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Structural & Civil Engineers

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AC23068-ABS-XX-XX-RP-C-5802-P01

18th November 2024

AC23068, Furner Lane: Drainage Strategy Report, Addendum

This addendum is to be read in conjunction with Abstruct Report AC23068-ABS-XX-XX-RP-C-5801 – Drainage Strategy Report and has been written to respond to queries raised by West Sussex County Council, acting as the Lead Local Flood Authority (LLFA) for the planning application this report was written in support of.

A copy of the letter received from the LLFA has been appended to this addendum for reference as we use the same numbering found in this letter to respond to the queries.

Reponses to Queries Raised by the LLFA

1) Any existing ditches adjacent, or in close proximity, to the site are outside of the red line site boundary, and therefore will not be filled in by the development. The topographic survey shows a hedgerow and bank down to the road (Furners Lane) along the northern boundary, not a ditch along here. The nearest ditch to the north of the site is on the other side of Furners Lane, and therefore will be unaffected by the development.

   The existing ditches mentioned above generally appear to be in poor condition, based on observations made during our initial site walkover. It is currently not known if these ditches have positive outfalls to a wider network of ditches / watercourses or drains at this stage. The ditch to the north west of the development is potentially a highway asset as it appears to drain the public highway (Furners Lane).

   Given the above we are currently not proposing to discharge the surface water from the development to either of these ditches. However, as noted on our drawing we have proposed that these should be investigated further with a view to potentially utilising the ditch / ditches within our overall surface water drainage strategy should the investigation show that the ditches have onward connectivity and a positive outfall. If the investigation is positive we would review our strategy and if appropriate amend our proposed final outfall point to suit.

   The level of these ditches are not sufficiently deep to allow for a gravity connection to the west (ditch IL is 27.89, ground level where the balancing pond is shown is 28.00. Therefore, this would still require a pumped solution.

   The ditch to the north would require crossing 3rd party land (Furners Lane is not public highway past the entrance to the site), which we cannot guarantee being permited, as well as not knowing the final outfall of this ditch. However, this ditch does have an IL of 26.80, therefore also being above the bottom of the attenuation feature and still requiring pumping, though admittedly a shorter distance.

2) Limited infiltration testing has been undertaken on site which confirmed that infiltration is not feasible, the results of the testing are appended to this addendum.

3) We note that Southern Water have already responded to Horsham District Council, having been consulted as part of the planning process, confirming that they have capacity within the network for both the foul and surface water drainage proposed to discharge from site. The letter confirming this is appended to this addendum.

4) Additional levels have been added to the SUDS features on the plan as requested. The new plan has been appended to this addendum.

5) The calculations have been rerun with updated figures as requested and the new results are appended to this addendum.

Yours sincerely

[redacted]

Martin Howell
MEng (Hons)
Associate
[redacted]

Appended Documents

West Sussex County Council queries letter
Infiltration Testing
Letter from Southern Water
Revised Strategy Drawing
Revised Calculations

Ground Floor
Northleigh
County Hall
Chichester
West Sussex
PO19 1RH

Lead Local Flood Authority

Stephanie Bryant
Development Control
Horsham District Council
Parkside
Chart Way
Horsham
RH14 1RL

Date 11th November 2024

Dear Stephanie,

RE: **DC/24/1538 – Land to the south of Furners Lane, Henfield, West Sussex**

Thank you for your consultation on the above site, received on 22nd October 2024. We have reviewed the application as submitted and wish to make the following comments.

This is a full planning application for the erection of 29 dwellings with associated landscaping, open space, parking and creation of new vehicular access.

We **object** to this planning application in the absence of an acceptable Flood Risk Assessment (FRA) & Drainage Strategy relating to:

- The application is not in accordance with the NPPF, PPG Flood risk and coastal change or Policy 38 in Horsham District Planning Framework.
- Further investigations into above ground SuDS features need to be fully explored before pumped solution is proposed.

Reason
To prevent flooding in accordance with National Planning Policy Framework paragraph 173, 175 and 180 by ensuring the satisfactory management of local flood risk, surface water flow paths, storage and disposal of surface water from the site in a range of rainfall events and ensuring the SuDS proposed operates as designed for the lifetime of the development.

We will consider reviewing this objection if the issues highlighted below are adequately addressed:

1. The use of a pumped solution and the attenuation tank is not a sustainable way of draining the site. The topographic survey shows that there is a ditch in the north of the site which must be maintained as a ditch and not infilled and that there is a

ditch along Furners Lane. These must be ruled out as ways of draining the site before looking at other options.
2. No infiltration testing or winter groundwater monitoring has been submitted.
3. There is no evidence that Southern Water agree in principle about connecting to their surface water sewer.
4. The drainage layout must have the levels of the features on.
5. In the calculations, a Cv value of 1, additional storage of 0 and FEH 2022 rainfall is needed.

Once the investigation into the ditches has been completed, we will provide further comments if a pump is essential, however a pump is not a sustainable solution.

Yours sincerely,

Eleanor Read
Flood Risk Management Team
FRM@westsussex.gov.uk

Annex

The following documents have been reviewed, which have been submitted to support the application;

Drainage Strategy Layout by Abstruct Consulting, 20.09.2024, revision P02
Flood Risk Assessment by Abstruct Consulting, 20.09.2024, revision P02
Drainage Strategy Report by Abstruct Consulting, 20.09.2024, revision P03

31th May 2022

Our ref: GE20688/JG01/220531

Geo-Environmental

Sue Fulton
Millwood Designer Homes Limited
6 Alexander Grove,
Kings Hill,
West Malling,
Kent,
ME19 4XR

By email only

Dear Sue

RE: Furners Lane, Henfield – Preliminary Information

Further to our recent field works and subject to the results of the ongoing laboratory testing, we write to confirm our preliminary assessments with respect to the ground conditions and the proposed redevelopment:

Scope of works

The investigation was undertaken on 12th May 2022 and comprised:

- 2No. machine excavated trial pits to depths of up to 2.60m bgl (TP01 to TP02).

Figure 1 presents the exploratory hole locations.

The exploratory hole locations were positioned across the paddocks and were situated in areas that had been cleared of vegetation by the ecologists.

Site Description

The site was composed of two paddocks located to the south for Furners Lane, the paddocks are accessed along a track running along the west of the northern field. The fields were currently in pasture.

Ground Conditions

According to the British Geological Survey the ground conditions are likely to comprise the Folkestone Formation. During the investigation a thin mantle of Topsoil was encountered, overlying the Folkestone Formation. A summary of the ground conditions is provided below:

Top (m bgl)	Base (m bgl)	Geology	Positions
0	0.40-0.70	TOPSOIL: Light brown silty SAND with matted rootlets.	All
0.40-0.70	>2.60	FOLKESTONE FORMATION: Light grey with orangish brown mottling sandy CLAY becoming clayey SAND. Sand was fine.	All

The draft exploratory hole logs are appended.

No significant organoleptic evidence of contamination was noted during the intrusive investigation. However, samples have been recovered from the exploratory holes and submitted for laboratory analysis for a suite of commonly occurring contaminants including pesticides. The test results and assessment thereof will be presented within the final report.

Groundwater

Perched groundwater was encountered at 2.5m bgl in TP01.

It should be noted that changes in groundwater and perched water levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed within appropriate response zones.

