

AJHja-20220504-ArunCrem LLFA Comments.docx

6th May 2022

Simon J Davis
Principal Planning Officer
Arun District Council
Civic Centre
Maltravers Rd
Littlehampton
West Sussex
BN17 5LF

Dear Simon,

Y/55/22/DOC – CONDITIONS 8, 9 AND 10: DRAINAGE RESPONSE

Following the latest comments received in the email dated 26th April 2022 from Arun District Council's Drainage Engineer, this letter seeks to address the final outstanding comments pertaining to planning conditions 8, 9 and 10 under planning permission Y/55/22/DOC for the Crematorium, Bognor. This letter is to be read in conjunction with the previous email exchanges on the subject between ADC and CampbellReith.

For clarity, a copy of the full correspondence with Arun District Council's Drainage Engineer has been appended to this letter. A list of the relevant documents and latest revisions is at the bottom of this letter.

CampbellReith response to Condition 8:

1. Additional calculations have been undertaken to consider possibility of infiltration. Please refer to drainage calculations (*13591-CRH-XX-XX-CA-C-0007 Revision P2* and *13591-CRH-XX-XX-CA-C-0008 Revision P1*) appended to this letter.

Calculation pack 0007 models the proposed drainage strategy with no infiltration, while calculation pack 0008 models the proposed drainage strategy utilising infiltration in the bases of the attenuation basin and the areas of permeable paving as requested. An infiltration capacity of 2.37×10^{-6} m/s has been assumed for all areas of infiltration as per onsite testing results. A review of the two calculation packs shows that both networks can effectively control surface water runoff from the proposed development with no flooding up to the 1 in 30 year storm event, and minimal flooding for the 1 in 100 year storm event with a 40% allowance for climate change. The use of infiltration reduces the maximum volume of water stored by the attenuation basin by approximately 36m³ in the most extreme storm event

modelled. The attenuation basin and swales are to be unlined, while all permeable paving is proposed to be lined with permeable membranes. This will enable the use of infiltration to discharge surface water if possible. If, in practice this is not possible, due to high groundwater for instance, calculation pack 0007 has shown that the proposed drainage strategy is sufficient without reliance on infiltration.

2. As above, please see enclosed drainage calculations (*13591-CRH-XX-XX-CA-C-0007 Revision P2* and *13591-CRH-XX-XX-CA-C-0008 Revision P1*) showing the proposed drainage network in full, both without and with the use of infiltration respectively (please refer to the response to point 1). A manhole schedule, key plan, and sub-catchment plan (*13591-CRH-XX-XX-DR-C-5260 Revision P2*) have been provided to aid the review of the calculations. An allowance has been made for incoming flow from the package treatment works via node FW5.
3. Please see enclosed sub-catchment plan (*13591-CRH-XX-XX-DR-C-5260 Revision P2*).
4. Please refer to latest drainage layout plans (*13591-CRH-XX-XX-DR-C-5050 Revision P8* and *13591-CRH-XX-XX-DR-C-5051 Revision P7*).
5. Details are shown on the latest drainage layout plan (*13591-CRH-XX-XX-DR-C-5051 Revision P7*).
6. Permeable pavement details can be found in proposed pavement details drawing (*13591-CRH-XX-XX-DR-C-5350 Revision P3*), and formation levels of the porous sub base are shown on the latest drainage layout plans (*13591-CRH-XX-XX-DR-C-5050 Revision P8* and *13591-CRH-XX-XX-DR-C-5051 Revision P7*). Invert levels of fin drains are to be approximately equal to the formation level of sub-base, as shown in pavement detail P2. As the system is unlined and the sub-base is not required for storage, partial infiltration may take place. The fin drains will remove any residual water.
7. Cover levels are shown on the latest drainage layout plans (*13591-CRH-XX-XX-DR-C-5050 Revision P8* and *13591-CRH-XX-XX-DR-C-5051 Revision P7*).
8. This comment has been noted, however, the proposed drainage network is not designed to be an adopted system for which Arun District Council would have any long-term responsibility. This is a privately owned and privately maintained drainage system which will ultimately be the responsibility of the tenant to construct and maintain. The proposed product has been successfully used elsewhere without issue and will be used in this site.
9. Please see latest basin detail drawings (*13591-CRH-XX-XX-DR-C-5310 Revision P2* and *13591-CRH-XX-XX-DR-C-5311 Revision P1*).

CampbellReith response to Condition 9:

1. The OWC consent has been chased. It is noted that OWC is a separate issue to planning condition discharge.

2. A suitable buffer has been provided between top of basin and edge of watercourse to allow for maintenance, as shown on drawing (*13591-CRH-XX-XX-DR-C-5051 Revision P7*).

CampbellReith response to Condition 10:

1. Noted.

I trust the above is sufficient to address and close out any final comments. However, please let me know if you require any further information.

Yours sincerely



ANDY HIGGINS

For and on behalf of **CAMPBELL REITH HILL LLP**

cc

Lisa Jackson (Jackson Planning)

Jonathan Stone (Westerleigh Group Ltd)

Encl.

- Email correspondence with ADC incl. comments from Drainage Engineer
- 13591-CRH-XX-XX-CA-C-0007-P2_Proposed SW Network Calcs
- 13591-CRH-XX-XX-CA-C-0008-P1_Proposed SW Network Infiltration Calcs
- 13591-CRH-XX-XX-DR-C-5050-P8_Proposed Drainage Layout (Sheet 1)
- 13591-CRH-XX-XX-DR-C-5051-P7_Proposed Drainage Layout (Sheet 2)
- 13591-CRH-XX-XX-DR-C-5250-P1_Proposed Impermeable Areas Plan
- 13591-CRH-XX-XX-DR-C-5260-P2_Sub-Catchment Plan
- 13591-CRH-XX-XX-DR-C-5310-P2_Proposed Basin Details (Sheet 1)
- 13591-CRH-XX-XX-DR-C-5311-P1_Proposed Basin Details (Sheet 2)
- 13591-CRH-XX-XX-DR-C-5350-P3_Proposed Pavement Details

From: Simon Davis <Simon.Davis@arun.gov.uk>

Subject: RE: Planning Re-Consultation on: Y/32/22/DOC

Date: 26 April 2022 at 14:18:43 BST

To: Lisa Jackson <[REDACTED]>

Cc: Jonathan Stone <[REDACTED]>, "Bava Sathan ("Bava Sathan ([REDACTED]), Andy Higgins <[REDACTED]>, Daniel Vick <[REDACTED]>

>

Dear Lisa,

I have read your email and listened to your voice mail. Our policy as set out on our website (<https://www.arun.gov.uk/what-happens-next>) is to only allow one attempt at amending the application before issuing our decision and this is applied across the board.

On your first application, whilst I accept that our Engineer did not respond with advice on your updated submission, at that time, we had already allowed one attempt at resolving the concerns.

On this application, I wrote to you 30/03 outlining the Engineers initial comments and you provided further information so I then reconsulted Engineers. However, it is clear that they still have issues. You have had one attempt at resolving the concerns and there is now no time within the 8 week period to resolve this. As already stated, we will not agree an Extension of Time.

I accept that with Y/39/22/DOC our Engineer has only just responded with advice, almost 5 weeks after they were consulted. However, as stated, it may be possible to discharge that condition and I am checking this with our Engineer. Furthermore the decision date for this is the 10th May so if further info is needed and it is minor, we may yet be able to allow you to respond.

I note your clients intention to start on site in mid-May. If you wish to proceed with this commencement and the pre-commencement conditions have not been discharged by then, then you do so at your own risk.

Kind Regards

Simon J Davis MRTPI
Principal Planning Officer
Directorate of Place



T: 01903 737874

E: simon.davis@arun.gov.uk

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From: Lisa Jackson [REDACTED]
Sent: 26 April 2022 13:14
To: Simon Davis <Simon.Davis@arun.gov.uk>
[REDACTED]

Subject: Re: Planning Re-Consultation on: Y/32/22/DOC

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Dear Simon

I have spoken to the applicant and have been advised as follows:

1. The applicant will agree an extension of time for Y/32/22/DOC until 17/5/22 to assist the Council in determining this application. Whilst I understand that this is not your normal procedure I do believe there are exceptional circumstances in this case. The Council have had the application since 8/3/22 and have waited for 7 weeks before issuing comments. This is unacceptable, especially as this is the second attempt to clear these conditions. The application has been prepared by a large national reputable firm of professional consulting engineers who have tried exceptionally hard to meet the requests from the Council. It appears the issue is your Council's resourcing, certainly this resulted in the first refusal, and has delayed your response on this second application.
2. The contract has been let for the building of the Crematorium to start on site in mid May and it is the intention of the developer to start on site despite the current position.

Kind regards,
Lisa

Lisa Jackson MA, BSc MRTPI
Jackson Planning Ltd
Fox Barn, Lower Chute,
Andover, Hants, SP11 9DU



On 26 Apr 2022, at 11:09, Simon Davis <Simon.Davis@arun.gov.uk> wrote:

Dear Lisa,

Please see further comments below. Unfortunately there is insufficient time before the decision date and as per our policy we do not allow extensions on DOC's and so I will be refusing today. I have just agreed this position with my Team Leader.

Simon

Simon J Davis MRTPI
Principal Planning Officer
Directorate of Place
<image012.jpg>
T: 01903 737874
E: simon.davis@arun.gov.uk

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From: Laura Gibbons <Laura.Gibbons@arun.gov.uk>
Sent: 26 April 2022 10:02
To: Planning.Responses <Planning.Responses@arun.gov.uk>
Cc: Simon Davis <Simon.Davis@arun.gov.uk>
Subject: RE: Planning Re-Consultation on: Y/32/22/DOC

Key

ADC comments 11/01/22

CR response 25/01/22

ADC comments 08/02/22

CR response 08/02/22

ADC comments 30/03/22

CR response 08/04/22

ADC Comments 26/04/22

Engineers Comments Regarding Condition 8

1. Please supply results of winter groundwater monitoring and winter infiltration testing. Winter groundwater monitoring and infiltration/percolation testing was undertaken on several occasions previously. Details and results are contained within Land Quality Statement submitted as part of original application (ref 13591-CRH-XX-XX-RP-GE-0002 Revision D02), relevant extracts attached to this letter. Previous correspondence between ADC Drainage Engineer and CampbellPeith is also enclosed for context.

As per WSCC policy for the management of surface water policy 1- design must follow the hierarchy for sustainable drainage. Locations of groundwater monitoring and infiltration testing have not been provided. It is noted that groundwater was found to peak at circa 1m depth. Shallow infiltration testing was completed and gave rates which do not preclude the use of infiltration. Please supply evidence why the sole use of infiltration is not acceptable here. E.g. a design with infiltrating permeable paving, swales and shallow infiltration basin. A full review of responses to our other comments has not been completed as this fundamental issue must be addressed first before reviewing details. Please find attached layout plan showing location of the boreholes/ percolation test together with details of results -

As noted from the test results, the lowest value is 2.37×10^{-6} m/s, which when the appropriate factor of safety (in this case the lower factor of safety in accordance with CIRIA SuDS Manual is 5 for areas greater than $1,000\text{m}^2$) is applied would yield a percolation rate of 4.74×10^{-7} m/s and at this rate no infiltration system would pass the half drainage time requirements not even for a ten year storm return period - however for absolute clarity, please see attached calculation extract demonstrating same.

It should be noted that percolation testing (despite having been requested by ADC) is not appropriate for use in the design of infiltration drainage systems. Percolation test should only be used for determination of drainage fields for foul drainage (please refer to Building Regulations Part H for guidance on this). CIRIA SuDS Manual C753, Section 25.3 states that infiltration testing should be undertaken following the BRE method and BRE 365 tests have been undertaken for this site

and yielded no infiltration. Please see attached for further details relating to those tests.

