m)	2.400
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	7080	Depth (m)	
Safety Factor	2.0	Ring Diameter (m)	2.100	Inf Depth (m)	
Porosity	1.00	Pit Width (m)	2.400	Number Required	3

Node CARPARK 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.450	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	409	Depth (m)	
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node CARPARK 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.400	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	1230	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	24.000		

Node CARPARK 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.150	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	1440	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	19.000		

Node CARPARK 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.600	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	542	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	57.000		

Node CARPARK 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.700	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	804	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	69.000		

Other (defaults)

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

Approval Settings

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

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute winter	S1	5340	38.330	0.880	0.3	0.9957	0.0000	SURCHARGED
5760 minute winter	S2	5340	38.330	0.980	0.4	1.1088	0.0000	SURCHARGED
5760 minute winter	SOAKAWAY	5340	38.330	1.030	0.4	37.7495	0.0000	OK

240 minute winter	DUMMY	236	38.615	0.115	0.0	0.0009	0.0000	OK
240 minute winter	CARPARK 1	236	38.615	0.165	3.9	18.4650	0.0000	OK

720 minute winter	SIC2	690	38.732	0.232	0.0	0.0019	0.0000	FLOOD RISK
720 minute winter	CARPARK 2	690	38.732	0.282	0.9	11.8659	0.0000	OK

480 minute winter	SIC3	472	38.576	0.226	0.1	0.0018	0.0000	FLOOD RISK
480 minute winter	CARPARK 3	472	38.576	0.276	2.5	24.1672	0.0000	OK

480 minute winter	SIC4	472	38.943	0.243	0.0	0.0019	0.0000	FLOOD RISK
480 minute winter	CARPARK 4	472	38.943	0.293	6.2	57.4901	0.0000	OK

480 minute winter	SIC5	472	39.117	0.217	0.1	0.0017	0.0000	FLOOD RISK
480 minute winter	CARPARK 5	472	39.117	0.267	8.8	84.9176	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
5760 minute winter	S1	1.000	S2	0.3	0.215	0.005	1.9717	
5760 minute winter	S2	1.001	SOAKAWAY	0.4	0.279	0.006	0.9859	
5760 minute winter	SOAKAWAY	Head/Flow		0.0				0.0
5760 minute winter	SOAKAWAY	Infiltration		0.1				
240 minute winter	DUMMY	2.000	CARPARK 1	0.0	-0.011	-0.002	0.0804	
240 minute winter	CARPARK 1	Infiltration		0.4				
720 minute winter	SIC2	3.000	CARPARK 2	0.0	-0.009	-0.002	0.0880	
720 minute winter	CARPARK 2	Head/Flow		0.0				0.0
720 minute winter	CARPARK 2	Infiltration		0.1				
480 minute winter	SIC3	4.000	CARPARK 3	-0.1	-0.014	-0.003	0.0880	
480 minute winter	CARPARK 3	Head/Flow		0.0				0.0
480 minute winter	CARPARK 3	Infiltration		0.2				
480 minute winter	SIC4	5.000	CARPARK 4	0.0	-0.012	-0.003	0.0880	
480 minute winter	CARPARK 4	Infiltration		0.6				
480 minute winter	SIC5	6.000	CARPARK 5	-0.1	-0.016	-0.003	0.0880	
480 minute winter	CARPARK 5	Infiltration		0.7				



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.043	5.00	38.950	1200	1.500
S2	0.010	5.00	38.840	1200	1.490
SOAKAWAY			38.900	300	1.600
DUMMY	0.000	5.00	38.900	100	0.400
CARPARK 1	0.039		38.900	100	0.450
SIC2	0.000	5.00	38.900	100	0.400
CARPARK 2	0.023		38.900	100	0.450
SIC3	0.000	5.00	38.750	100	0.400
CARPARK 3	0.044		38.750	100	0.450
SIC4	0.000	5.00	39.100	100	0.400
CARPARK 4	0.108		39.100	100	0.450
SIC5	0.000	5.00	39.300	100	0.400
CARPARK 5	0.154		39.300	100	0.450