Soakage Testing

Two full scale BRE Digest 365 tests were carried out, preliminary results are recorded below,

Location	Depth of Pit (m bgl)	Fall in head (m)	Total time (mins)	Calculated infiltration rate (m/s)	Remarks
TP01	2.60	0.20	180	-	Insufficient fall over time to calculate rate.
TP02	2.50	0.26	250	-	Insufficient fall over time to calculate rate.

It was inappropriate to extrapolate the test data, given the limited fall in head. Based on the results it is considered unlikely that conventional shallow soakaways will work effectively on the site.

Excavations

Both shallow and deeper dry excavations within the cohesive soils are likely to remain stable in the short to medium term. However, any excavation that intersects perched water bodies may become unstable in the short term and may require pumping from sumps and shuttering to maintain stability.

Appropriate Health and Safety precautions should be adopted where man entry into excavations is required. However, groundworks should be designed in such a manner to avoid man entry into excavations.

Foundations

Based on the ground and groundwater conditions encountered during the intrusive works, it is considered that conventional foundations may be appropriate for a low-rise development. The clay horizons of the Folkestone Formation are likely to be classified as ranging between medium and high volume change potential as defined by NHBC Standards, Chapter 4.2. The more granular horizons of the Folkstone Formation are likely to range between low and medium volume change potential. However, these assessments will be confirmed by the ongoing geotechnical classification tests. Minimum foundation depths of at 1.50m bgl are likely to be applicable within the more granular horizons, outside of the zone of influence of any current, recently removed or proposed trees. Foundations within shrinkable soils within the zone of moisture demand of existing, proposed or recently removed trees will require deepening and potentially heave protection measures included.

Furthermore, foundations which span the clay and sand horizons of the Folkestone Formation should be nominally reinforced to account for differential settlement.
Where the depth of foundations require deepening beyond 2.50m bgl on account of trees, the use of a piled foundation solution on site may be more appropriate.

A preliminary net allowable bearing pressure of 125kPa is considered suitable for traditional trench foundations up to 1.50m in width taken down through any disturbed, desiccated or loose materials to bear upon the granular deposits of the Folkstone Formation.

Given the presence of shrinkable soils on site, floor slabs should be fully suspended.

Closure

We trust we have interpreted your request correctly and provide sufficient information for your current requirements.

It should be noted that the comments provided herein are for preliminary purposes only and could change following receipt and review of geotechnical laboratory testing. As such, detailed design should not be undertaken based on the preliminary findings.

If you have any questions or queries in relation the preliminary information provided at this stage, please do not hesitate to contact the undersigned.

Yours sincerely
For and on Behalf of Geo-Environmental

[redacted]

James Gooding, BSc (Hons), MSc, FGS, AMIEnvSc
Senior Consulting Engineer

Enc. Figure 1 - Exploratory hole plan
Preliminary exploratory hole logs

Project:	Furners Lane, Henfield			**Title**	Exploratory Hole Plan
Client:	Millwood Designer Homes Ltd			**Geo-Environmental Services Ltd** **Unit 7 Danworth Farm, Cuckfield Road** **Hurstpierpoint, West Sussex BN6 9GL** **+44(0)1273 832972 www.gesl.net**	Geo-Environmental
Ref No:	GE20688	**Revision:**	0		
Drawn:	JG	**Date:**			
Figure:	1	**Scale:**	NTS		

Geo-Environmental
Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL
www.gesl.net

Trial Pit Log

TrialPit No: TP01
Sheet 1 of 1

Project Name: Furners Green	Project No. GE20688	Co-ords: 521791.19 - 116077.21 Level:	Date 12/05/2022
Location: Henfield		Dimensions (m): 2.45 × 0.58 Depth 2.60	Scale 1:25
Client: MDH			Logged JG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					Light brown silty SAND. Matted rootlets to 0.5m bgl. TOPSOIL
				0.40			
	0.50	D					Firm light grey mottled orange brown sandy CLAY. Sand is fine. FOLKESTONE FORMATION
	0.60	ES					
	1.00	D					
	1.50	D		1.50			Light grey mottled orange brown clayey SAND with pockets of clay. FOLKESTONE FORMATION
	2.00	D					
				2.30			Grey with occasional orange brown mottling very clayey SAND. Sand is fine. FOLKESTONE FORMATION
	2.50	D					*Perched groundwater was encountered at 2.5m bgl.*
				2.60			End of Pit at 2.60m

1 2 3 4 5

Water Strike - Details	
Depth Water	Depth Water Value

Remarks:

Stability: Sides Stable

AGS

Geo-Environmental
Unit 7, Danworth Farm
Hurstpierpoint
BN6 9GL
www.gesl.net

Trial Pit Log

TrialPit No: TP02
Sheet 1 of 1

Project Name: Furners Green	Project No. GE20688	Co-ords: 521779.60 - 115997.76 Level:	Date 12/05/2022
Location: Henfield		Dimensions (m): 2.73 x 0.63 Depth 2.50	Scale 1:25
Client: MDH			Logged JG

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					Light brown silty SAND. Matted rootlets to 0.05m bgl. TOPSOIL
	0.20	ES					
	0.50	D		0.70			Firm orange brown mottled light grey sandy CLAY becoming at 1.5 clayey SAND with clay pockets. Sand is fine FOLKESTONE FORMATION
	1.00	D					
	1.50	D					
	2.00	D					
	2.50	D		2.50			End of Pit at 2.50m

1
2
3
4
5

Water Strike - Details	
Depth Water	Depth Water Value

Remarks

Stability: Sides Stable

AGS

from Southern Water

Horsham District Council
Parkside
Chart Way
Horsham
West Sussex
RH12 1RL

Your ref
DC/24/1538

Our ref
DSA000038316

Date
12/11/2024

Contact
Tel 0330 303 0119

Dear Sir/Madam,

Proposal: Erection of 29 dwellings with associated landscaping, open space, parking and creation of new vehicular access.
Site: Land To The South of Furners Lane Henfield West Sussex, BN5 9LH.

Thank you for your correspondence dated the 22nd of October 2024, please see our comments below regarding the above application.

Connection to public sewer

Our investigations indicate that Southern Water can facilitate foul sewerage /surface water run off disposal to service the proposed development. Southern Water requires a formal application for a connection to the public sewer to be made by the applicant or developer.

To make an application visit Southern Water's Get Connected service: https://developerservices.southernwater.co.uk and please read our New Connections Charging Arrangements documents which are available on our website via the following link: https://www.southernwater.co.uk/developing-building/connection-charging-arrangements

We request that should this planning application receive planning approval, the following informative is attached to the consent: Construction of the development shall not commence until details of the proposed means of foul sewerage and surface water disposal have been submitted to and approved in writing by the Local Planning Authority in consultation with Southern Water.

Rainwater Harvesting

The proposed rainwater harvesting system should be designed, installed and maintained to current British Standards to ensure that measures are in place to protect the public water supply and avoid cross contamination.

Condition: Southern Water requests that the following condition be added to any planning consent; Prior to the commencement of development, details of the rainwater harvesting system including measures to prevent contamination of the water supply and any discharge to public sewers will need to be submitted to and approved by the Local Planning Authority.

Prior to occupation of the development, maintenance responsibilities and regimes for the rainwater harvesting system will need to be submitted to and approved by the Local Planning Authority.