As previously noted, the drainage basin (and none of the drainage features) are to be lined - i.e. during summer / low groundwater table, the drainage features will allow natural dispersal by infiltration. The drainage basin has been designed assuming worst case scenario that ensures sufficient buffer for drainage in all scenarios and is fully compliant with the requirements under NPPF. In effect there is over provision of storage within the drainage features to cater for the worst case scenario. CIRIA SuDS Manual does not state that when determining if infiltration is viable that a factor of safety should first be applied to obtained infiltration rates, it is therefore unclear why this has been completed. The calculations submitted apply infiltration to the base of the pond only, as indicated in previous responses a design utilising permeable paving should be investigated. BRE DG 365 does not state a minimum acceptable depth of test pits, applying BRE DG365 calculations to the percolation tests provides the same results as using the equations as defined in Approved Document H. Approved Document H 3.28- surface water drainage design states that percolation test results can be used in the design of infiltrating surface water drainage systems, it advises using BRE DG 365 for larger sites. It is also worth noting that the BRE DG 365 tests referred to as yielding no infiltration were completed below peak groundwater level- so this is to be expected. We do not believe that sufficient evidence has been presented to demonstrate that the hierarchy has been followed, however the below comments are based on the attenuation design as proposed. The SuDS manual states in Section 25.6 that the infiltration coefficient should be calculated by 'dividing the infiltration rate found from field tests by the appropriate factor of safety'. In this instance, as per table 26.2, a safety factor of 5 has been used (as explained above). The use of safety factors in infiltration comes from the previous CIRIA report 156: Infiltration Drainage - Manual of Good Practice and states the following in Section 4.4.2: "(b) Factors of safety. In any design of an infiltration system it is not possible to have complete confidence in the specification of all the parameters. While some parameters, such as the area to be drained, will be known with some accuracy, others, such as the infiltration coefficient, will not be known with the same degree of confidence. In fact, one of the largest uncertainties is associated with the infiltration coefficient which may reduce over time, particularly if maintenance is poor. To account for this, a factor of safety is introduced into the design procedure which reduces the observed value of the infiltration coefficient. The factor of safety to be used depends upon the consequences of failure and engineering judgement is therefore required as to the factor to be used. The quoted factors of safety (see Table 4.6) take account of the possible loss of infiltration capacity throughout the design life of the system. Little information is available on such a loss of performance and so the figures given are suggestions rather than figures based on historic data." CIRIA report 156 goes on to say: *"The observed infiltration coefficient should be divided by the factor of safety to obtain the effective infiltration coefficient to be used in the hydraulic design."* In terms of shallow percolation, Building Regulations Part H states that the percolation test method is suitable only for soakaways serving areas up to 100m² (Section H3.3.26). For larger areas, Part H refers to report BE756 which in itself refers back to CIRIA Report 156 above. The key point to re-emphasise is that the drainage basin, swales and permeable paving are not to be lined - i.e. during summer / low groundwater table, the drainage features will allow natural dispersal by infiltration but will provide the additional security from flooding in that they will function as attenuation features with a positive restricted outfall to watercourse during times of high groundwater.

Instead of providing select paragraphs from CIRIA etc. please provide evidence to support the key point raised: The calculations previously submitted apply infiltration to the base of the pond only, as indicated in previous responses please supply calculations utilising permeable paving for infiltration also.

2. Please supply calculations to support design.

Please see enclosed drainage calculations (13591-CRH-XX-XX-CA-C-0005 Revision P1) showing proposed attenuation and discharge volumes. Total storage requirement is equivalent to approximately 530m³. The results show how this equates to an average depth of no more than 350mm over the whole basin footprint of 1,400m² and accounting for the banks. The volume of storage takes account of the high groundwater and only refers to available volume above the highest recorded groundwater level. Note that the volume of storage provided within the basin does not account for the upstream storage within the permeable paving (112 m³) and swales (240 m³) in the calculations. In dry conditions, taking account of upstream storage there is more than sufficient volume to accommodate all storms up to and including the 1 in 100 year storm +40% climate change with runoff restricted to QBar for all events. *A source control results file has been provided, this evidences a maximum water level of 3.947mAOD, this is above the cover level of several car park gullies and channel drains. To determine degree of site flooding and adequacy of design please provide a network model. The source control model does not account for inlets to the basin being below the outlet, the impact of surcharging these networks should be evidenced within calculations. Without this information it is not possible to establish if a policy compliant design is being provided. Please see attached drainage network calculations 13591-CRH-XX-XX-CA-C-0007-P1 which contains full details of the drainage scheme including storage features, pipes, flow controls and outfall. The results show that in all storms the restricted flow limit is maintained and that there is no flooding of any form in all storms up to the 1 in 30 year storm event. There is very minor ponding of surface water (equating to less than 0.4m³) during the 1 in 100 year +40%CC event, however, this is located away from pedestrian areas or buildings. The excess runoff will drain to the nearest gully/permeable parking bay once capacity is available as is acceptable under the non-statutory technical standards for SuDS. The network model has a number of inconsistencies between layout and calculations, these should be corrected. For example invert levels of pipes, invert level of outfall from swale, formation levels of permeable paving, slope of permeable paving, etc. Furthermore, printouts should include modelled cover levels. Please include inflow to network from package treatment plant within calculations. Please also label pipes with micro drainage pipe reference numbers, it does not appear that standard naming convention has been fully followed making it more challenging to review.*

3. Please supply an impermeable area catchment plan. Please see enclosed impermeable area plan 13591-CRH-XX-XX-DR-C-5250 Revision P1. Okay. We have also included the additional detailed sub-catchment plan 13591-CRH-XX-XX-DR-C-5260-P1 to accompany the drainage calculations and provide absolute clarity as to which areas contribute to the model. *To be further reviewed once points 1 and 2 are addressed.*

4. *Please label all pipes with diameter and fall.* Additional pipe labels have been added to drainage layout plans 13591-CRH-XX-XX-DR-C-5050 Revision P6 and 5051 Revision P5 . Gradients for short (<5m) pipe lengths have not been shown. Pipe sizes, maximum grades and materials are to be as specified on drainage notes drawing 13591-CRH-XX-XX-DR-C-5300 Revision P1 previously provided. *Okay.*

5. *Hydrobrake unit references should be included on layout plans.* Details have been added to updated drainage layout plan 13591-CRH-XX-XX-DR-C-5051 Revision P5 . *Okay, but please see comment above for more detailed calculations to evidence a compliant design. Hydrobrake reference on plans matches the calculations.*

6. *Please label finish and formation level of permeable paving.* Permeable pavement details have been previously provided on detail drawing 13591-CRH-XX-XX-DR-C-5350 Revision P2 . This includes depths of proposed pavement build-up. The proposed surface levels can be obtained from levels plan 13591-CRH-XX-XX-DR-C-5200 Revision P3 and sub base levels inferred (Minor updates to Revision P3 enclosed for completeness). *Finish and formation levels of permeable paving must be detailed, thank you for providing a finished levels plan, please provide formation levels on layout plan, this is required to evidence adequacy of proposed connections from permeable paving. And to ensure correct construction. Formation levels of porous sub base of permeable paving have been added in green text to drawings DR-5050 and 5051 as requested. Formation levels do not match modelled invert levels or slopes. Please label invert levels of fin drains.*

7. *Gullies and channel drains should be labelled with cover levels.* Cover levels have been provided for proposed gullies on updated drainage layout plan 13591-CRH-XX-XX-DR-C-5050 Revision P6 and 5051 Revision P5 . Channel drain cover levels will necessarily vary along the length and hence have not been provided. Exact levels will be determined by contractor to suit the finished levels as shown on levels plan 13591-CRH-XX-XX-DR-C-5200 Revision P3 . *Levels should be provided on plan to ensure construction is carried out in accordance with proposals. Channel drain cover levels have been added to drawings DR-5050 and 5051 as requested. To be reviewed once an updated set of calculations is provided.*

8. *The gabion outfall construction detail drawing is unclear. Is it proposed to have buried pipes discharging to the basin?* The gabion basket is to be built into the embankment and to be exposed so as to be accessible for maintenance. The pipework will be within the basket and wrapped in a permeable membrane to prevent build-up of fines. The gabion provides siltation protection as well as dispersal of incoming flow to reduce scour. The gabion basket also removes the need for a traditional headwall and grille, reduces the maintenance requirements and provides a bigger area of contact/surface flow. *Pipework should be exposed and within headwalls. To bury pipework within a gabion will prevent visual inspections for blockage being undertaken. The permeable membrane surrounding the pipe and gabion will likely silt up. Design must be maintainable. The gabion basket headwall is designed to minimise impact to the visual impact vs traditional precast concrete headwall units while allowing free flow of water. The headwalls proposed have been successfully utilised on other schemes and have been encouraged by other drainage authorities; an example can be found on page 76 of the Cambridge SuDS design and Adoption Guide (attached for reference). We do not accept the proposals, as detailed previously "Pipework should be exposed and within headwalls. To bury pipework within a gabion will prevent visual inspections for blockage*

being undertaken. The permeable membrane surrounding the pipe and gabion will likely silt up. Design must be maintainable”

9. Please supply site specific construction details of the attenuation basin, showing invert level, top of bank level, width at bed and width at bank. Please see enclosed basin detail drawing 13591-CRH-XX-XX-DR-C-5310 Revision P1 . To be reviewed once principals are agreed.

Engineers Comments Regarding Condition 9

1. Please supply evidence of consent applications for the new ditch, and headwall to the existing ditch. OWC application for the discharge headwall from the basin was formally submitted in September 2021 together with all information requested by Paul Cann as per his email of 11th August 2021. Referring to Land Drainage Act 1991 Section 23(3), could you please confirm when consent letter will be issued? This is with Paul Cann. The OWC consent for the new ditch is as shown on the attached consent (Consent Number LDC/ARUN/2021/015) Okay. This text appears to imply the approval has been granted? Could you please confirm and forward the approval letter if correct? As per the consent supplied by you LDC/ARUN/2021/015 granted on 1st November 21, but with a six month validity, this may need to be extended, please liaise with Paul Cann.

2. Please supply a buffer plan to show that at least 3m is being provided between top of bank of watercourses and obstructing features, such as fences, buildings, and basins. A suitable buffer has been provided between top of basin and edge of watercourse to allow for maintenance, as shown on drawing 13591-CRH-XX-XX-DR-C-5051 Revision P5 . Buffer not clearly shown, please show the buffer on a plan. A buffer has been shown on drawings DR-5050 and 5051 as requested. Okay.

Engineers Comments Regarding Condition 10

1. Review of the maintenance manual will occur once the drainage design has been agreed.

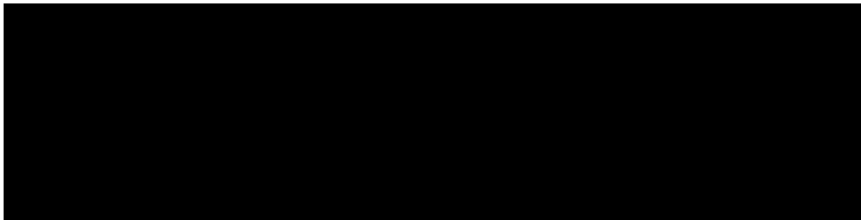
Noted, but please let us know if there are any comments once you have reviewed the information provided. Original comment stands.

Kind regards,

Laura Gibbons

Drainage Engineer

Engineering Services



Arun District Council, Civic Centre, Maltrovers Rd, Littlehampton, West Sussex, BN17 5LF

<http://www.arun.gov.uk>
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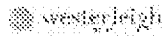
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Arun Crematorium

Design Calculations

13591 - Proposed Surface Water Network

13591-CRH-XX-XX-CA-C-0007

Rev P2

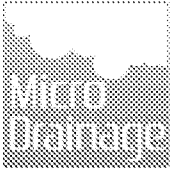
Date: 04/05/22

Project No: 13591

Engineer: J. Adams

Checked: A. Higgins

Campbell Reith Hill LLP
Raven House
29 Linkfield Lane

CampbellReith		Page 1
Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0007-P2_...	Designed by JA Checked by AJH	
XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 498000 101400 SU 98000 01400	
C (1km)	-0.026
D1 (1km)	0.390
D2 (1km)	0.244
D3 (1km)	0.410
E (1km)	0.311
F (1km)	2.320
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.411	4-8	0.163

Total Area Contributing (ha) = 0.574

Total Pipe Volume (m³) = 359.682

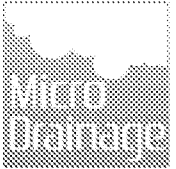
Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	31.570	0.450	70.2	0.073	4.00	0.0	0.600		o	225	Pipe/Conduit	
1.001	40.605	0.370	109.7	0.006	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.34	3.150	0.073	0.0	0.0	0.0	1.56	62.2	9.9
1.001	50.00	4.88	3.700	0.079	0.0	0.0	0.0	1.25	49.6	10.7