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S1	S2	28.000	0.600	37.450	37.350	0.100	280.0	300	5.50	0.0
1.001	S2	SOAKAWAY	14.000	0.600	37.350	37.300	0.050	280.0	300	5.75	0.0
2.000	DUMMY	CARPARK 1	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
3.000	SIC2	CARPARK 2	5.000	0.600	38.500	38.450	0.050	100.0	150	5.08	0.0
4.000	SIC3	CARPARK 3	5.000	0.600	38.350	38.300	0.050	100.0	150	5.08	0.0
5.000	SIC4	CARPARK 4	5.000	0.600	38.700	38.650	0.050	100.0	150	5.08	0.0
6.000	SIC5	CARPARK 5	5.000	0.600	38.900	38.850	0.050	100.0	150	5.08	0.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.934	66.0	0.0	1.200	1.190	0.043	0.0	0	0.000
1.001	0.934	66.0	0.0	1.190	1.300	0.053	0.0	0	0.000
2.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
3.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
4.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
5.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000
6.000	1.005	17.8	0.0	0.250	0.300	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.000	280.0	300	Circular	38.950	37.450	1.200	38.840	37.350	1.190
1.001	14.000	280.0	300	Circular	38.840	37.350	1.190	38.900	37.300	1.300
2.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
3.000	5.000	100.0	150	Circular	38.900	38.500	0.250	38.900	38.450	0.300
4.000	5.000	100.0	150	Circular	38.750	38.350	0.250	38.750	38.300	0.300
5.000	5.000	100.0	150	Circular	39.100	38.700	0.250	39.100	38.650	0.300
6.000	5.000	100.0	150	Circular	39.300	38.900	0.250	39.300	38.850	0.300

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	SOAKAWAY	300	Manhole	Adoptable
2.000	DUMMY	100	Manhole	Adoptable	CARPARK 1	100	Manhole	Adoptable
3.000	SIC2	100	Manhole	Adoptable	CARPARK 2	100	Manhole	Adoptable
4.000	SIC3	100	Manhole	Adoptable	CARPARK 3	100	Manhole	Adoptable
5.000	SIC4	100	Manhole	Adoptable	CARPARK 4	100	Manhole	Adoptable
6.000	SIC5	100	Manhole	Adoptable	CARPARK 5	100	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	38.950	1.500	1200	0	1.000	37.450	300
S2	38.840	1.490	1200		1.000	37.350	300
SOAKAWAY	38.900	1.600	300	1	1.001	37.350	300
					1.001	37.300	300
DUMMY	38.900	0.400	100	0	2.000	38.500	150
CARPARK 1	38.900	0.450	100		2.000	38.450	150
SIC2	38.900	0.400	100	0	3.000	38.500	150
CARPARK 2	38.900	0.450	100		3.000	38.450	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SIC3	38.750	0.400	100					
				0	4.000	38.350	150	
CARPARK 3	38.750	0.450	100		1	4.000	38.300	150
SIC4	39.100	0.400	100					
				0	5.000	38.700	150	
CARPARK 4	39.100	0.450	100		1	5.000	38.650	150
SIC5	39.300	0.400	100					
				0	6.000	38.900	150	
CARPARK 5	39.300	0.450	100		1	6.000	38.850	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Node SOAKAWAY Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 37.300

Head
(m)
0.001

Flow
(l/s)
0.000

Node CARPARK 2 Online Head/Flow Control

Flap Valve x | Replaces Downstream Link ✓ | Invert Level (m) 38.450

Head (m)	Flow (l/s)
0.001	0.000

Node CARPARK 3 Online Head/Flow Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	38.300
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Head (m)	Flow (l/s)
0.001	0.000

Node SOAKAWAY Lined Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00360	Invert Level (m)	36.150	Pit Length (m)	2.400
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	9240	Depth (m)	
Safety Factor	2.0	Ring Diameter (m)	2.100	Inf Depth (m)	
Porosity	1.00	Pit Width (m)	2.400	Number Required	3