SuDS

The supporting documents make reference to drainage using Sustainable Drainage Systems (SuDS). Under certain circumstances SuDS will be adopted by Southern Water should this be requested by the developer. Where SuDS form part of a continuous sewer system, and are not an isolated end of pipe SuDS component, adoption will be considered if such systems comply with the latest Design and Construction Guidance (Appendix C) and CIRIA guidance available here:

https://www.water.org.uk/sewerage-sector-guidance-approved-documents/
https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS

Where SuDS rely upon facilities which are not adoptable by sewerage undertakers the applicant will need to ensure that arrangements exist for the long-term maintenance of the SuDS facilities. It is critical that the effectiveness of these systems is maintained in perpetuity. Good management will avoid flooding from the proposed surface water system, which may result in the inundation of the foul sewerage system.

Thus, where a SuDS scheme is to be implemented, the drainage details submitted to the Local Planning Authority should:

- Specify the responsibilities of each party for the implementation of the SuDS scheme.

- Specify a timetable for implementation.

- Provide a management and maintenance plan for the lifetime of the development.

This should include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.
This initial assessment does not prejudice any future assessment or commit to any adoption agreements under Section 104 of the Water Industry Act 1991. Please note that non-compliance with the Design and Construction Guidance will preclude future adoption of the foul and surface water sewerage network on site. The design of drainage should ensure that no groundwater or land drainage is to enter public sewers.

Water features above or close to sewers

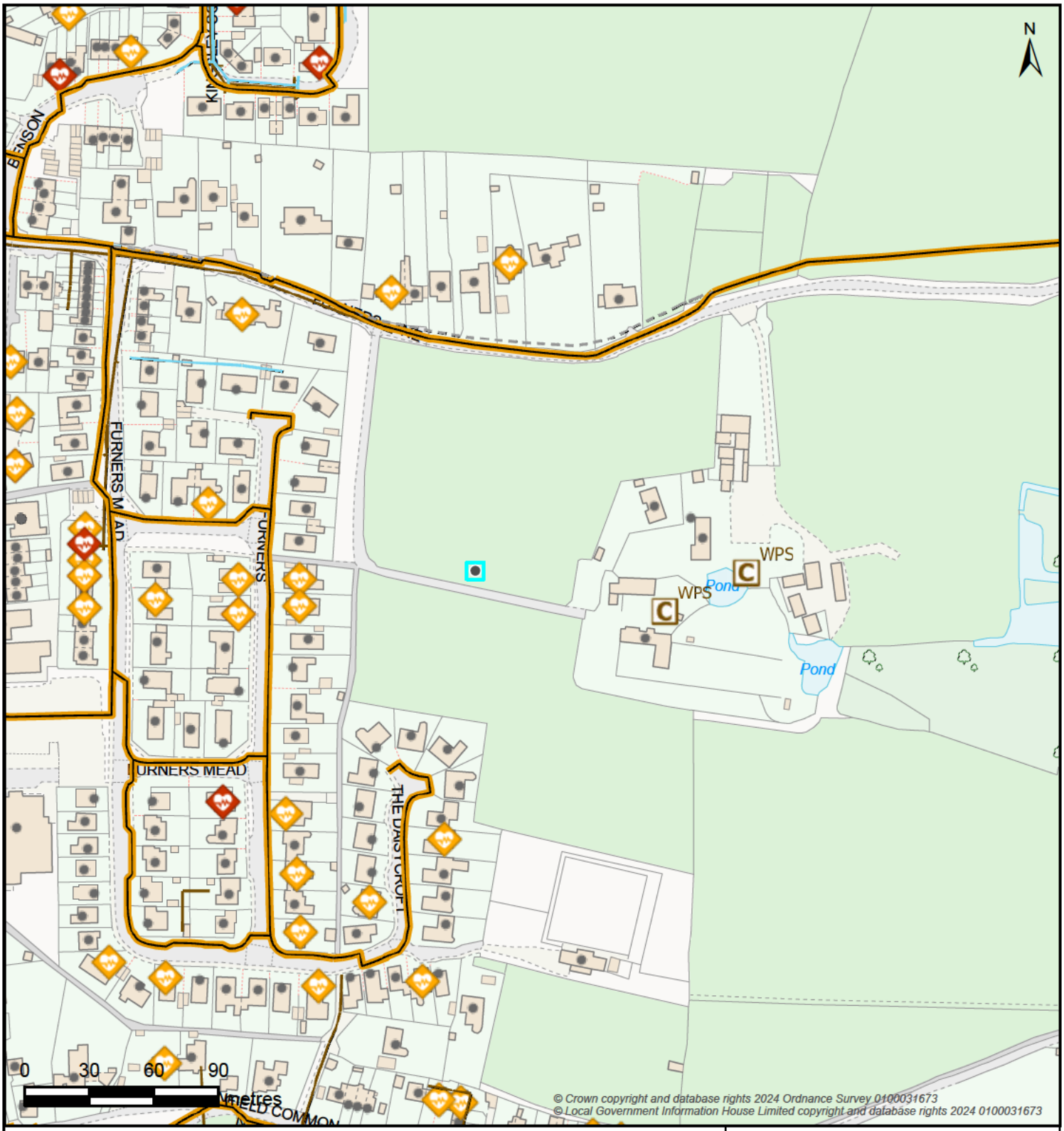
No soakaways, swales, ponds, watercourses or any other surface water retaining or conveying features should be located within 5 metres of public or adoptable gravity sewers, rising mains or water mains.

For further advice, please contact Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX (Tel: 0330 303 0119).

Website: southernwater.co.uk or by email at: SouthernWaterPlanning@southernwater.co.uk

Yours faithfully,

Future Growth Planning Team
southernwater.co.uk/developing-building/planning-your-development



Boundary Box	Break Pressure Tank	Capped End	Hydrant
Boundary Box	BPT Break Pressure Tank	Capped End	Emptying Plug; Fire Hydrant; WOH Washout Hydrant

Pressure Monitoring	Service Reservoir	Meter	Valve - Controllable
Logger	Covered; Tower	Meter	Open Valve; Closed Valve; Stop Tap

Site	Valve - Flow
Abstraction Point; Supply Works; Booster Station; Transfer Station; Surface Reservoir; Underground Source	AV Air Valve; NRV Non-Return Valve; WO Washout Empty Valve

Valve - Pressure	Pipe Bridge
PRV Pressure Reducing Valve; PSV Pressure Sustaining Valve	Pipe Bridge

Water Pipe	Water Area
Communication; Trunk; Decommissioned; Distribution; Raw; Discolouration; Non-Potable; Private	Water Supply Zone; District Meter Area

Map Title: SW Print

Printed By: Kelly.Donaldson

Date Printed: 12/11/2024

Map Scale: 2500

The information provided is believed to be correct but is provided on an 'as is' basis and without any warranty or condition express or implied, statutory or otherwise as to its quality or fitness for purpose. Actual positions of assets should always be determined on site.

WATER for LIFE from Southern Water

APPROXIMATE LOCATION OF SOUTHERN WATER PUBLIC FOUL WATER SEWER, CHAMBER REF. 6151.
CL=26.21
IL=24.70
DP=1.51m
INFORMATION TAKEN FROM SEWER RECORDS, NOT VISIBLE ON SURVEY OR FROM WALK OVER.
FURTHER INVESTIGATION REQUIRED

5m SECTION OF GRAVITY PIPEWORK BETWEEN RECEIVING CHAMBER OF RISING MAIN AND PUBLIC SEWER.