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	18.245	0.210	86.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.000	40.430	0.400	101.1	0.067	4.00	0.0	0.600		o	225	Pipe/Conduit	
3.000	17.120	0.290	59.0	0.009	4.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	8.720	0.180	48.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.003	32.050	0.320	100.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	19.980	0.200	99.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
4.000	5.500	0.050	110.0	0.045	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.000	24.900	0.550	45.3	0.006	4.00	0.0		0.045 4 \=/	500	1:4 Swale		
6.000	7.040	0.130	54.2	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	
7.000	8.390	0.180	46.6	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.001	38.945	0.380	102.5	0.000	0.00	0.0		0.045 4 \=/	500	1:4 Swale		
8.000	7.220	0.105	68.8	0.027	4.00	0.0	0.600		o	150	Pipe/Conduit	
9.000	8.270	0.055	150.4	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.002	9.841	0.100	98.4	0.021	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	50.00	5.10	3.330	0.079	0.0	0.0	0.0	1.40	55.8	10.7
2.000	50.00	4.52	3.700	0.067	0.0	0.0	0.0	1.30	51.7	9.1
3.000	50.00	4.17	3.590	0.009	0.0	0.0	0.0	1.71	67.8	1.2
2.001	50.00	4.60	3.390	0.076	0.0	0.0	0.0	1.88	74.9	10.3
1.003	50.00	5.50	3.120	0.155	0.0	0.0	0.0	1.31	51.9	21.0
1.004	50.00	5.76	2.800	0.155	0.0	0.0	0.0	1.31	52.1	21.0
4.000	50.00	4.10	3.550	0.045	0.0	0.0	0.0	0.96	16.9	6.1
5.000	50.00	4.60	3.800	0.006	0.0	0.0	0.0	0.69	113.5	0.8
6.000	50.00	4.09	3.450	0.020	0.0	0.0	0.0	1.37	24.2	2.7
7.000	50.00	4.09	3.590	0.018	0.0	0.0	0.0	1.48	26.1	2.4
5.001	50.00	6.02	3.250	0.044	0.0	0.0	0.0	0.46	75.4	6.0
8.000	50.00	4.10	3.950	0.027	0.0	0.0	0.0	1.21	21.5	3.7
9.000	50.00	4.17	3.900	0.025	0.0	0.0	0.0	0.92	14.4	3.4
5.002	50.00	6.15	2.870	0.117	0.0	0.0	0.0	1.32	52.4	15.8

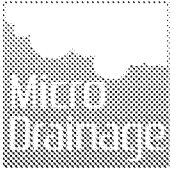
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
10.000	8.690	0.155	56.1	0.006	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.003	19.900	0.170	117.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
11.000	5.000	0.130	38.5	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
11.001	7.000	0.050	140.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
12.000	5.000	0.010	500.0	0.042	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.000	5.000	0.020	250.0	0.010	4.00	0.0	0.600		o	150	Pipe/Conduit	
12.001	7.000	0.050	140.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
14.000	10.260	0.130	78.9	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.001	6.320	0.020	316.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
14.002	14.190	0.150	94.6	0.012	0.00	0.0		0.045 4 \=/		500	1:4 Swale	
15.000	7.735	0.040	193.4	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.003	24.460	0.250	97.8	0.000	0.00	0.0		0.045 4 \=/		500	1:4 Swale	
16.000	19.620	0.200	98.1	0.053	4.00	0.0	0.600		o	225	Pipe/Conduit	
16.001	20.520	0.200	102.6	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
16.002	8.180	0.250	32.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	4.11	3.000	0.006	0.0	0.0	0.0	1.35	23.8	0.8
5.003	50.00	6.42	2.770	0.123	0.0	0.0	0.0	1.21	48.0	16.7
11.000	50.00	4.05	3.630	0.018	0.0	0.0	0.0	1.63	28.8	2.4
11.001	50.00	4.19	3.500	0.018	0.0	0.0	0.0	0.85	15.0	2.4
12.000	50.00	4.19	2.910	0.042	0.0	0.0	0.0	0.44	7.8	5.7
13.000	50.00	4.13	2.920	0.010	0.0	0.0	0.0	0.63	11.2	1.4
12.001	50.00	4.33	2.900	0.052	0.0	0.0	0.0	0.85	15.0	7.0
14.000	50.00	4.15	3.800	0.025	0.0	0.0	0.0	1.13	20.0	3.4
14.001	50.00	4.34	3.670	0.025	0.0	0.0	0.0	0.56	9.9	3.4
14.002	50.00	4.84	3.650	0.037	0.0	0.0	0.0	0.48	78.5	5.0
15.000	50.00	4.18	3.540	0.020	0.0	0.0	0.0	0.72	12.7	2.7
14.003	50.00	5.71	3.580	0.057	0.0	0.0	0.0	0.47	77.2	7.7
16.000	50.00	4.25	3.900	0.053	0.0	0.0	0.0	1.32	52.5	7.2
16.001	50.00	4.51	3.700	0.064	0.0	0.0	0.0	1.29	51.3	8.7
16.002	50.00	4.57	3.500	0.064	0.0	0.0	0.0	2.30	91.3	8.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
14.004	14.690	0.335	43.9	0.000	0.00	0.0		0.045	4 \=/	225	1:4 Swale	
17.000	7.765	0.105	74.0	0.030	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.005	32.200	0.320	100.6	0.030	0.00	0.0	0.600		o	225	Pipe/Conduit	
18.000	18.900	0.280	71.1	0.000	4.00	0.1	0.600		o	150	Pipe/Conduit	
1.005	6.395	0.600	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
1.006	5.370	0.500	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
14.004	50.00	6.09	3.250	0.121	0.0	0.0	0.0	0.65	80.1	16.4
17.000	50.00	4.11	3.100	0.030	0.0	0.0	0.0	1.17	20.7	4.1
14.005	50.00	6.50	2.920	0.181	0.0	0.0	0.0	1.30	51.8	24.5
18.000	50.00	4.28	2.880	0.000	0.1	0.0	0.0	1.19	21.1	0.1
1.005	50.00	6.53	2.600	0.574	0.1	0.0	0.0	3.10	54.9	77.8
1.006	50.00	6.56	2.000	0.574	0.1	0.0	0.0	3.09	54.6	77.8

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XP Solutions		Network 2020.1

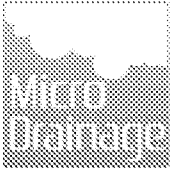


Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW1	4.850	0.700	Open Manhole	600	1.000	4.150	225				
SW2	4.500	0.800	Open Manhole	600	1.001	3.700	225	1.000	3.700	225	
SW3	4.500	1.170	Open Manhole	600	1.002	3.330	225	1.001	3.330	225	
SW18	4.700	1.000	Open Manhole	600	2.000	3.700	225				
SW20	4.700	1.110	Open Manhole	600	3.000	3.590	225				
SW19	4.700	1.400	Open Manhole	600	2.001	3.300	225	2.000	3.300	225	
								3.000	3.300	225	
SW4	4.500	1.380	Open Manhole	600	1.003	3.120	225	1.002	3.120	225	
								2.001	3.120	225	
SW5	4.000	1.200	Open Manhole	600	1.004	2.800	225	1.003	2.800	225	
SW14	4.350	0.800	Open Manhole	600	4.000	3.550	150				
Gabion HW	4.500	0.700	Open Manhole	600	5.000	3.800	500				
RE5	3.950	0.500	Open Manhole	600	6.000	3.450	150				
RE2	4.050	0.550	Open Manhole	600	7.000	3.500	150				
SW6	3.970	0.720	Open Manhole	600	5.001	3.250	500	5.000	3.250	500	70
								6.000	3.320	150	
								7.000	3.320	150	70
RE6	3.550	0.500	Open Manhole	600	8.000	3.050	150				
RE3	3.550	0.550	Open Manhole	600	9.000	3.000	150				
SW7	3.600	0.730	Open Manhole	600	5.002	2.870	225	5.001	2.870	500	
								8.000	2.945	150	
								9.000	2.945	150	
RE4	3.600	0.600	Open Manhole	600	10.000	3.000	150				
SW8	4.050	1.280	Open Manhole	600	5.003	2.770	225	5.002	2.770	225	
								10.000	2.845	150	
Perm Pav 1	4.050	0.420	Open Manhole	600	11.000	3.630	150				
RE1	4.050	0.550	Open Manhole	600	11.001	3.500	150	11.000	3.500	150	
Perm Pav 15a	3.950	0.440	Open Manhole	600	12.000	2.910	150				
Perm Pav 15b	3.950	0.430	Open Manhole	600	13.000	2.920	150				
SW15	3.450	0.550	Open Manhole	600	12.001	2.900	150	12.000	2.900	150	
								13.000	2.900	150	
SW16	4.800	1.000	Open Manhole	600	14.000	3.800	150				
SW17	4.500	0.830	Open Manhole	600	14.001	3.670	150	14.000	3.670	150	
Swale	4.500	0.850	Open Manhole	600	14.002	3.650	500	14.001	3.650	150	
RE7	4.050	0.510	Open Manhole	600	15.000	3.540	150				
SW9	4.150	0.650	Open Manhole	600	14.003	3.500	500	14.002	3.500	500	
								15.000	3.500	150	
SW11	4.750	0.850	Open Manhole	600	16.000	3.800	225				
SW12	4.700	1.000	Open Manhole	600	16.001	3.700	225	16.000	3.700	225	
SW13	4.500	1.000	Open Manhole	600	16.002	3.500	225	16.001	3.500	225	
Swale	4.500	1.250	Open Manhole	600	14.004	3.250	225	14.003	3.250	500	
								16.002	3.250	225	
RE8	3.600	0.500	Open Manhole	600	17.000	3.100	150				
SW10	4.100	1.185	Open Manhole	600	14.005	2.920	225	14.004	2.915	225	

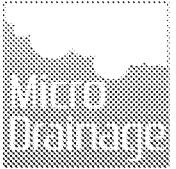
Manhole Schedules for Storm											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FW5 Gabion HW	4.300	1.420	Open Manhole	600	18.000	2.880	150	17.000	2.995	150	
	4.200	1.600	Open Manhole	600	1.005	2.600	150	1.004	2.600	225	
								4.000	3.500	150	900
								5.003	2.600	225	
								11.001	3.450	150	850
								12.001	2.850	150	250
								14.005	2.600	225	
SW20	4.000	2.000	Open Manhole	1200	1.006	2.000	150	1.005	2.000	150	
Outfall	4.000	2.500	Open Manhole	0		OUTFALL		1.006	1.500	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW1	497992.607	101768.526	497992.607	101768.526	Required	●
SW2	498022.043	101779.935	498022.043	101779.935	Required	●
SW3	498036.717	101742.074	498036.717	101742.074	Required	●
SW18	498020.588	101759.609	498020.588	101759.609	Required	●
SW20	498019.235	101715.724	498019.235	101715.724	Required	●
SW19	498035.198	101721.911	498035.198	101721.911	Required	●
SW4	498043.325	101725.068	498043.325	101725.068	Required	●
SW5	498054.933	101695.195	498054.933	101695.195	Required	●
SW14	497931.041	101656.360	497931.041	101656.360	Required	●
Gabion HW	497943.256	101689.431	497943.256	101689.431	Required	●
RE5	497968.354	101685.745	497968.354	101685.745	Required	●
RE2	497962.253	101671.596	497962.253	101671.596	Required	●

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW6	497965.931	101679.139	497965.931	101679.139	Required	⊗
RE6	498003.646	101670.167	498003.646	101670.167	Required	⊗
RE3	497997.379	101656.099	497997.379	101656.099	Required	⊗
SW7	498001.497	101663.273	498001.497	101663.273	Required	⊗
RE4	498004.907	101652.731	498004.907	101652.731	Required	⊗
SW8	498010.527	101659.359	498010.527	101659.359	Required	⊗
Perm Pav 1	497947.290	101664.312	497947.290	101664.312	Required	⊗
RE1	497956.193	101657.975	497956.193	101657.975	Required	⊗
Perm Pav 15a	497990.680	101644.889	497990.680	101644.889	Required	⊗
Perm Pav 15b	498008.648	101637.892	498008.648	101637.892	Required	⊗
SW15	497998.245	101639.419	497998.245	101639.419	Required	⊗
SW16	497964.026	101728.967	497964.026	101728.967	Required	⊗
SW17	497967.733	101719.401	497967.733	101719.401	Required	⊗
Swale	497965.231	101713.600	497965.231	101713.600	Required	⊗
RE7	497975.142	101700.660	497975.142	101700.660	Required	⊗
SW9	497978.171	101707.776	497978.171	101707.776	Required	⊗
SW11	498002.991	101743.031	498002.991	101743.031	Required	⊗
SW12	497996.317	101724.584	497996.317	101724.584	Required	⊗
SW13	498003.732	101705.451	498003.732	101705.451	Required	⊗