Node CARPARK 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.450	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	409	Depth (m)	
Safety Factor	2.0	Width (m)	15.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node CARPARK 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.400	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	1808	Depth (m)	
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	24.000		

Node CARPARK 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.150	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	2168	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	19.000		

Node CARPARK 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.600	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	542	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	57.000		

Node CARPARK 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00650	Invert Level (m)	38.700	Slope (1:X)	5000.0
Side Inf Coefficient (m/hr)	0.00650	Time to half empty (mins)	804	Depth (m)	
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.30	Length (m)	69.000		

Other (defaults)

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

Approval Settings

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

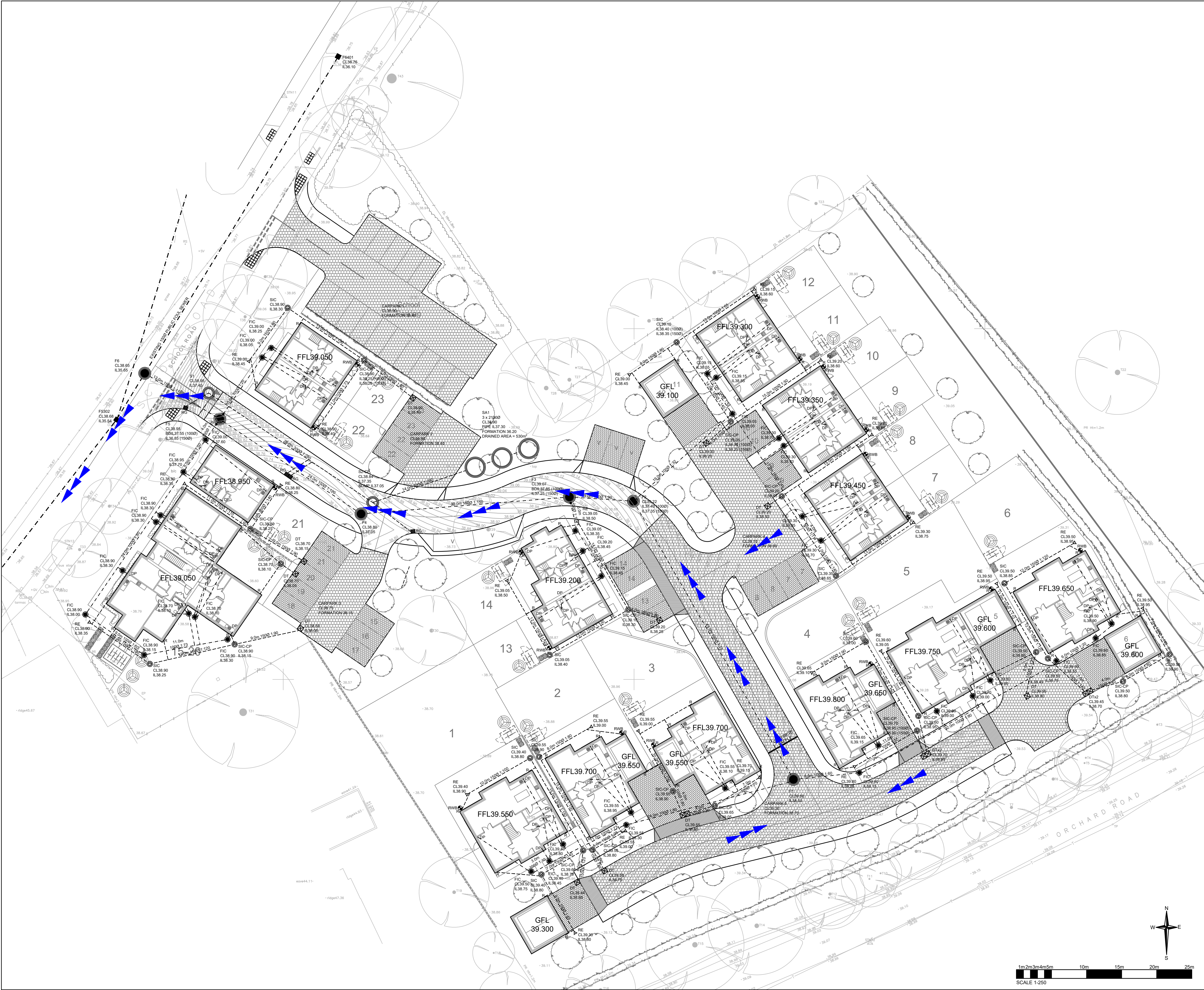
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
7200 minute winter	S1	6720	38.800	1.350	0.3	1.5271	0.0000	FLOOD RISK
7200 minute winter	S2	6720	38.800	1.450	0.4	1.6402	0.0000	FLOOD RISK
7200 minute winter	SOAKAWAY	6720	38.800	1.500	0.4	45.9025	0.0000	OK
360 minute winter	DUMMY	352	38.674	0.174	0.0	0.0014	0.0000	FLOOD RISK
360 minute winter	CARPARK 1	352	38.674	0.224	3.7	25.2096	0.0000	OK
480 minute winter	SIC2	472	38.857	0.357	0.1	0.0029	0.0000	FLOOD RISK
480 minute winter	CARPARK 2	472	38.857	0.407	1.7	16.3611	0.0000	OK
480 minute winter	SIC3	472	38.724	0.374	0.1	0.0030	0.0000	FLOOD RISK