PROPOSED NEW CONNECTION TO EXISTING PUBLIC SEWER SUBJECT TO APPROPRIATE SECTION 106 CONNECTION APPLICATION WITH SOUTHERN WATER.

BREAK CHAMBER FOR PUMPED RISING MAIN.

EXISTING MANHOLE ASSUMED TO BE SOUTHERN WATER PUBLIC FOUL WATER SEWER, CHAMBER REF. 6101.
CL=26.43
IL=UNKNOWN
DP=UNKNOWN
INFORMATION TAKEN FROM SEWER RECORDS. POSITION TAKEN FROM TOPOGRAPHICAL SURVEY.

EXISTING MANHOLE ASSUMED TO BE SOUTHERN WATER PUBLIC FOUL WATER SEWER, CHAMBER REF. 6102.
CL=27.91
IL=26.31
DP=1.60m
INFORMATION TAKEN FROM SEWER RECORDS. POSITION TAKEN FROM TOPOGRAPHICAL SURVEY.

EXISTING MANHOLE ASSUMED TO BE SOUTHERN WATER PUBLIC FOUL WATER SEWER, CHAMBER REF. 7101.
CL=28.70
IL=27.09
DP=1.61m
INFORMATION TAKEN FROM SEWER RECORDS. POSITION TAKEN FROM TOPOGRAPHICAL SURVEY.

PROPOSED NEW CONNECTION TO EXISTING PUBLIC SEWER SUBJECT TO APPROPRIATE SECTION 106 CONNECTION APPLICATION WITH SOUTHERN WATER.

DITCH OUTFALL AND DOWN STREAM NETWORK TO BE INVESTIGATED TO DETERMINE IF SURFACE WATER FROM SITE COULD DISCHARGE TO THIS POINT TO REDUCE LENGTH OF RISING MAIN / WORKS TO FURNERS LANE.

SURFACE WATER PUMP LIMITS OFFSITE FLOW RATE TO GREENFIELD QBAR RUNOFF RATE OF 3.2l/s

POND
TOP LEVEL 28.00
WATER LEVEL 27.40

TANK
TOP LEVEL 27.00
BOTTOM LEVEL 26.00

BALANCING POND WITH GEOCEULLULAR ATTENUATION TANK BENEATH.

TANK TO BE 18m x 18m x 1m AND SIZED TO STORE THE 1:30 YEAR EVENT.

POND ABOVE PROVIDES THE ADDITIONAL STORAGE UP TO AND INCLUDING THE 1:100 YEAR EVENT WITH A 45% ALLOWANCE FOR CLIMATE CHANGE.

SWALE 1 OUTLET
CL 28.10
IL 27.60

500mm DEEP SWALE.

SWALE 1 INLET
CL 28.60
IL 28.10

SWALE 2 OUTLET
CL 28.70
IL 28.10

500mm DEEP SWALE.

SWALE 2 INLET
CL 29.10
IL 28.60

SWALE 3 OUTLET
CL 29.20
IL 28.70

PERMEABLE PAVING WITH 20m x 8.5m x 400mm DEEP GEOCELLULAR ATTENUATION CRATES BENEATH FOR STORAGE.

500mm DEEP SWALE.

SWALE 3 INLET
CL 29.50
IL 29.00

SWALE 4 OUTLET
CL 29.60
IL 29.10

500mm DEEP SWALE.

SWALE 4 INLET
CL 30.10
IL 29.60

HYDROBRAKE LIMITS FLOW RATE TO 1l/s

HYDROBRAKE LIMITS FLOW RATE TO 1l/s

PERMEABLE PAVING WITH 17m x 11m x 400mm DEEP GEOCELLULAR ATTENUATION CRATES BENEATH FOR STORAGE.

Pond

KEY:

PRIVATE DRAINAGE

ALL BELOW GROUND PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

- 150Ø, 1:80 — -SURFACE WATER DRAIN.
- S1 — -SURFACE WATER CHAMBER.
- CP1 — -SURFACE WATER CATCHPIT CHAMBER.
- SPS — -SURFACE WATER PUMPING STATION.
- -PUMPED SURFACE WATER RISING MAIN.
- HB — -HYDRO-BRAKE FLOW CONTROL MANHOLE.
- -PERMEABLE PAVING (TANKED).
- -HEADWALL (INLET / OUTLET)
- -BELOW GROUND GEOLIGHT SURFACE WATER ATTENUATION STORAGE SYSTEM BY SDS (TEL: 01934 751 303).
- -EXCEEDANCE FLOOD ROUTING.
- 150Ø, 1:80 — F1 — -FOUL WATER DRAIN.
- -FOUL WATER CHAMBER.
- FPS — -FOUL WATER PUMPING STATION.
- -PUMPED FOUL WATER RISING MAIN.

EXISTING DRAINAGE

- 150Ø — Ex. — -SURFACE WATER DRAIN TO REMAIN.
- -SURFACE WATER CHAMBER.
- 150Ø — Ex. — -FOUL WATER DRAIN TO REMAIN.
- -FOUL WATER CHAMBER.

0m 5 10 15 20 25m 30 35 40 45 50m
1:500 SCALE

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND SPECIFICATIONS.

FOR INFORMATION ONLY

P03	MH	MRW	18.11.24	ADDITIONAL INFO ADDED TO SUDS FEATURES.
P02	MH	MRW	20.09.24	SITE PLAN UPDATED TO LATEST.
P01	MH	MRW	13.09.24	PRELIMINARY ISSUE
Rev	Drwn	Chkd	D.M.Y	Revision notes
Revisions				

abstruct consulting
Structural & Civil Engineers
T: 01732 838650 E: info@abstruct-consult.com www.abstruct-consult.com