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Swale	498000.554	101697.917	498000.554	101697.917	Required	
RE8	498010.268	101685.163	498010.268	101685.163	Required	
SW10	498013.991	101691.976	498013.991	101691.976	Required	
FW5	498047.056	101698.496	498047.056	101698.496	Required	
Gabion HW	498021.090	101623.117	498021.090	101623.117	Required	
SW20	498025.533	101618.519	498025.533	101618.519	Required	
Outfall	498029.291	101614.686			No Entry	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.073	0.073	0.073
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.067	0.067	0.067
3.000	-	-	100	0.009	0.009	0.009
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.045	0.045	0.045
5.000	-	-	100	0.006	0.006	0.006
6.000	-	-	100	0.020	0.020	0.020
7.000	-	-	100	0.018	0.018	0.018
5.001	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.027	0.027	0.027
9.000	-	-	100	0.025	0.025	0.025
5.002	-	-	100	0.021	0.021	0.021
10.000	-	-	100	0.006	0.006	0.006
5.003	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.018	0.018	0.018
11.001	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.042	0.042	0.042
13.000	-	-	100	0.010	0.010	0.010
12.001	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.025	0.025	0.025
14.001	-	-	100	0.000	0.000	0.000
14.002	-	-	100	0.012	0.012	0.012
15.000	-	-	100	0.020	0.020	0.020
14.003	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.053	0.053	0.053
16.001	-	-	100	0.011	0.011	0.011
16.002	-	-	100	0.000	0.000	0.000
14.004	-	-	100	0.000	0.000	0.000
17.000	-	-	100	0.030	0.030	0.030
14.005	-	-	100	0.030	0.030	0.030
18.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.574	0.574	0.574

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.006	Outfall	4.000	1.500	0.000	0	0

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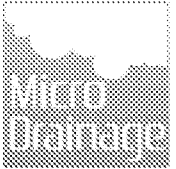
Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	11	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.311
Return Period (years)	100	F (1km)	2.320
FEH Rainfall Version	1999	Summer Storms	Yes
Site Location	GB 498000 101400 SU 98000 01400	Winter Storms	No
C (1km)	-0.026	Cv (Summer)	0.750
D1 (1km)	0.390	Cv (Winter)	0.840
D2 (1km)	0.244	Storm Duration (mins)	30
D3 (1km)	0.410		

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Online Controls for Storm

Non Return Valve Manhole: SW15, DS/PN: 12.001, Volume (m³): 0.3

Complex Manhole: Gabion HW, DS/PN: 1.005, Volume (m³): 3.9

Orifice

Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 2.600

Hydro-Brake® Optimum

Unit Reference MD-SHE-0074-2000-0500-2000
Design Head (m) 0.500
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 74
Invert Level (m) 3.000
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.0	Kick-Flo®	0.342	1.7
Flush-Flo™	0.149	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	0.800	2.5	2.000	3.8	4.000	5.2	7.000	6.8
0.200	2.0	1.000	2.7	2.200	3.9	4.500	5.5	7.500	7.1
0.300	1.8	1.200	3.0	2.400	4.1	5.000	5.8	8.000	7.3
0.400	1.8	1.400	3.2	2.600	4.3	5.500	6.1	8.500	7.5
0.500	2.0	1.600	3.4	3.000	4.6	6.000	6.3	9.000	7.8
0.600	2.2	1.800	3.6	3.500	4.9	6.500	6.6	9.500	8.0

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Storage Structures for Storm

Porous Car Park Manhole: RE5, DS/PN: 6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.540	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE2, DS/PN: 7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	59.5
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.630	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE6, DS/PN: 8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	43.1	Slope (1:X)	106.9
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.170	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE3, DS/PN: 9.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	43.1	Slope (1:X)	60.8
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.000	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE4, DS/PN: 10.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	240.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.070	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: Perm Pav 1, DS/PN: 11.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	22.0
Max Percolation (l/s)	30.6	Slope (1:X)	61.1
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.630	Cap Volume Depth (m)	0.300

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Porous Car Park Manhole: Perm Pav 15a, DS/PN: 12.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	55.6	Slope (1:X)	66.7
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	2.910	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: Perm Pav 15b, DS/PN: 13.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	2.920	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE7, DS/PN: 15.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	111.1
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.540	Cap Volume Depth (m)	0.300

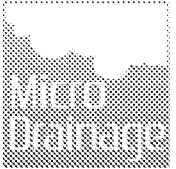
Porous Car Park Manhole: RE8, DS/PN: 17.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	32.0
Max Percolation (l/s)	44.4	Slope (1:X)	110.3
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.170	Membrane Depth (mm)	150

Tank or Pond Manhole: Gabion HW, DS/PN: 1.005

Invert Level (m) 3.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1400.0	0.500	1680.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Surcharged			Volume (m³)	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)
				Level (m)	Depth (m)	Flooded				
1.000	SW1	15 minute 2 year Winter I+0%	4.850	4.223	-0.152	0.000			0.019	5.811
1.001	SW2	15 minute 2 year Winter I+0%	4.500	3.784	-0.141	0.000			0.061	6.288
1.002	SW3	15 minute 2 year Winter I+0%	4.500	3.411	-0.144	0.000			0.080	6.288
2.000	SW18	15 minute 2 year Winter I+0%	4.700	3.776	-0.149	0.000			0.020	5.333
3.000	SW20	15 minute 2 year Winter I+0%	4.700	3.615	-0.200	0.000			0.006	0.717
2.001	SW19	15 minute 2 year Winter I+0%	4.700	3.373	-0.152	0.000			0.096	6.050
1.003	SW4	15 minute 2 year Winter I+0%	4.500	3.241	-0.104	0.000			0.183	12.338
1.004	SW5	15 minute 2 year Winter I+0%	4.000	3.100	0.075	0.000			0.795	11.849
4.000	SW14	15 minute 2 year Summer I+0%	4.350	3.633	-0.067	0.000			0.022	3.198
5.000	Gabion HW	15 minute 2 year Winter I+0%	4.500	3.809	-0.691	0.000			0.001	0.478
6.000	RE5	15 minute 2 year Summer I+0%	3.950	3.492	-0.108	0.000			0.011	1.423
7.000	RE2	15 minute 2 year Winter I+0%	4.050	3.538	-0.112	0.000			0.009	1.433
5.001	SW6	15 minute 2 year Summer I+0%	3.970	3.298	-0.672	0.000			0.024	3.129
8.000	RE6	15 minute 2 year Summer I+0%	3.550	3.103	-0.097	0.000			0.013	1.920
9.000	RE3	1440 minute 2 year Winter I+0%	3.550	3.089	-0.061	0.000			0.385	8.505
5.002	SW7	1440 minute 2 year Winter I+0%	3.600	3.089	-0.006	0.000			2.835	38.516
10.000	RE4	1440 minute 2 year Winter I+0%	3.600	3.088	-0.062	0.000			0.084	2.046
5.003	SW8	1440 minute 2 year Winter I+0%	4.050	3.088	0.093	0.000			0.582	40.084
11.000	Perm Pav 1	15 minute 2 year Winter I+0%	4.050	3.668	-0.112	0.000			0.075	1.434
11.001	RE1	15 minute 2 year Winter I+0%	4.050	3.551	-0.099	0.000			0.022	1.434
12.000	Perm Pav 15a	1440 minute 2 year Winter I+0%	3.350	3.088	0.028	0.000			1.637	13.374
13.000	Perm Pav 15b	1440 minute 2 year Winter I+0%	3.350	3.088	0.018	0.000			2.709	1.692
12.001	SW15	1440 minute 2 year Winter I+0%	3.450	3.088	0.038	0.000			0.196	14.921
14.000	SW16	15 minute 2 year Winter I+0%	4.800	3.851	-0.099	0.000			0.013	1.990
14.001	SW17	15 minute 2 year Summer I+0%	4.500	3.751	-0.069	0.000			0.053	1.777
14.002	Swale	15 minute 2 year Winter I+0%	4.500	3.691	-0.809	0.000			0.031	2.945
15.000	RE7	15 minute 2 year Winter I+0%	4.050	3.596	-0.094	0.000			0.276	1.592
14.003	SW9	15 minute 2 year Winter I+0%	4.150	3.552	-0.598	0.000			0.207	4.536
16.000	SW11	15 minute 2 year Winter I+0%	4.750	3.969	-0.156	0.000			0.018	4.219

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

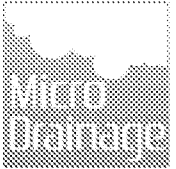
PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1		13.3	OK
1.001	SW2		13.7	OK
1.002	SW3		13.9	OK
2.000	SW18		12.1	OK
3.000	SW20		1.6	OK
2.001	SW19		13.6	OK
1.003	SW4		27.2	OK
1.004	SW5		26.9	SURCHARGED
4.000	SW14		8.2	OK
5.000	Gabion HW		1.1	OK
6.000	RE5	5	3.7	OK
7.000	RE2	5	3.3	OK
5.001	SW6		7.8	OK
8.000	RE6	5	4.9	OK
9.000	RE3	705	0.2	OK
5.002	SW7		1.1	OK
10.000	RE4	341	0.1	OK
5.003	SW8		1.1	SURCHARGED
11.000	Perm Pav 1	4	3.3	OK
11.001	RE1		3.2	OK
12.000	Perm Pav 15a	1611	0.4	FLOOD RISK
13.000	Perm Pav 15b		0.0	FLOOD RISK
12.001	SW15		0.4	SURCHARGED
14.000	SW16		4.6	OK
14.001	SW17		4.6	OK
14.002	Swale		6.3	OK
15.000	RE7	5	3.3	OK
14.003	SW9		9.5	OK
16.000	SW11		9.7	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow (l/s)	Maximum Vol (m³)	Discharge (m³)
16.001	SW12	15 minute 2 year Winter I+0%	4.700	3.775	-0.150	0.000		0.067	5.094
16.002	SW13	15 minute 2 year Winter I+0%	4.500	3.560	-0.165	0.000		0.055	5.094
14.004	Swale	15 minute 2 year Winter I+0%	4.500	3.331	-1.169	0.000		0.315	9.627
17.000	RE8	15 minute 2 year Summer I+0%	3.600	3.157	-0.093	0.000		0.015	2.133
14.005	SW10	15 minute 2 year Winter I+0%	4.100	3.121	-0.024	0.000		0.770	14.240
18.000	FW5	1440 minute 2 year Winter I+0%	4.300	3.088	0.058	0.000		0.057	17.237
1.005	Gabion HW	1440 minute 2 year Winter I+0%	4.200	3.087	0.337	0.000		127.882	160.603
1.006	SW20	1440 minute 2 year Winter I+0%	4.000	2.019	-0.131	0.000		0.017	160.586

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
16.001	SW12		11.2	OK
16.002	SW13		11.1	OK
14.004	Swale		20.6	OK
17.000	RE8	5	5.5	OK
14.005	SW10		28.2	OK
18.000	FW5		0.1	SURCHARGED
1.005	Gabion HW		1.8	SURCHARGED
1.006	SW20		1.8	OK

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

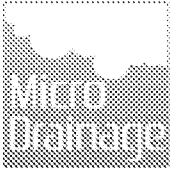
Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Surcharged			Volume (m³)	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)
				Level (m)	Depth (m)	Flooded				
1.000	SW1	15 minute 30 year Winter I+0%	4.850	4.260	-0.115	0.000			0.030	12.304
1.001	SW2	15 minute 30 year Winter I+0%	4.500	3.832	-0.093	0.000			0.137	13.315
1.002	SW3	15 minute 30 year Winter I+0%	4.500	3.598	0.043	0.000			0.724	13.315
2.000	SW18	15 minute 30 year Winter I+0%	4.700	3.816	-0.109	0.000			0.031	11.293
3.000	SW20	15 minute 30 year Winter I+0%	4.700	3.625	-0.190	0.000			0.008	1.517
2.001	SW19	15 minute 30 year Winter I+0%	4.700	3.561	0.036	0.000			0.971	12.810
1.003	SW4	15 minute 30 year Winter I+0%	4.500	3.534	0.189	0.000			1.136	26.125
1.004	SW5	15 minute 30 year Winter I+0%	4.000	3.233	0.208	0.000			1.248	25.501
4.000	SW14	15 minute 30 year Summer I+0%	4.350	3.725	0.025	0.000			0.045	6.772
5.000	Gabion HW	15 minute 30 year Winter I+0%	4.500	3.819	-0.681	0.000			0.004	1.012
6.000	RE5	15 minute 30 year Winter I+0%	3.950	3.513	-0.087	0.000			0.017	3.372
7.000	RE2	15 minute 30 year Winter I+0%	4.050	3.556	-0.094	0.000			0.015	3.035
5.001	SW6	15 minute 30 year Summer I+0%	3.970	3.321	-0.649	0.000			0.037	6.625
8.000	RE6	15 minute 30 year Winter I+0%	3.550	3.184	-0.016	0.000			0.052	4.545
9.000	RE3	15 minute 30 year Winter I+0%	3.550	3.180	0.030	0.000			1.525	3.982
5.002	SW7	15 minute 30 year Winter I+0%	3.600	3.167	0.072	0.000			5.932	17.375
10.000	RE4	960 minute 30 year Winter I+0%	3.600	3.153	0.003	0.000			1.080	3.084
5.003	SW8	960 minute 30 year Winter I+0%	4.050	3.153	0.158	0.000			0.613	60.859
11.000	Perm Pav 1	15 minute 30 year Winter I+0%	4.050	3.687	-0.093	0.000			0.163	3.035
11.001	RE1	15 minute 30 year Winter I+0%	4.050	3.579	-0.071	0.000			0.035	3.035
12.000	Perm Pav 15a	960 minute 30 year Winter I+0%	3.350	3.153	0.093	0.000			3.011	20.155
13.000	Perm Pav 15b	960 minute 30 year Winter I+0%	3.350	3.152	0.082	0.000			3.886	2.541
12.001	SW15	960 minute 30 year Winter I+0%	3.450	3.152	0.102	0.000			0.225	22.504
14.000	SW16	15 minute 30 year Winter I+0%	4.800	3.879	-0.071	0.000			0.021	4.214
14.001	SW17	15 minute 30 year Summer I+0%	4.500	3.825	0.005	0.000			0.137	3.763
14.002	Swale	15 minute 30 year Winter I+0%	4.500	3.714	-0.786	0.000			0.052	6.236
15.000	RE7	15 minute 30 year Winter I+0%	4.050	3.625	-0.065	0.000			0.629	3.371
14.003	SW9	15 minute 30 year Winter I+0%	4.150	3.576	-0.574	0.000			0.316	9.606
16.000	SW11	15 minute 30 year Winter I+0%	4.750	4.003	-0.122	0.000			0.028	8.933