480 minute winter	CARPARK 3	472	38.724	0.424	3.3	32.6125	0.0000	OK
480 minute winter	SIC4	472	39.061	0.361	0.1	0.0029	0.0000	FLOOD RISK
480 minute winter	CARPARK 4	472	39.061	0.411	8.0	77.7613	0.0000	OK
600 minute winter	SIC5	585	39.256	0.356	0.1	0.0028	0.0000	FLOOD RISK
600 minute winter	CARPARK 5	585	39.256	0.406	9.4	113.6357	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
7200 minute winter	S1	1.000	S2	0.3	0.215	0.005	1.9717	
7200 minute winter	S2	1.001	SOAKAWAY	0.4	0.279	0.006	0.9859	
7200 minute winter	SOAKAWAY	Head/Flow		0.0				0.0
7200 minute winter	SOAKAWAY	Infiltration		0.1				
360 minute winter	DUMMY	2.000	CARPARK 1	0.0	-0.008	0.002	0.0880	
360 minute winter	CARPARK 1	Infiltration		0.4				
480 minute winter	SIC2	3.000	CARPARK 2	-0.1	-0.011	-0.003	0.0880	
480 minute winter	CARPARK 2	Head/Flow		0.0				0.0
480 minute winter	CARPARK 2	Infiltration		0.1				
480 minute winter	SIC3	4.000	CARPARK 3	-0.1	-0.018	-0.004	0.0880	
480 minute winter	CARPARK 3	Head/Flow		0.0				0.0
480 minute winter	CARPARK 3	Infiltration		0.2				
480 minute winter	SIC4	5.000	CARPARK 4	-0.1	-0.011	-0.003	0.0880	
480 minute winter	CARPARK 4	Infiltration		0.6				
600 minute winter	SIC5	6.000	CARPARK 5	-0.1	-0.008	-0.003	0.0880	
600 minute winter	CARPARK 5	Infiltration		0.7				

Appendix E

Flood exceedance plan



NOTES
CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE
COMMENCING ANY WORK ON SHOP DRAWINGS
DO NOT SCALE FROM THIS DRAWING
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FLOOD EXCEEDANCE ROUTE

P1	PRELIMINARY ISSUE	12.07.2025	RAC
REV	AMENDMENT	DATE	CHKD

DRAWING STATUS

PRELIMINARY

RCD

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CLIENT

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
SCHOOL ROAD
HURST

DRAWING TITLE
FLOOD EXCEEDANCE PLAN

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:250 @ A1 1:500 @ A3	STC	RAC	JUL 2025

DRAWING NUMBER	REVISION
1111-2530-CIV-FEP	P1