Client
ELIVIA HOMES

Project
FURNERS LANE,
HENFIELD

Drawing Title
DRAINAGE STRATEGY LAYOUT

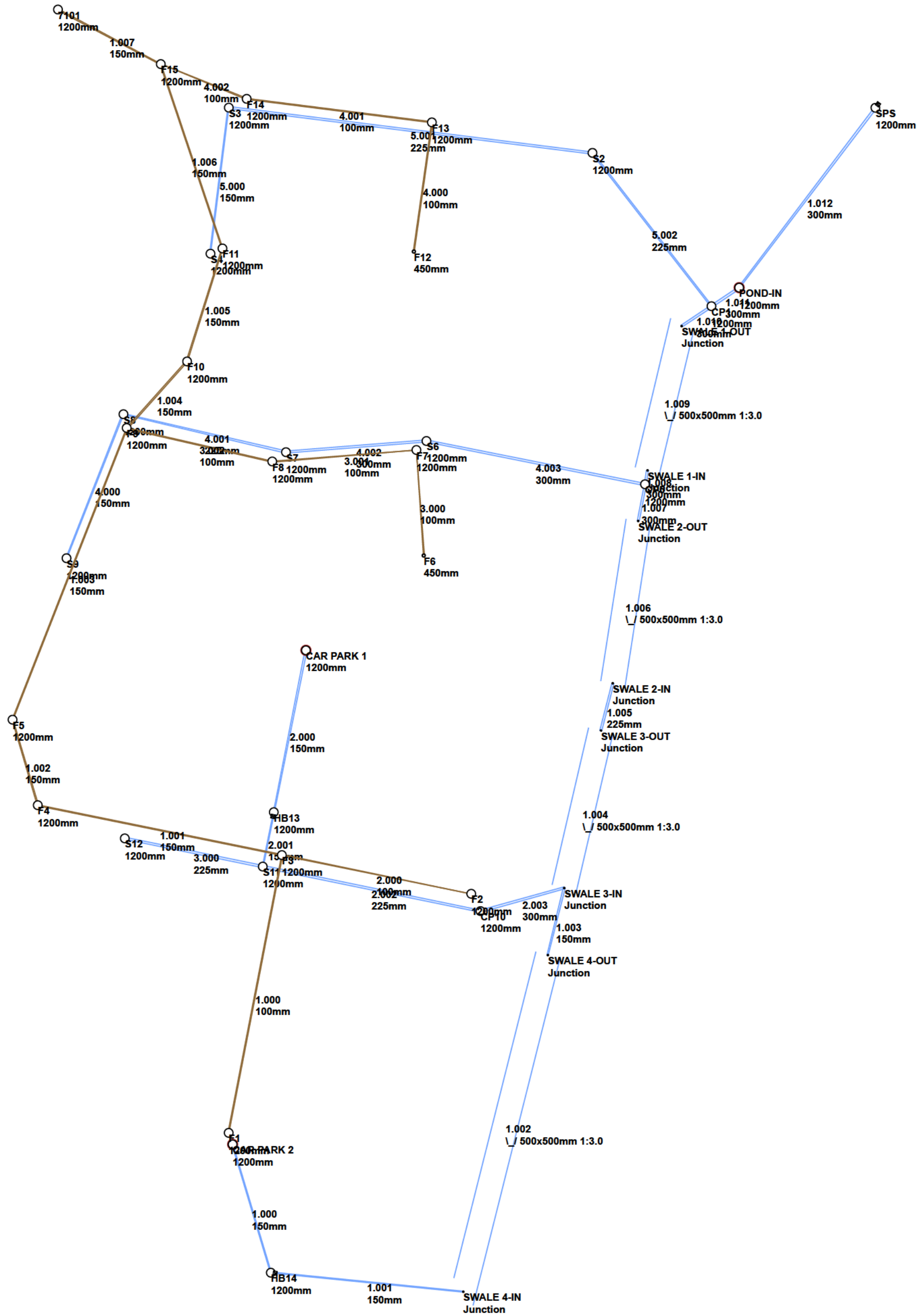
Status FOR INFORMATION

Scale 1 : 500 @A1 Proj. No. AC23068

Drawing Ref. AC23068-ABS-XX-ZZ-DR-C-5100 Revision P03

THIS DRAWING MUST BE READ AS A COLOUR PRINT

DWG FILE:/AC23068-ABS-XX-ZZ-DR-C-5100-P03.dwg



Design Settings

Rainfall Methodology	FEH-22	Time of Entry (mins)	5.00	Connection Type	Level Soffits	Enforce best practice design rules	x
Return Period (years)	1	Maximum Time of Concentration (mins)	30.00	Minimum Backdrop Height (m)	0.200		
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0	Preferred Cover Depth (m)	1.200		
CV	1.000	Minimum Velocity (m/s)	1.00	Include Intermediate Ground	✓		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
CAR PARK 2	0.085	5.00	30.700	1200	521767.150	115992.379	0.800
HB14			30.800	1200	521772.460	115974.582	1.020
SWALE 4-IN			30.100		521799.234	115971.942	0.500
SWALE 4-OUT			29.600		521810.994	116018.628	0.500
CAR PARK 1	0.076	5.00	30.200	1200	521777.341	116060.905	0.600
HB13			30.540	1200	521772.872	116038.455	1.110
S12	0.033	5.00	30.430	1200	521752.149	116034.821	1.030
S11	0.055	5.00	30.500	1200	521771.339	116030.910	1.220
CP10	0.041	5.00	30.050	1200	521801.619	116024.738	1.000
SWALE 3-IN			29.500		521813.275	116027.931	0.500
SWALE 3-OUT			29.200		521818.374	116049.764	0.500
SWALE 2-IN			29.100		521820.015	116056.335	0.500
SWALE 2-OUT			28.700		521823.552	116078.845	0.500
S9	0.020	5.00	29.810	1200	521744.044	116073.681	0.960
S8	0.028	5.00	29.540	1200	521751.963	116093.650	0.910
S7	0.043	5.00	29.680	1200	521774.568	116088.386	1.280
S6			29.440	1200	521794.103	116089.937	1.140
CP5	0.026	5.00	28.650	1200	521824.503	116083.936	0.500
SWALE 1-IN			28.600		521824.863	116085.860	0.500
SWALE 1-OUT			28.100		521829.602	116105.867	0.500
S4	0.042	5.00	29.220	1200	521764.068	116115.917	1.500
S3	0.039	5.00	29.140	1200	521766.615	116136.169	1.710
S2	0.031	5.00	28.750	1200	521817.196	116129.896	1.850
CP1			28.050	1200	521833.746	116108.634	1.950
POND-IN			28.000	1200	521837.596	116111.205	2.000
SPS			28.000	1200	521856.549	116136.156	2.100

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)	Design Flow (l/s)
1.000	CAR PARK 2	HB14	18.572	0.600	29.900	29.780	0.120	154.8	150	5.38	35.3	
1.001	HB14	SWALE 4-IN	26.904	0.600	29.780	29.600	0.180	149.5	150	5.93	34.3	1.0
1.002	SWALE 4-IN	SWALE 4-OUT	48.144	0.240	29.600	29.100	0.500	96.3	500	10.42	26.1	
1.003	SWALE 4-OUT	SWALE 3-IN	9.579	0.600	29.100	29.000	0.100	95.8	150	10.58	25.9	

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	0.805	14.2	10.8	0.650	0.870	0.085	0.0	98	0.885
1.001	0.819	14.5	1.0	0.870	0.350	0.085	0.0	27	0.469
1.002	0.179	178.7	8.0	0.000	0.000	0.085	0.0	119	0.080
1.003	1.027	18.1	8.0	0.350	0.350	0.085	0.0	69	0.993