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0007-P2_...	Designed by JA Checked by AJH	
XP Solutions	Network 2020.1	

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

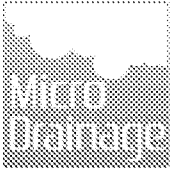
PN	US/MH Name	Half Drain Pipe		Status
		Time (mins)	Flow (l/s)	
1.000	SW1		28.1	OK
1.001	SW2		29.5	OK
1.002	SW3		25.6	SURCHARGED
2.000	SW18		25.6	OK
3.000	SW20		3.5	OK
2.001	SW19		24.1	SURCHARGED
1.003	SW4		47.1	SURCHARGED
1.004	SW5		47.1	SURCHARGED
4.000	SW14		17.5	SURCHARGED
5.000	Gabion HW		2.3	OK
6.000	RE5	5	7.7	OK
7.000	RE2	5	7.0	OK
5.001	SW6		16.6	OK
8.000	RE6	5	9.8	OK
9.000	RE3	6	4.8	SURCHARGED
5.002	SW7		22.9	SURCHARGED
10.000	RE4	449	0.1	SURCHARGED
5.003	SW8		2.5	SURCHARGED
11.000	Perm Pav 1	4	6.9	OK
11.001	RE1		6.8	OK
12.000	Perm Pav 15a		0.8	FLOOD RISK
13.000	Perm Pav 15b		0.1	FLOOD RISK
12.001	SW15		0.9	FLOOD RISK
14.000	SW16		9.7	OK
14.001	SW17		8.8	SURCHARGED
14.002	Swale		14.3	OK
15.000	RE7	5	6.7	OK
14.003	SW9		20.5	OK
16.000	SW11		20.5	OK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
Date 04/05/2022	Designed by JA	
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XP Solutions		Network 2020.1

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow (l/s)	Maximum Vol (m³)	Discharge (m³)
16.001	SW12	15 minute 30 year Winter I+0%	4.700	3.817	-0.108	0.000		0.131	10.787
16.002	SW13	15 minute 30 year Winter I+0%	4.500	3.592	-0.133	0.000		0.087	10.787
14.004	Swale	15 minute 30 year Winter I+0%	4.500	3.366	-1.134	0.000		0.606	20.390
17.000	RE8	15 minute 30 year Winter I+0%	3.600	3.316	0.066	0.000		1.821	5.058
14.005	SW10	15 minute 30 year Winter I+0%	4.100	3.306	0.161	0.000		4.205	30.091
18.000	FW5	960 minute 30 year Winter I+0%	4.300	3.152	0.122	0.000		0.076	11.462
1.005	Gabion HW	960 minute 30 year Winter I+0%	4.200	3.152	0.402	0.000		222.167	181.165
1.006	SW20	960 minute 30 year Winter I+0%	4.000	2.020	-0.130	0.000		0.018	181.121

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
16.001	SW12		24.5	OK
16.002	SW13		24.3	OK
14.004	Swale		44.9	OK
17.000	RE8	4	11.2	FLOOD RISK
14.005	SW10		44.8	SURCHARGED
18.000	FW5		0.1	SURCHARGED
1.005	Gabion HW		2.0	SURCHARGED
1.006	SW20		2.0	OK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Surcharged Flooded				
				Level (m)	Depth (m)	Volume (m³)	Overflow (l/s)	Maximum Vol (m³)
1.000	SW1	15 minute 100 year Winter I+40%	4.850	4.690	0.315	0.000		0.151
1.001	SW2	15 minute 100 year Winter I+40%	4.500	4.500	0.575	0.250		1.706
1.002	SW3	15 minute 100 year Winter I+40%	4.500	4.301	0.746	0.000		1.864
2.000	SW18	15 minute 100 year Winter I+40%	4.700	4.514	0.589	0.000		0.229
3.000	SW20	15 minute 100 year Winter I+40%	4.700	4.321	0.506	0.000		0.205
2.001	SW19	15 minute 100 year Winter I+40%	4.700	4.312	0.787	0.000		2.525
1.003	SW8	15 minute 100 year Winter I+40%	4.500	4.180	0.830	0.000		1.323
1.004	SW5	15 minute 100 year Winter I+40%	4.000	3.501	0.476	0.000		1.447
4.000	SW14	15 minute 100 year Summer I+40%	4.350	3.886	0.186	0.000		0.094
5.000	Gabion HW	15 minute 100 year Winter I+40%	4.500	3.826	-0.674	0.000		0.006
6.000	RE5	15 minute 100 year Winter I+40%	3.950	3.539	-0.061	0.000		0.024
7.000	RE2	15 minute 100 year Winter I+40%	4.050	3.578	-0.072	0.000		0.021
5.001	SW6	15 minute 100 year Summer I+40%	3.970	3.342	-0.628	0.000		0.049
8.000	RE6	1440 minute 100 year Winter I+40%	3.550	3.276	0.076	0.000		0.965
9.000	RE3	1440 minute 100 year Winter I+40%	3.550	3.276	0.126	0.000		3.553
5.002	SW7	1440 minute 100 year Winter I+40%	3.600	3.276	0.181	0.000		13.084
10.000	RE4	1440 minute 100 year Winter I+40%	3.600	3.275	0.125	0.000		3.322
5.003	SW8	1440 minute 100 year Winter I+40%	4.050	3.275	0.280	0.000		0.652
11.000	Perm Pav 1	15 minute 100 year Winter I+40%	4.050	3.709	-0.071	0.000		0.304
11.001	RE1	15 minute 100 year Winter I+40%	4.050	3.616	-0.034	0.000		0.055
12.000	Perm Pav 15a	1440 minute 100 year Winter I+40%	3.350	3.275	0.215	0.000		6.561
13.000	Perm Pav 15b	1440 minute 100 year Winter I+40%	3.350	3.275	0.205	0.000		5.499
12.001	SW15	1440 minute 100 year Winter I+40%	3.450	3.275	0.225	0.000		0.260
14.000	SW16	15 minute 100 year Summer I+40%	4.800	3.995	0.045	0.000		0.054
14.001	SW17	15 minute 100 year Summer I+40%	4.500	3.879	0.059	0.000		0.205
14.002	Swale	15 minute 100 year Summer I+40%	4.500	3.736	-0.764	0.000		0.071
15.000	RE7	15 minute 100 year Winter I+40%	4.050	3.662	-0.028	0.000		1.283
14.003	SW9	15 minute 100 year Winter I+40%	4.150	3.600	-0.550	0.000		0.421
16.000	SW11	15 minute 100 year Winter I+40%	4.750	4.047	-0.078	0.000		0.040

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Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0007-P2_...	Designed by JA Checked by AJH	
XP Solutions	Network 2020.1	

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

PN	US/MH Name	Discharge Vol (m³)	Half Drain Pipe		Status
			Time (mins)	Flow (l/s)	
1.000	SW1	21.633		46.0	FLOOD RISK
1.001	SW2	23.409		40.6	FLOOD
1.002	SW3	23.409		35.3	FLOOD RISK
2.000	SW18	19.850		39.1	FLOOD RISK
3.000	SW20	2.668		5.2	SURCHARGED
2.001	SW19	22.518		36.9	SURCHARGED
1.003	SW4	45.835		71.1	SURCHARGED
1.004	SW5	45.112		70.7	SURCHARGED
4.000	SW14	11.907		30.6	SURCHARGED
5.000	Gabion HW	1.779		4.1	OK
6.000	RE5	5.928	5	13.6	OK
7.000	RE2	5.336	5	12.2	OK
5.001	SW6	11.646		29.1	OK
8.000	RE6	25.945	546	0.8	FLOOD RISK
9.000	RE3	22.471	1305	0.6	FLOOD RISK
5.002	SW7	104.502		2.8	SURCHARGED
10.000	RE4	4.161	1453	0.1	SURCHARGED
5.003	SW8	108.036		2.8	SURCHARGED
11.000	Perm Pav 1	5.335	4	12.1	OK
11.001	RE1	5.336		12.0	OK
12.000	Perm Pav 15a	36.288		1.0	FLOOD RISK
13.000	Perm Pav 15b	5.117		0.1	FLOOD RISK
12.001	SW15	41.171		1.1	FLOOD RISK
14.000	SW16	6.616		17.0	SURCHARGED
14.001	SW17	6.616		16.9	SURCHARGED
14.002	Swale	9.790		24.9	OK
15.000	RE7	5.927	5	11.0	OK
14.003	SW9	16.891		35.3	OK
16.000	SW11	15.707		36.0	OK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P2	
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XP Solutions	Network 2020.1	

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

PN	US/MH Name	Event	US/CL (m)	Water Surcharged Flooded			Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)
				Level (m)	Depth (m)	Volume (m³)			
16.001	SW12	15 minute 100 year Winter I+40%	4.700	3.871	-0.054	0.000		0.290	18.967
16.002	SW13	15 minute 100 year Winter I+40%	4.500	3.628	-0.097	0.000		0.170	18.967
14.004	Swale	15 minute 100 year Winter I+40%	4.500	3.469	-1.031	0.000		2.638	35.855
17.000	RE8	15 minute 100 year Winter I+40%	3.600	3.459	0.209	0.000		7.018	8.891
14.005	SW10	15 minute 100 year Winter I+40%	4.100	3.464	0.318	0.000		10.110	52.876
18.000	FW5	1440 minute 100 year Winter I+40%	4.300	3.275	0.245	0.000		0.110	17.194
1.005	Gabion HW	1440 minute 100 year Winter I+40%	4.200	3.274	0.524	0.000		408.154	283.537
1.006	SW20	1440 minute 100 year Summer I+40%	4.000	2.020	-0.130	0.000		0.018	280.799

PN	US/MH Name	Half Drain Pipe		Status
		Time (mins)	Flow (l/s)	
16.001	SW12		43.1	OK
16.002	SW13		42.6	OK
14.004	Swale		68.8	OK
17.000	RE8	7	17.5	FLOOD RISK
14.005	SW10		55.1	SURCHARGED
18.000	FW5		0.1	SURCHARGED
1.005	Gabion HW		2.0	SURCHARGED
1.006	SW20		2.0	OK

13591 New Arun Crematorium
Surface Water Calculations - Key Plan
13591-CRH-XX-XX-CA-C-007
Rev P2
04/05/2022
Engineer: JA



- ### Notes
- Do not scale from this drawing on print or electronically. Work from figured dimensions only.
 - No deviation from the details on this drawing is allowed without CampbellReith's prior permission in writing.
 - Read this drawing with all Architect's, Service Engineer's and CampbellReith's relevant details, specifications and drawings.
 - All work is to be done in accordance with the relevant specifications issued by CampbellReith, British Standard Codes of Practice, Statutory Requirements and the Contract Documents.
 - Drawing status:**
P: Preliminary Evolving drawings for approvals, tenders, billings etc.
C: Construction Fully developed drawings issued under instructions for construction.
 - Only status C drawings to be used for construction.
 - Suitability code:
Work in progress
S0 - Work in progress
Shared (Non-contractual)
S1 - For coordination, **S2** - For information, **S3** - For internal review and comment, **S4** - For construction approval.
Documentation (For contractors purposes)
D1 - For Costing, **D2** - For Tender, **D3** - For contractor design, **D4** - for manufacture/procurement.
Construction
A - For construction, **B** - For construction but with comments (i.e. areas in abeyance), **CR** - Construction Record (Final Construction ONLY. Any deviations to that which is on site is not the liability of CampbellReith)
 - For full drainage strategy refer to drawings 13591-CRH-XX-XX-DR-C-5050 and 13591-CRH-XX-XX-DR-C-5051.
 - For proposed finished levels refer to drawing 13591-CRH-XX-XX-DR-C-5200.
 - Refer to proposed catchment plan 13591-CRH-XX-XX-DR-C-5250 for details of overall site catchments.
 - This plan should be read with reference to proposed surface water drainage model 13591-CRH-XX-XX-CA-C-0007. Note: colour of ring around manhole indicates node at which area of same colour enters system in the Network model 13591-CRH-XX-XX-CA-C-0007.

LEGEND

	Site boundary (2.765 ha)
	Proposed surface water sewer
	Linear drainage channel
	Surface water manhole
	Surface water inspection chamber
	Rodding eye
	Rainwater pipe
	Surface water gully
	Permeable paving
	Swale
	Attenuation basin
	Gabion basket headwall
	Precast headwall
	Sub-catchment area *Refer to note 11

TOTAL impermeable area draining to surface water network = 0.574 ha

P2	Minor updates to match proposed drainage	04.05.22	JA
P1	Issued for Information	08.04.22	JA
Rev	Description	Date	By

CampbellReith

consulting engineers

London	020 7340 1700	☐ Manchester	0161 819 3060
Surrey	01737 784 500	☒ Birmingham	01675 467 484
Bristol	0117 916 1066	☐ Dubai	00 971 4345 7088

www.campbellreith.com

Job Title	Central Arun Crematorium
Client	Westerleigh

Proposed Surface Water Drainage Sub-Catchment Plan

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
JA	April'22	1:500	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5260	P2

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Arun Crematorium

Design Calculations

13591 - Proposed Surface Water Network with Infiltration

13591-CRH-XX-XX-CA-C-0008

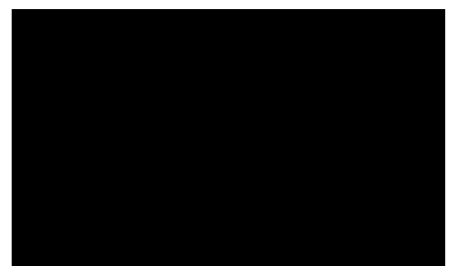
Rev P1

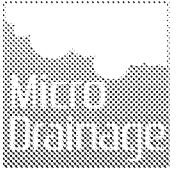
Date: 04/05/22

Project No: 13591

Engineer: J. Adams

Checked: A. Higgins



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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0008-P1_...	Designed by JA Checked by AJH	
XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 498000 101400 SU 98000 01400	
C (1km)	-0.026
D1 (1km)	0.390
D2 (1km)	0.244
D3 (1km)	0.410
E (1km)	0.311
F (1km)	2.320
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.411	4-8	0.163

Total Area Contributing (ha) = 0.574

Total Pipe Volume (m³) = 359.682

Network Design Table for Storm

- Indicates pipe length does not match coordinates

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	31.570	0.450	70.2	0.073	4.00	0.0	0.600		o	225	Pipe/Conduit	
1.001	40.605	0.370	109.7	0.006	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.34	3.150	0.073	0.0	0.0	0.0	1.56	62.2	9.9
1.001	50.00	4.88	3.700	0.079	0.0	0.0	0.0	1.25	49.6	10.7

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Raven House 29 Linkfield Lane Surrey RH1 1SS		13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0008-P1_...		Designed by JA Checked by AJH	
XP Solutions		Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	18.245	0.210	86.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
2.000	40.430	0.400	101.1	0.067	4.00	0.0	0.600		o	225	Pipe/Conduit	
3.000	17.120	0.290	59.0	0.009	4.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	8.720	0.180	48.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.003	32.050	0.320	100.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.004	19.980	0.200	99.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
4.000	5.500	0.050	110.0	0.045	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.000	24.900	0.550	45.3	0.006	4.00	0.0		0.045 4 \=/	500	1:4 Swale		
6.000	7.040	0.130	54.2	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	
7.000	8.390	0.180	46.6	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.001	38.945	0.380	102.5	0.000	0.00	0.0		0.045 4 \=/	500	1:4 Swale		
8.000	7.220	0.105	68.8	0.027	4.00	0.0	0.600		o	150	Pipe/Conduit	
9.000	8.270	0.055	150.4	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.002	9.841	0.100	98.4	0.021	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	50.00	5.10	3.330	0.079	0.0	0.0	0.0	1.40	55.8	10.7
2.000	50.00	4.52	3.700	0.067	0.0	0.0	0.0	1.30	51.7	9.1
3.000	50.00	4.17	3.590	0.009	0.0	0.0	0.0	1.71	67.8	1.2
2.001	50.00	4.60	3.390	0.076	0.0	0.0	0.0	1.88	74.9	10.3
1.003	50.00	5.50	3.120	0.155	0.0	0.0	0.0	1.31	51.9	21.0
1.004	50.00	5.76	2.800	0.155	0.0	0.0	0.0	1.31	52.1	21.0
4.000	50.00	4.10	3.550	0.045	0.0	0.0	0.0	0.96	16.9	6.1
5.000	50.00	4.60	3.800	0.006	0.0	0.0	0.0	0.69	113.5	0.8
6.000	50.00	4.09	3.450	0.020	0.0	0.0	0.0	1.37	24.2	2.7
7.000	50.00	4.09	3.590	0.018	0.0	0.0	0.0	1.48	26.1	2.4
5.001	50.00	6.02	3.250	0.044	0.0	0.0	0.0	0.46	75.4	6.0
8.000	50.00	4.10	3.950	0.027	0.0	0.0	0.0	1.21	21.5	3.7
9.000	50.00	4.17	3.900	0.025	0.0	0.0	0.0	0.92	14.4	3.4
5.002	50.00	6.15	2.870	0.117	0.0	0.0	0.0	1.32	52.4	15.8

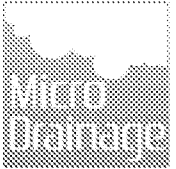
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Raven House 29 Linkfield Lane Surrey RH1 1SS		13591-Arun Crem Prop SW Network - Infiltration Rev P1	
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
10.000	8.690	0.155	56.1	0.006	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.003	19.900	0.170	117.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
11.000	5.000	0.130	38.5	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
11.001	7.000	0.050	140.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
12.000	5.000	0.010	500.0	0.042	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.000	5.000	0.020	250.0	0.010	4.00	0.0	0.600		o	150	Pipe/Conduit	
12.001	7.000	0.050	140.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
14.000	10.260	0.130	78.9	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.001	6.320	0.020	316.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
14.002	14.190	0.150	94.6	0.012	0.00	0.0		0.045 4 \=/		500	1:4 Swale	
15.000	7.735	0.040	193.4	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.003	24.460	0.250	97.8	0.000	0.00	0.0		0.045 4 \=/		500	1:4 Swale	
16.000	19.620	0.200	98.1	0.053	4.00	0.0	0.600		o	225	Pipe/Conduit	
16.001	20.520	0.200	102.6	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
16.002	8.180	0.250	32.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	4.11	3.000	0.006	0.0	0.0	0.0	1.35	23.8	0.8
5.003	50.00	6.42	2.770	0.123	0.0	0.0	0.0	1.21	48.0	16.7
11.000	50.00	4.05	3.630	0.018	0.0	0.0	0.0	1.63	28.8	2.4
11.001	50.00	4.19	3.500	0.018	0.0	0.0	0.0	0.85	15.0	2.4
12.000	50.00	4.19	2.910	0.042	0.0	0.0	0.0	0.44	7.8	5.7
13.000	50.00	4.13	2.920	0.010	0.0	0.0	0.0	0.63	11.2	1.4
12.001	50.00	4.33	2.900	0.052	0.0	0.0	0.0	0.85	15.0	7.0
14.000	50.00	4.15	3.800	0.025	0.0	0.0	0.0	1.13	20.0	3.4
14.001	50.00	4.34	3.670	0.025	0.0	0.0	0.0	0.56	9.9	3.4
14.002	50.00	4.84	3.650	0.037	0.0	0.0	0.0	0.48	78.5	5.0
15.000	50.00	4.18	3.540	0.020	0.0	0.0	0.0	0.72	12.7	2.7
14.003	50.00	5.71	3.580	0.057	0.0	0.0	0.0	0.47	77.2	7.7
16.000	50.00	4.25	3.900	0.053	0.0	0.0	0.0	1.32	52.5	7.2
16.001	50.00	4.51	3.700	0.064	0.0	0.0	0.0	1.29	51.3	8.7
16.002	50.00	4.57	3.500	0.064	0.0	0.0	0.0	2.30	91.3	8.7

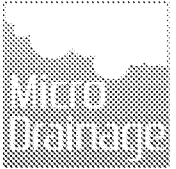
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
14.004	14.690	0.335	43.9	0.000	0.00	0.0		0.045	4 \=/	225	1:4 Swale	
17.000	7.765	0.105	74.0	0.030	4.00	0.0	0.600		o	150	Pipe/Conduit	
14.005	32.200	0.320	100.6	0.030	0.00	0.0	0.600		o	225	Pipe/Conduit	
18.000	18.900	0.280	71.1	0.000	4.00	0.1	0.600		o	150	Pipe/Conduit	
1.005	6.395	0.600	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
1.006	5.370	0.500	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
14.004	50.00	6.09	3.250	0.121	0.0	0.0	0.0	0.65	80.1	16.4
17.000	50.00	4.11	3.100	0.030	0.0	0.0	0.0	1.17	20.7	4.1
14.005	50.00	6.50	2.920	0.181	0.0	0.0	0.0	1.30	51.8	24.5
18.000	50.00	4.28	2.880	0.000	0.1	0.0	0.0	1.19	21.1	0.1
1.005	50.00	6.53	2.600	0.574	0.1	0.0	0.0	3.10	54.9	77.8
1.006	50.00	6.56	2.000	0.574	0.1	0.0	0.0	3.09	54.6	77.8

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Raven House 29 Linkfield Lane Surrey RH1 1SS		13591-Arun Crem Prop SW Network - Infiltration Rev P1	
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW1	4.850	0.700	Open Manhole	600	1.000	4.150	225				
SW2	4.500	0.800	Open Manhole	600	1.001	3.700	225	1.000	3.700	225	
SW3	4.500	1.170	Open Manhole	600	1.002	3.330	225	1.001	3.330	225	
SW18	4.700	1.000	Open Manhole	600	2.000	3.700	225				
SW20	4.700	1.110	Open Manhole	600	3.000	3.590	225				
SW19	4.700	1.400	Open Manhole	600	2.001	3.300	225	2.000	3.300	225	
								3.000	3.300	225	
SW4	4.500	1.380	Open Manhole	600	1.003	3.120	225	1.002	3.120	225	
								2.001	3.120	225	
SW5	4.000	1.200	Open Manhole	600	1.004	2.800	225	1.003	2.800	225	
SW14	4.350	0.800	Open Manhole	600	4.000	3.550	150				
Gabion HW	4.500	0.700	Open Manhole	600	5.000	3.800	500				
RE5	3.950	0.500	Open Manhole	600	6.000	3.450	150				
RE2	4.050	0.550	Open Manhole	600	7.000	3.500	150				
SW6	3.970	0.720	Open Manhole	600	5.001	3.250	500	5.000	3.250	500	70
								6.000	3.320	150	
								7.000	3.320	150	70
RE6	3.550	0.500	Open Manhole	600	8.000	3.050	150				
RE3	3.550	0.550	Open Manhole	600	9.000	3.000	150				
SW7	3.600	0.730	Open Manhole	600	5.002	2.870	225	5.001	2.870	500	
								8.000	2.945	150	
								9.000	2.945	150	
RE4	3.600	0.600	Open Manhole	600	10.000	3.000	150				
SW8	4.050	1.280	Open Manhole	600	5.003	2.770	225	5.002	2.770	225	
								10.000	2.845	150	
Perm Pav 1	4.050	0.420	Open Manhole	600	11.000	3.630	150				
RE1	4.050	0.550	Open Manhole	600	11.001	3.500	150	11.000	3.500	150	
Perm Pav 15a	3.350	0.440	Open Manhole	600	12.000	2.910	150				
Perm Pav 15b	3.350	0.430	Open Manhole	600	13.000	2.920	150				
SW15	3.450	0.550	Open Manhole	600	12.001	2.900	150	12.000	2.900	150	
								13.000	2.900	150	
SW16	4.800	1.000	Open Manhole	600	14.000	3.800	150				
SW17	4.500	0.830	Open Manhole	600	14.001	3.670	150	14.000	3.670	150	
Swale	4.500	0.850	Open Manhole	600	14.002	3.650	500	14.001	3.650	150	
RE7	4.050	0.510	Open Manhole	600	15.000	3.540	150				
SW9	4.150	0.650	Open Manhole	600	14.003	3.500	500	14.002	3.500	500	
								15.000	3.500	150	
SW11	4.750	0.850	Open Manhole	600	16.000	3.800	225				
SW12	4.700	1.000	Open Manhole	600	16.001	3.700	225	16.000	3.700	225	
SW13	4.500	1.000	Open Manhole	600	16.002	3.500	225	16.001	3.500	225	
Swale	4.500	1.250	Open Manhole	600	14.004	3.250	225	14.003	3.250	500	
								16.002	3.250	225	
RE8	3.600	0.500	Open Manhole	600	17.000	3.100	150				
SW10	4.100	1.185	Open Manhole	600	14.005	2.920	225	14.004	2.915	225	