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)	Design Flow (l/s)
2.000	CAR PARK 1	HB13	22.890	0.600	29.600	29.430	0.170	134.6	150	5.44	35.2	
2.001	HB13	S11	7.699	0.600	29.430	29.355	0.075	102.7	150	5.57	34.9	1.0
3.000	S12	S11	19.584	0.600	29.400	29.280	0.120	163.2	225	5.32	35.4	
2.002	S11	CP10	30.903	0.600	29.280	29.125	0.155	199.4	225	6.13	33.9	
2.003	CP10	SWALE 3-IN	12.085	0.600	29.050	29.000	0.050	241.7	300	6.33	33.4	
1.004	SWALE 3-IN	SWALE 3-OUT	22.421	0.240	29.000	28.700	0.300	74.7	500	12.42	23.6	
1.005	SWALE 3-OUT	SWALE 2-IN	6.773	0.600	28.700	28.600	0.100	67.7	225	12.49	23.6	
1.006	SWALE 2-IN	SWALE 2-OUT	22.786	0.240	28.600	28.200	0.400	57.0	500	14.12	21.9	
1.007	SWALE 2-OUT	CP5	5.179	0.600	28.200	28.150	0.050	103.6	300	14.18	21.8	
4.000	S9	S8	21.482	0.600	28.850	28.705	0.145	148.2	150	5.43	35.2	
4.001	S8	S7	23.210	0.600	28.630	28.475	0.155	149.7	225	5.80	34.5	
4.002	S7	S6	19.596	0.600	28.400	28.300	0.100	196.0	300	6.09	34.0	
4.003	S6	CP5	30.987	0.600	28.300	28.150	0.150	206.6	300	6.56	32.9	
1.008	CP5	SWALE 1-IN	1.957	0.600	28.150	28.100	0.050	39.1	300	14.19	21.8	
1.009	SWALE 1-IN	SWALE 1-OUT	20.561	0.240	28.100	27.600	0.500	41.1	500	15.45	20.7	
1.010	SWALE 1-OUT	CP1	4.983	0.600	27.600	26.100	1.500	3.3	300	15.46	20.7	
5.000	S4	S3	20.412	0.600	27.720	27.505	0.215	94.9	150	5.33	35.4	
5.001	S3	S2	50.969	0.600	27.430	26.900	0.530	96.2	225	5.97	34.2	
5.002	S2	CP1	26.944	0.600	26.900	26.175	0.725	37.2	225	6.18	33.8	
1.011	CP1	POND-IN	4.630	0.600	26.100	26.000	0.100	46.3	300	15.49	20.7	
1.012	POND-IN	SPS	31.333	0.600	26.000	25.900	0.100	313.3	300	16.08	20.2	

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)
2.000	0.864	15.3	9.7	0.450	0.960	0.076	0.0	86	0.913
2.001	0.991	17.5	1.0	0.960	0.995	0.076	0.0	24	0.536
3.000	1.021	40.6	4.2	0.805	0.995	0.033	0.0	49	0.664
2.002	0.922	36.7	20.1	0.995	0.700	0.164	0.0	119	0.943
2.003	1.007	71.2	24.8	0.700	0.200	0.205	0.0	122	0.919
1.004	0.203	202.9	27.6	0.000	0.000	0.323	0.0	204	0.121
1.005	1.591	63.3	27.5	0.275	0.275	0.323	0.0	103	1.534
1.006	0.232	232.4	27.9	0.000	0.000	0.353	0.0	192	0.135
1.007	1.544	109.2	27.9	0.200	0.200	0.353	0.0	103	1.297
4.000	0.823	14.5	2.5	0.810	0.685	0.020	0.0	42	0.620
4.001	1.066	42.4	6.0	0.685	0.980	0.048	0.0	57	0.756
4.002	1.119	79.1	11.2	0.980	0.840	0.091	0.0	76	0.798
4.003	1.090	77.0	10.8	0.840	0.200	0.091	0.0	75	0.774
1.008	2.520	178.1	37.1	0.200	0.200	0.470	0.0	92	2.002
1.009	0.273	273.5	38.2	0.000	0.000	0.510	0.0	207	0.165
1.010	8.683	613.8	38.2	0.200	1.650	0.510	0.0	50	4.895
5.000	1.031	18.2	5.4	1.350	1.485	0.042	0.0	56	0.900
5.001	1.333	53.0	10.0	1.485	1.625	0.081	0.0	66	1.032
5.002	2.152	85.6	13.7	1.625	1.650	0.112	0.0	60	1.582
1.011	2.316	163.7	46.5	1.650	1.700	0.622	0.0	109	2.006
1.012	0.883	62.4	45.5	1.700	1.800	0.622	0.0	191	0.961

Simulation Settings

Rainfall Methodology	FEH-22	Summer CV	1.000	Analysis Speed	Detailed	Drain Down Time (mins)	240	Starting Level (m)	Check Discharge Volume x
Rainfall Events	Singular	Winter CV	1.000	Skip Steady State	x	Additional Storage (m³/ha)	0.0	Check Discharge Rate(s) x	

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 | 2160

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	0	0	0	100	45	0	0

Node HB14 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.520	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0053-1000-0520-1000		
Invert Level (m)	29.780	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075		

Node HB13 Online Hydro-Brake® Control

Flap Valve	x	Design Depth (m)	0.590	Sump Available	✓	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	1.0	Product Number	CTL-SHE-0052-1000-0590-1000		
Invert Level (m)	29.430	Objective	(HE) Minimise upstream storage	Min Outlet Diameter (m)	0.075		

Node SPS Online Pump Control

Flap Valve	x	Replaces Downstream Link	✓	Invert Level (m)	25.900	Switch on depth (m)	0.001	Switch off depth (m)	0.000

Depth (m)	Flow (l/s)
0.001	3.200

Node CAR PARK 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	29.600	Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	170.0	0.0	0.400	170.0	0.0	0.401	0.0	0.0

Node CAR PARK 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	29.900	Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	187.0	0.0	0.400	187.0	0.0	0.401	0.0	0.0

Node POND-IN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	1.00	Invert Level (m)	27.400	Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	615.0	0.0	0.600	844.0	0.0

Node POND-IN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Side Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Porosity	0.95	Invert Level (m)	26.000	Time to half empty (mins)