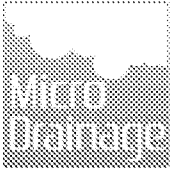
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Manhole Schedules for Storm

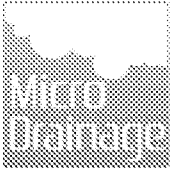
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FW5	4.300	1.420	Open Manhole	600	18.000	2.880	150	17.000	2.995	150	
Gabion HW	4.200	1.600	Open Manhole	600	1.005	2.600	150	1.004	2.600	225	
								4.000	3.500	150	900
								5.003	2.600	225	
								11.001	3.450	150	850
								12.001	2.850	150	250
								14.005	2.600	225	
								18.000	2.600	150	
SW20	4.000	2.000	Open Manhole	1200	1.006	2.000	150	1.005	2.000	150	
Outfall	4.000	2.500	Open Manhole	0		OUTFALL		1.006	1.500	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW1	497992.607	101768.526	497992.607	101768.526	Required	●
SW2	498022.043	101779.935	498022.043	101779.935	Required	●
SW3	498036.717	101742.074	498036.717	101742.074	Required	●
SW18	498020.588	101759.609	498020.588	101759.609	Required	●
SW20	498019.235	101715.724	498019.235	101715.724	Required	●
SW19	498035.198	101721.911	498035.198	101721.911	Required	●
SW4	498043.325	101725.068	498043.325	101725.068	Required	●
SW5	498054.933	101695.195	498054.933	101695.195	Required	●
SW14	497931.041	101656.360	497931.041	101656.360	Required	●
Gabion HW	497943.256	101689.431	497943.256	101689.431	Required	●
RE5	497968.354	101685.745	497968.354	101685.745	Required	●
RE2	497962.253	101671.596	497962.253	101671.596	Required	●

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW6	497965.931	101679.139	497965.931	101679.139	Required	
RE6	498003.646	101670.167	498003.646	101670.167	Required	
RE3	497997.379	101656.099	497997.379	101656.099	Required	
SW7	498001.497	101663.273	498001.497	101663.273	Required	
RE4	498004.907	101652.731	498004.907	101652.731	Required	
SW8	498010.527	101659.359	498010.527	101659.359	Required	
Perm Pav 1	497947.290	101664.312	497947.290	101664.312	Required	
RE1	497956.193	101657.975	497956.193	101657.975	Required	
Perm Pav 15a	497990.680	101644.889	497990.680	101644.889	Required	
Perm Pav 15b	498008.648	101637.892	498008.648	101637.892	Required	
SW15	497998.245	101639.419	497998.245	101639.419	Required	
SW16	497964.026	101728.967	497964.026	101728.967	Required	
SW17	497967.733	101719.401	497967.733	101719.401	Required	
Swale	497965.231	101713.600	497965.231	101713.600	Required	
RE7	497975.142	101700.660	497975.142	101700.660	Required	
SW9	497978.171	101707.776	497978.171	101707.776	Required	
SW11	498002.991	101743.031	498002.991	101743.031	Required	
SW12	497996.317	101724.584	497996.317	101724.584	Required	
SW13	498003.732	101705.451	498003.732	101705.451	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
Swale	498000.554	101697.917	498000.554	101697.917	Required	
RE8	498010.268	101685.163	498010.268	101685.163	Required	
SW10	498013.991	101691.976	498013.991	101691.976	Required	
FW5	498047.056	101698.496	498047.056	101698.496	Required	
Gabion HW	498021.090	101623.117	498021.090	101623.117	Required	
SW20	498025.533	101618.519	498025.533	101618.519	Required	
Outfall	498029.291	101614.686			No Entry	

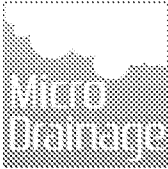
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XP Solutions	Network 2020.1	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.073	0.073	0.073
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.067	0.067	0.067
3.000	-	-	100	0.009	0.009	0.009
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.045	0.045	0.045
5.000	-	-	100	0.006	0.006	0.006
6.000	-	-	100	0.020	0.020	0.020
7.000	-	-	100	0.018	0.018	0.018
5.001	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.027	0.027	0.027
9.000	-	-	100	0.025	0.025	0.025
5.002	-	-	100	0.021	0.021	0.021
10.000	-	-	100	0.006	0.006	0.006
5.003	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.018	0.018	0.018
11.001	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.042	0.042	0.042
13.000	-	-	100	0.010	0.010	0.010
12.001	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.025	0.025	0.025
14.001	-	-	100	0.000	0.000	0.000
14.002	-	-	100	0.012	0.012	0.012
15.000	-	-	100	0.020	0.020	0.020
14.003	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.053	0.053	0.053
16.001	-	-	100	0.011	0.011	0.011
16.002	-	-	100	0.000	0.000	0.000
14.004	-	-	100	0.000	0.000	0.000
17.000	-	-	100	0.030	0.030	0.030
14.005	-	-	100	0.030	0.030	0.030
18.000	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.574	0.574	0.574

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.006	Outfall	4.000	1.500	0.000	0	0

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XP Solutions	Network 2020.1	

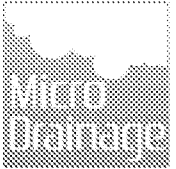
Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	11	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.311
Return Period (years)	100	F (1km)	2.320
FEH Rainfall Version	1999	Summer Storms	Yes
Site Location	GB 498000 101400 SU 98000 01400	Winter Storms	No
C (1km)	-0.026	Cv (Summer)	0.750
D1 (1km)	0.390	Cv (Winter)	0.840
D2 (1km)	0.244	Storm Duration (mins)	30
D3 (1km)	0.410		

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Online Controls for Storm

Non Return Valve Manhole: SW15, DS/PN: 12.001, Volume (m³): 0.3

Complex Manhole: Gabion HW, DS/PN: 1.005, Volume (m³): 3.9

Orifice

Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 2.600

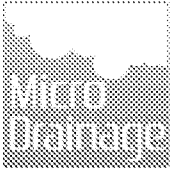
Hydro-Brake® Optimum

Unit Reference MD-SHE-0074-2000-0500-2000
Design Head (m) 0.500
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 74
Invert Level (m) 3.000
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.0	Kick-Flo®	0.342	1.7
Flush-Flo™	0.149	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	0.800	2.5	2.000	3.8	4.000	5.2	7.000	6.8
0.200	2.0	1.000	2.7	2.200	3.9	4.500	5.5	7.500	7.1
0.300	1.8	1.200	3.0	2.400	4.1	5.000	5.8	8.000	7.3
0.400	1.8	1.400	3.2	2.600	4.3	5.500	6.1	8.500	7.5
0.500	2.0	1.600	3.4	3.000	4.6	6.000	6.3	9.000	7.8
0.600	2.2	1.800	3.6	3.500	4.9	6.500	6.6	9.500	8.0

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Storage Structures for Storm

Porous Car Park Manhole: RE5, DS/PN: 6.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	100.0
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.540	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE2, DS/PN: 7.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	59.5
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.630	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE6, DS/PN: 8.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	43.1	Slope (1:X)	106.9
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.170	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE3, DS/PN: 9.000

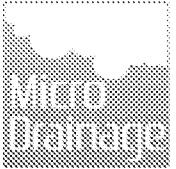
Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	43.1	Slope (1:X)	60.8
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.000	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE4, DS/PN: 10.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	240.0
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.070	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: Perm Pav 1, DS/PN: 11.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	22.0
Max Percolation (l/s)	30.6	Slope (1:X)	61.1
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.630	Cap Volume Depth (m)	0.300

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Porous Car Park Manhole: Perm Pav 15a, DS/PN: 12.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	55.6	Slope (1:X)	66.7
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	2.910	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: Perm Pav 15b, DS/PN: 13.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	16.7	Slope (1:X)	300.0
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	2.920	Cap Volume Depth (m)	0.300

Porous Car Park Manhole: RE7, DS/PN: 15.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	27.8	Slope (1:X)	111.1
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.540	Cap Volume Depth (m)	0.300

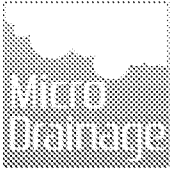
Porous Car Park Manhole: RE8, DS/PN: 17.000

Infiltration Coefficient Base (m/hr)	0.00853	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	32.0
Max Percolation (l/s)	44.4	Slope (1:X)	110.3
Safety Factor	3.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.170	Membrane Depth (mm)	150

Infiltration Basin Manhole: Gabion HW, DS/PN: 1.005

Invert Level (m)	3.000	Safety Factor	5.0
Infiltration Coefficient Base (m/hr)	0.00853	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1400.0	0.500	1680.0

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XP Solutions	Network 2020.1	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

							Water	Surcharged	Flooded			
	US/MH						Level	Depth	Volume	Overflow	Infil.	Infil.
PN	Name	Event					(m)	(m)	(m³)	(l/s)	Flow (l/s)	Vol (m³)
1.000	SW1	15 minute	2 year	Winter	I+0%	4.850	4.223	-0.152	0.000			
1.001	SW2	15 minute	2 year	Winter	I+0%	4.500	3.784	-0.141	0.000			
1.002	SW3	15 minute	2 year	Winter	I+0%	4.500	3.411	-0.144	0.000			
2.000	SW18	15 minute	2 year	Winter	I+0%	4.700	3.776	-0.149	0.000			
3.000	SW20	15 minute	2 year	Winter	I+0%	4.700	3.615	-0.200	0.000			
2.001	SW19	15 minute	2 year	Winter	I+0%	4.700	3.373	-0.152	0.000			
1.003	SW4	15 minute	2 year	Winter	I+0%	4.500	3.241	-0.104	0.000			
1.004	SW5	15 minute	2 year	Winter	I+0%	4.000	3.100	0.075	0.000			
4.000	SW14	15 minute	2 year	Summer	I+0%	4.350	3.633	-0.067	0.000			
5.000	Gabion HW	15 minute	2 year	Winter	I+0%	4.500	3.809	-0.691	0.000			
6.000	RE5	15 minute	2 year	Summer	I+0%	3.950	3.492	-0.108	0.000		0.0	0.000
7.000	RE2	15 minute	2 year	Winter	I+0%	4.050	3.538	-0.112	0.000		0.0	0.000
5.001	SW6	15 minute	2 year	Summer	I+0%	3.970	3.298	-0.672	0.000			
8.000	RE6	15 minute	2 year	Summer	I+0%	3.550	3.103	-0.097	0.000		0.0	0.000
9.000	RE3	15 minute	2 year	Winter	I+0%	3.550	3.081	-0.069	0.000		0.0	0.019
5.002	SW7	960 minute	2 year	Winter	I+0%	3.600	3.079	-0.016	0.000			
10.000	RE4	960 minute	2 year	Winter	I+0%	3.600	3.078	-0.072	0.000		0.0	0.014
5.003	SW8	960 minute	2 year	Winter	I+0%	4.050	3.078	0.083	0.000			
11.000	Perm Pav 1	15 minute	2 year	Winter	I+0%	4.050	3.668	-0.112	0.000		0.0	0.003
11.001	RE1	15 minute	2 year	Winter	I+0%	4.050	3.551	-0.099	0.000			
12.000	Perm Pav 15a	960 minute	2 year	Winter	I+0%	3.350	3.078	0.018	0.000		0.0	3.139
13.000	Perm Pav 15b	960 minute	2 year	Winter	I+0%	3.350	3.078	0.008	0.000		0.0	4.808
12.001	SW15	960 minute	2 year	Winter	I+0%	3.450	3.078	0.028	0.000			
14.000	SW16	15 minute	2 year	Winter	I+0%	4.800	3.851	-0.099	0.000			
14.001	SW17	15 minute	2 year	Summer	I+0%	4.500	3.751	-0.069	0.000			
14.002	Swale	15 minute	2 year	Winter	I+0%	4.500	3.691	-0.809	0.000			
15.000	RE7	15 minute	2 year	Winter	I+0%	4.050	3.596	-0.094	0.000		0.0	0.012
14.003	SW9	15 minute	2 year	Winter	I+0%	4.150	3.552	-0.598	0.000			
16.000	SW11	15 minute	2 year	Winter	I+0%	4.750	3.969	-0.156	0.000			