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	324.0	0.0	1.000	324.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	CAR PARK 2	232	29.953	0.053	3.4	9.4066	0.0000	OK
360 minute summer	HB14	232	29.952	0.172	1.3	0.1947	0.0000	SURCHARGED
120 minute winter	SWALE 4-IN	104	29.651	0.051	1.0	0.0000	0.0000	OK
15 minute summer	SWALE 4-OUT	13	29.132	0.031	2.4	0.0000	0.0000	OK
240 minute summer	CAR PARK 1	160	29.647	0.047	3.8	7.7094	0.0000	OK
240 minute summer	HB13	160	29.647	0.217	1.6	0.2451	0.0000	SURCHARGED
15 minute summer	S12	10	29.447	0.047	4.0	0.0532	0.0000	OK
15 minute summer	S11	11	29.364	0.084	10.7	0.0946	0.0000	OK
15 minute summer	CP10	11	29.152	0.102	15.2	0.1156	0.0000	OK
15 minute summer	SWALE 3-IN	12	29.137	0.137	15.2	0.0000	0.0000	OK
15 minute summer	1.004:50%	13	29.030	0.180	15.8	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	13	28.773	0.073	13.6	0.0000	0.0000	OK
15 minute summer	SWALE 2-IN	14	28.733	0.133	13.7	0.0000	0.0000	OK
30 minute summer	1.006:50%	23	28.568	0.168	14.4	0.0000	0.0000	OK
30 minute summer	SWALE 2-OUT	23	28.281	0.081	13.7	0.0000	0.0000	OK
15 minute summer	S9	11	28.891	0.041	2.4	0.0466	0.0000	OK
15 minute summer	S8	11	28.687	0.057	5.7	0.0640	0.0000	OK
15 minute summer	S7	11	28.477	0.077	10.7	0.0868	0.0000	OK
15 minute summer	S6	11	28.376	0.076	10.7	0.0865	0.0000	OK
30 minute summer	CP5	21	28.251	0.101	20.3	0.1138	0.0000	OK
30 minute summer	SWALE 1-IN	22	28.251	0.151	20.2	0.0000	0.0000	OK
30 minute summer	1.009:50%	23	28.083	0.233	22.1	0.0000	0.0000	OK
30 minute summer	SWALE 1-OUT	23	27.638	0.038	21.3	0.0000	0.0000	OK
15 minute summer	S4	10	27.775	0.055	5.1	0.0624	0.0000	OK
15 minute summer	S3	10	27.497	0.067	9.8	0.0753	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)
360 minute summer	CAR PARK 2	1.000	HB14	1.3	0.211	0.093	0.2146	
360 minute summer	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
120 minute winter	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1396	
15 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-2.4	-0.269	-0.133	0.0912	
240 minute summer	CAR PARK 1	2.000	HB13	1.6	0.220	0.105	0.2561	
240 minute summer	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	3.9	0.423	0.097	0.1893	
15 minute summer	S11	2.002	CP10	10.4	0.791	0.284	0.4070	
15 minute summer	CP10	2.003	SWALE 3-IN	15.2	0.599	0.213	0.3149	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	12.2	0.088	0.060	1.7237	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	13.6	0.122	0.067	1.3446	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	13.7	0.962	0.217	0.1178	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	13.1	0.098	0.057	1.5925	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	13.0	0.125	0.056	1.2501	
30 minute summer	SWALE 2-OUT	1.007	CP5	13.7	0.830	0.125	0.0916	
15 minute summer	S9	4.000	S8	2.3	0.602	0.161	0.0834	
15 minute summer	S8	4.001	S7	5.7	0.739	0.134	0.1782	
15 minute summer	S7	4.002	S6	10.7	0.759	0.136	0.2774	
15 minute summer	S6	4.003	CP5	10.8	0.723	0.140	0.4813	
30 minute summer	CP5	1.008	SWALE 1-IN	20.2	0.730	0.113	0.0550	
30 minute summer	SWALE 1-IN	1.009	1.009:50%	20.1	0.098	0.074	2.1757	
30 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	21.3	0.174	0.078	1.5564	
30 minute summer	SWALE 1-OUT	1.010	CP1	21.3	1.855	0.035	0.0819	
15 minute summer	S4	5.000	S3	5.0	0.870	0.275	0.1176	
15 minute summer	S3	5.001	S2	9.6	1.061	0.182	0.4635	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S2	11	26.960	0.060	13.4	0.0676	0.0000	OK
15 minute summer	CP1	11	26.485	0.385	27.2	0.4359	0.0000	SURCHARGED
960 minute summer	POND-IN	675	26.285	0.285	13.4	87.8931	0.0000	OK
180 minute winter	SPS	124	26.310	0.410	7.4	0.4636	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 summer	S2	5.002	CP1	13.3	1.309	0.156	0.6495	
15 minute summer	CP1	1.011	POND-IN	42.0	2.110	0.256	0.1642	
960 minute summer	POND-IN	1.012	SPS	12.2	0.706	0.196	2.1854	
180 minute winter	SPS	Pump		3.2				62.8

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	CAR PARK 2	232	30.086	0.186	7.8	33.2246	0.0000	SURCHARGED
240 minute winter	HB14	232	30.085	0.305	1.5	0.3452	0.0000	SURCHARGED
2160 minute winter	SWALE 4-IN	1080	29.651	0.051	1.0	0.0000	0.0000	OK
30 minute summer	SWALE 4-OUT	21	29.256	0.156	10.4	0.0000	0.0000	SURCHARGED
240 minute winter	CAR PARK 1	232	29.775	0.175	6.9	28.5381	0.0000	SURCHARGED
240 minute winter	HB13	232	29.775	0.345	1.7	0.3899	0.0000	SURCHARGED
15 minute summer	S12	11	29.512	0.112	15.5	0.1264	0.0000	OK
15 minute summer	S11	11	29.501	0.221	40.8	0.2497	0.0000	OK
15 minute summer	CP10	11	29.294	0.244	58.1	0.2763	0.0000	OK
15 minute summer	SWALE 3-IN	12	29.259	0.259	57.7	0.0000	0.0000	OK
15 minute summer	1.004:50%	12	29.162	0.312	59.6	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	13	28.948	0.248	61.2	0.0000	0.0000	FLOOD RISK
15 minute summer	SWALE 2-IN	14	28.866	0.266	56.6	0.0000	0.0000	OK
30 minute summer	1.006:50%	22	28.679	0.279	62.2	0.0000	0.0000	OK
30 minute summer	SWALE 2-OUT	21	28.476	0.276	61.4	0.0000	0.0000	OK
15 minute summer	S9	10	28.940	0.090	9.4	0.1018	0.0000	OK
15 minute summer	S8	10	28.751	0.120	22.4	0.1363	0.0000	OK
15 minute summer	S7	10	28.567	0.167	42.1	0.1890	0.0000	OK
30 minute summer	S6	20	28.472	0.172	38.8	0.1947	0.0000	OK
30 minute summer	CP5	20	28.455	0.305	97.2	0.3447	0.0000	FLOOD RISK
30 minute summer	SWALE 1-IN	21	28.417	0.317	96.9	0.0000	0.0000	OK
30 minute summer	1.009:50%	21	28.309	0.459	108.3	0.0000	0.0000	OK
30 minute summer	SWALE 1-OUT	21	27.683	0.083	106.1	0.0000	0.0000	OK
15 minute summer	S4	11	27.884	0.163	19.7	0.1849	0.0000	SURCHARGED
15 minute summer	S3	11	27.573	0.143	36.9	0.1613	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)
240 minute winter	CAR PARK 2	1.000	HB14	1.5	0.213	0.106	0.3270	
240 minute winter	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
2160 minute winter	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1394	
30 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-10.2	-0.615	-0.562	0.1686	
240 minute winter	CAR PARK 1	2.000	HB13	1.7	0.222	0.113	0.4030	
240 minute winter	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	14.7	0.567	0.362	0.5800	
15 minute summer	S11	2.002	CP10	39.7	1.099	1.082	1.1067	
15 minute summer	CP10	2.003	SWALE 3-IN	57.7	0.939	0.811	0.7588	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	45.7	0.118	0.225	4.3643	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	61.2	0.184	0.302	4.0440	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	56.6	1.424	0.895	0.2694	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	55.6	0.155	0.239	4.0821	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	59.8	0.174	0.257	4.0844	
30 minute summer	SWALE 2-OUT	1.007	CP5	64.5	0.963	0.591	0.3577	
15 minute summer	S9	4.000	S8	9.2	0.858	0.631	0.2308	
15 minute summer	S8	4.001	S7	22.0	1.057	0.519	0.4841	
15 minute summer	S7	4.002	S6	41.7	1.067	0.527	0.7659	
30 minute summer	S6	4.003	CP5	37.8	0.770	0.490	1.7388	
30 minute summer	CP5	1.008	SWALE 1-IN	96.9	1.376	0.544	0.1378	
30 minute summer	SWALE 1-IN	1.009	1.009:50%	96.3	0.150	0.352	6.7805	
30 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	106.1	0.299	0.388	4.7408	
30 minute summer	SWALE 1-OUT	1.010	CP1	106.2	2.448	0.173	0.2143	
15 minute summer	S4	5.000	S3	19.0	1.135	1.041	0.3414	
15 minute summer	S3	5.001	S2	36.6	1.485	0.691	1.2764	

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S2	10	27.029	0.129	51.1	0.1462	0.0000	OK
960 minute winter	CP1	945	26.853	0.753	20.8	0.8519	0.0000	SURCHARGED
960 minute winter	POND-IN	945	26.853	0.853	30.8	263.5579	0.0000	SURCHARGED
960 minute winter	SPS	945	26.853	0.953	3.3	1.0776	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 summer	S2	5.002	CP1	51.2	1.454	0.599	0.8536	
960 minute winter	CP1	1.011	POND-IN	30.8	1.108	0.188	0.3260	
960 minute winter	POND-IN	1.012	SPS	-4.2	0.661	-0.068	2.2064	
960 minute winter	SPS	Pump		3.2				182.5

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	CAR PARK 2	464	30.292	0.392	8.3	70.1699	0.0000	SURCHARGED
480 minute winter	HB14	464	30.292	0.512	1.2	0.5788	0.0000	SURCHARGED
2160 minute winter	SWALE 4-IN	840	29.651	0.051	1.0	0.0000	0.0000	OK
30 minute summer	SWALE 4-OUT	21	29.331	0.231	13.6	0.0000	0.0000	FLOOD RISK
360 minute winter	CAR PARK 1	352	29.973	0.373	9.3	60.6090	0.0000	FLOOD RISK
360 minute winter	HB13	352	29.972	0.542	1.3	0.6129	0.0000	SURCHARGED
15 minute summer	S12	11	30.241	0.841	28.3	0.9511	0.0000	FLOOD RISK
15 minute summer	S11	11	30.174	0.894	71.9	1.0107	0.0000	SURCHARGED
15 minute summer	CP10	11	29.488	0.438	104.5	0.4956	0.0000	SURCHARGED
15 minute summer	SWALE 3-IN	11	29.349	0.349	104.4	0.0000	0.0000	OK
15 minute summer	1.004:50%	12	29.242	0.392	114.3	0.0000	0.0000	OK
15 minute summer	SWALE 3-OUT	13	29.175	0.475	108.3	0.0000	0.0000	FLOOD RISK
15 minute summer	SWALE 2-IN	13	28.938	0.338	95.0	0.0000	0.0000	OK
30 minute summer	1.006:50%	21	28.776	0.376	109.4	0.0000	0.0000	OK
30 minute summer	SWALE 2-OUT	21	28.700	0.500	106.1	0.0000	0.0670	FLOOD
15 minute summer	S9	11	29.152	0.302	17.1	0.3416	0.0000	SURCHARGED
15 minute summer	S8	11	28.980	0.350	40.1	0.3956	0.0000	SURCHARGED
15 minute summer	S7	11	28.838	0.438	73.1	0.4954	0.0000	SURCHARGED
15 minute summer	S6	12	28.746	0.446	70.0	0.5044	0.0000	SURCHARGED
30 minute summer	CP5	20	28.629	0.479	168.8	0.5414	0.0000	FLOOD RISK
30 minute summer	SWALE 1-IN	20	28.508	0.408	168.8	0.0000	0.0000	OK
30 minute summer	1.009:50%	25	28.368	0.518	190.8	16.6954	0.0000	PONDING
1440 minute winter	SWALE 1-OUT	1470	27.726	0.126	26.3	0.0000	0.0000	OK
15 minute summer	S4	12	29.128	1.408	36.0	1.5921	0.0000	FLOOD RISK
15 minute summer	S3	11	28.404	0.974	61.5	1.1014	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	CAR PARK 2	1.000	HB14	1.2	0.209	0.086	0.3270	
480 minute winter	HB14	Hydro-Brake®	SWALE 4-IN	1.0				
2160 minute winter	SWALE 4-IN	1.002	SWALE 4-OUT	1.0	0.043	0.006	1.1394	
30 minute summer	SWALE 4-OUT	1.003	SWALE 3-IN	-13.3	-0.754	-0.731	0.1686	
360 minute winter	CAR PARK 1	2.000	HB13	1.3	0.224	0.086	0.4030	
360 minute winter	HB13	Hydro-Brake®	S11	1.0				
15 minute summer	S12	3.000	S11	26.9	0.678	0.664	0.7789	
15 minute summer	S11	2.002	CP10	71.0	1.785	1.936	1.2290	
15 minute summer	CP10	2.003	SWALE 3-IN	104.4	1.483	1.467	0.8510	
15 minute summer	SWALE 3-IN	1.004	1.004:50%	87.3	0.149	0.430	6.6786	
15 minute summer	SWALE 3-IN	1.004	SWALE 3-OUT	108.3	0.196	0.534	8.7312	
15 minute summer	SWALE 3-OUT	1.005	SWALE 2-IN	95.0	2.390	1.502	0.2694	
15 minute summer	SWALE 2-IN	1.006	1.006:50%	94.4	0.172	0.406	6.2956	
15 minute summer	SWALE 2-IN	1.006	SWALE 2-OUT	104.7	0.160	0.451	8.9202	
30 minute summer	SWALE 2-OUT	1.007	CP5	112.1	1.593	1.027	0.3647	
15 minute summer	S9	4.000	S8	16.1	0.938	1.110	0.3782	
15 minute summer	S8	4.001	S7	36.2	1.119	0.854	0.9231	
15 minute summer	S7	4.002	S6	70.0	1.143	0.885	1.3799	
15 minute summer	S6	4.003	CP5	69.1	0.982	0.897	2.1821	
30 minute summer	CP5	1.008	SWALE 1-IN	168.8	2.397	0.948	0.1378	
30 minute summer	SWALE 1-IN	1.009	1.009:50%	167.8	0.198	0.614	8.7624	
30 minute summer	SWALE 1-IN	1.009	SWALE 1-OUT	134.6	0.326	0.492	5.5170	
1440 minute winter	SWALE 1-OUT	1.010	CP1	27.0	1.333	0.044	0.2454	
15 minute summer	S4	5.000	S3	31.2	1.773	1.713	0.3593	
15 minute summer	S3	5.001	S2	60.8	1.529	1.147	2.0271	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.34%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S2	1470	27.722	0.822	8.7	0.9297	0.0000	SURCHARGED
1440 minute winter	CP1	1470	27.722	1.622	29.2	1.8348	0.0000	SURCHARGED
1440 minute winter	POND-IN	1440	27.722	1.722	24.6	527.7936	0.0000	FLOOD RISK
1440 minute winter	SPS	1440	27.721	1.821	13.9	2.0600	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)
1440 minute winter	S2	5.002	CP1	4.6	0.803	0.054	1.0716	
1440 minute winter	CP1	1.011	POND-IN	24.6	1.099	0.150	0.3260	
1440 minute winter	POND-IN	1.012	SPS	13.9	0.614	0.223	2.2064	
1440 minute winter	SPS	Pump		3.2				272.8

Water Quality

Area (ha)	Intended Land Use	Entering via Node or Link	Name	SuDS Component	Pollution hazard indices TSS	Metals	Hydrocarbons	Pollution mitigation indices TSS	Metals	Hydrocarbons	Cumulative pollution hazard indices TSS	Metals	Hydrocarbons
		Link	1.002	Swale				0.5	0.6	0.6			
		Link	1.004	Swale				0.25	0.3	0.3			
		Link	1.006	Swale				0.25	0.3	0.3			
		Link	1.009	Swale				0.25	0.3	0.3			
		Node	SPS								Sufficient	Sufficient	Sufficient