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XP Solutions	Network 2020.1	

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

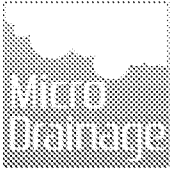
PN	US/MH Name	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1	0.019	5.811		13.3	OK
1.001	SW2	0.061	6.288		13.7	OK
1.002	SW3	0.080	6.288		13.9	OK
2.000	SW18	0.020	5.333		12.1	OK
3.000	SW20	0.006	0.717		1.6	OK
2.001	SW19	0.096	6.050		13.6	OK
1.003	SW4	0.183	12.338		27.2	OK
1.004	SW5	0.795	11.852		26.9	SURCHARGED
4.000	SW14	0.022	3.198		8.2	OK
5.000	Gabion HW	0.001	0.478		1.1	OK
6.000	RE5	0.011	1.423	5	3.7	OK
7.000	RE2	0.009	1.433	5	3.3	OK
5.001	SW6	0.024	3.129		7.8	OK
8.000	RE6	0.013	1.920	5	4.9	OK
9.000	RE3	0.317	1.912	5	3.3	OK
5.002	SW7	2.447	34.203		1.5	OK
10.000	RE4	0.033	1.861	331	0.1	OK
5.003	SW8	0.577	35.599		1.6	SURCHARGED
11.000	Perm Pav 1	0.075	1.431	4	3.3	OK
11.001	RE1	0.022	1.431		3.2	OK
12.000	Perm Pav 15a	1.455	9.912	558	0.5	FLOOD RISK
13.000	Perm Pav 15b	2.519	-1.834	690	0.0	FLOOD RISK
12.001	SW15	0.187	8.029		0.5	SURCHARGED
14.000	SW16	0.013	1.990		4.6	OK
14.001	SW17	0.053	1.777		4.6	OK
14.002	Swale	0.031	2.945		6.3	OK
15.000	RE7	0.275	1.580	5	3.3	OK
14.003	SW9	0.207	4.524		9.4	OK
16.000	SW11	0.018	4.219		9.7	OK

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XP Solutions	Network 2020.1	

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

PN	US/MH Name	Event	US/CL (m)	Water Surcharged Flooded			Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)
				Level (m)	Depth (m)	Volume (m³)			
16.001	SW12	15 minute 2 year Winter I+0%	4.700	3.775	-0.150	0.000			
16.002	SW13	15 minute 2 year Winter I+0%	4.500	3.560	-0.165	0.000			
14.004	Swale	15 minute 2 year Winter I+0%	4.500	3.331	-1.169	0.000			
17.000	RE8	15 minute 2 year Summer I+0%	3.600	3.157	-0.093	0.000		0.0	0.000
14.005	SW10	15 minute 2 year Winter I+0%	4.100	3.121	-0.024	0.000			
18.000	FW5	960 minute 2 year Winter I+0%	4.300	3.078	0.048	0.000			
1.005	Gabion HW	960 minute 2 year Winter I+0%	4.200	3.077	0.327	0.000		0.7	55.028
1.006	SW20	960 minute 2 year Winter I+0%	4.000	2.018	-0.132	0.000			

PN	US/MH Name	Half Drain		Pipe Flow (l/s)	Status
		Maximum Vol (m³)	Discharge Vol (m³)		
16.001	SW12	0.067	5.094	11.2	OK
16.002	SW13	0.055	5.094	11.1	OK
14.004	Swale	0.315	9.615	20.6	OK
17.000	RE8	0.015	2.133	5 5.5	OK
14.005	SW10	0.769	14.237	28.2	OK
18.000	FW5	0.055	11.479	0.1	SURCHARGED
1.005	Gabion HW	113.083	87.587	752 1.6	SURCHARGED
1.006	SW20	0.016	87.576	1.6	OK

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XP Solutions	Network 2020.1	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

							Water	Surcharged	Flooded		
	US/MH						Level	Depth	Volume	Overflow	Infil.
PN	Name	Event					(m)	(m)	(m³)	(l/s)	Flow (l/s)
1.000	SW1	15 minute	30 year	Winter	I+0%	4.850	4.260	-0.115	0.000		
1.001	SW2	15 minute	30 year	Winter	I+0%	4.500	3.832	-0.093	0.000		
1.002	SW3	15 minute	30 year	Winter	I+0%	4.500	3.598	0.043	0.000		
2.000	SW18	15 minute	30 year	Winter	I+0%	4.700	3.816	-0.109	0.000		
3.000	SW20	15 minute	30 year	Winter	I+0%	4.700	3.625	-0.190	0.000		
2.001	SW19	15 minute	30 year	Winter	I+0%	4.700	3.561	0.036	0.000		
1.003	SW4	15 minute	30 year	Winter	I+0%	4.500	3.534	0.189	0.000		
1.004	SW5	15 minute	30 year	Winter	I+0%	4.000	3.233	0.208	0.000		
4.000	SW14	15 minute	30 year	Summer	I+0%	4.350	3.725	0.025	0.000		
5.000	Gabion HW	15 minute	30 year	Winter	I+0%	4.500	3.819	-0.681	0.000		
6.000	RE5	15 minute	30 year	Winter	I+0%	3.950	3.513	-0.087	0.000		0.0
7.000	RE2	15 minute	30 year	Winter	I+0%	4.050	3.556	-0.094	0.000		0.0
5.001	SW6	15 minute	30 year	Summer	I+0%	3.970	3.321	-0.649	0.000		
8.000	RE6	15 minute	30 year	Winter	I+0%	3.550	3.184	-0.016	0.000		0.0
9.000	RE3	15 minute	30 year	Winter	I+0%	3.550	3.180	0.030	0.000		0.0
5.002	SW7	15 minute	30 year	Winter	I+0%	3.600	3.167	0.072	0.000		
10.000	RE4	480 minute	30 year	Winter	I+0%	3.600	3.141	-0.009	0.000		0.0
5.003	SW8	480 minute	30 year	Winter	I+0%	4.050	3.141	0.146	0.000		
11.000	Perm Pav 1	15 minute	30 year	Winter	I+0%	4.050	3.687	-0.093	0.000		0.0
11.001	RE1	15 minute	30 year	Winter	I+0%	4.050	3.579	-0.071	0.000		
12.000	Perm Pav 15a	480 minute	30 year	Winter	I+0%	3.350	3.141	0.081	0.000		0.1
13.000	Perm Pav 15b	480 minute	30 year	Winter	I+0%	3.350	3.140	0.070	0.000		0.0
12.001	SW15	480 minute	30 year	Winter	I+0%	3.450	3.140	0.090	0.000		
14.000	SW16	15 minute	30 year	Winter	I+0%	4.800	3.879	-0.071	0.000		
14.001	SW17	15 minute	30 year	Summer	I+0%	4.500	3.825	0.005	0.000		
14.002	Swale	15 minute	30 year	Winter	I+0%	4.500	3.714	-0.786	0.000		

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
	Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0008-P1_...	
XP Solutions	Designed by JA Checked by AJH Network 2020.1	

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

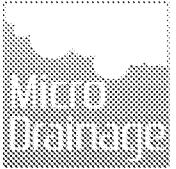
PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1		0.030	12.304		28.1	OK
1.001	SW2		0.137	13.315		29.5	OK
1.002	SW3		0.724	13.315		25.6	SURCHARGED
2.000	SW18		0.031	11.293		25.6	OK
3.000	SW20		0.008	1.517		3.5	OK
2.001	SW19		0.970	12.810		24.1	SURCHARGED
1.003	SW4		1.136	26.125		47.1	SURCHARGED
1.004	SW5		1.248	25.507		47.1	SURCHARGED
4.000	SW14		0.048	8.772		17.5	SURCHARGED
5.000	Gabion HW		0.004	1.012		2.3	OK
6.000	RE5	0.000	0.017	3.372	5	7.7	OK
7.000	RE2	0.000	0.015	3.035	5	7.0	OK
5.001	SW6		0.037	6.625		16.6	OK
8.000	RE6	0.000	0.051	4.547	5	9.8	OK
9.000	RE3	0.064	1.520	3.927	6	4.8	SURCHARGED
5.002	SW7		5.927	17.350		22.9	SURCHARGED
10.000	RE4	1.594	0.868	1.079	244	0.2	OK
5.003	SW8		0.607	50.211		4.5	SURCHARGED
11.000	Perm Pav 1	0.006	0.162	3.029	4	6.9	OK
11.001	RE1		0.035	3.029		6.8	OK
12.000	Perm Pav 15a	2.537	2.725	15.678	379	1.4	FLOOD RISK
13.000	Perm Pav 15b	2.571	3.666	-0.074		0.2	FLOOD RISK
12.001	SW15		0.222	15.439		1.5	SURCHARGED
14.000	SW16		0.021	4.214		9.7	OK
14.001	SW17		0.187	3.766		9.8	SURCHARGED
14.002	Swale		0.052	6.236		14.3	OK

CampbellReith		Page 19
Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022	Designed by JA	
File 13591-CRH-XX-XX-CA-C-0008-P1_...	Checked by AJH	
XP Solutions	Network 2020.1	

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

PN	US/MH Name	Event	US/CL (m)	Water Surcharged Flooded			Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)
				Level (m)	Depth (m)	Volume (m³)			
15.000	RE7	15 minute 30 year Winter I+0%	4.050	3.625	-0.065	0.000		0.0	0.022
14.003	SW9	15 minute 30 year Winter I+0%	4.150	3.576	-0.574	0.000			
16.000	SW11	15 minute 30 year Winter I+0%	4.750	4.003	-0.122	0.000			
16.001	SW12	15 minute 30 year Winter I+0%	4.700	3.817	-0.108	0.000			
16.002	SW13	15 minute 30 year Winter I+0%	4.500	3.592	-0.133	0.000			
14.004	Swale	15 minute 30 year Winter I+0%	4.500	3.366	-1.134	0.000			
17.000	RE8	15 minute 30 year Winter I+0%	3.600	3.316	0.066	0.000		0.1	0.025
14.005	SW10	15 minute 30 year Winter I+0%	4.100	3.305	0.160	0.000			
18.000	FW5	480 minute 30 year Winter I+0%	4.300	3.140	0.110	0.000			
1.005	Gabion HW	480 minute 30 year Winter I+0%	4.200	3.140	0.390	0.000		0.7	33.750
1.006	SW20	480 minute 30 year Winter I+0%	4.000	2.020	-0.130	0.000			

PN	US/MH Name	Half Drain Pipe		Time (mins)	Flow (l/s)	Status
		Maximum Vol (m³)	Discharge Vol (m³)			
15.000	RE7	0.626	3.349	5	6.7	OK
14.003	SW9	0.315	9.584		20.5	OK
16.000	SW11	0.028	8.933		20.5	OK
16.001	SW12	0.131	10.787		24.5	OK
16.002	SW13	0.087	10.787		24.3	OK
14.004	Swale	0.605	20.368		44.8	OK
17.000	RE8	1.812	5.033	4	11.1	FLOOD RISK
14.005	SW10	4.199	30.058		44.8	SURCHARGED
18.000	FW5	0.072	5.700		0.1	SURCHARGED
1.005	Gabion HW	204.540	89.307		2.0	SURCHARGED
1.006	SW20	0.018	89.266		2.0	OK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022	Designed by JA	
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XP Solutions	Network 2020.1	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Event	US/CL (m)	Water Surcharged Flooded				Overflow (l/s)	Infil. Flow (l/s)
				Level (m)	Depth (m)	Volume (m³)			
1.000	SW1	15 minute 100 year Winter I+40%	4.850	4.690	0.315	0.000			
1.001	SW2	15 minute 100 year Winter I+40%	4.500	4.500	0.575	0.250			
1.002	SW3	15 minute 100 year Winter I+40%	4.500	4.300	0.745	0.000			
2.000	SW18	15 minute 100 year Winter I+40%	4.700	4.514	0.589	0.000			
3.000	SW20	15 minute 100 year Winter I+40%	4.700	4.320	0.505	0.000			
2.001	SW19	15 minute 100 year Winter I+40%	4.700	4.312	0.787	0.000			
1.003	SW4	15 minute 100 year Winter I+40%	4.500	4.180	0.935	0.000			
1.004	SW5	15 minute 100 year Winter I+40%	4.000	3.501	0.476	0.000			
4.000	SW14	15 minute 100 year Summer I+40%	4.350	3.886	0.186	0.000			
5.000	Gabion HW	15 minute 100 year Winter I+40%	4.500	3.826	-0.674	0.000			
6.000	RE5	15 minute 100 year Winter I+40%	3.950	3.539	-0.061	0.000			0.0
7.000	RE2	15 minute 100 year Winter I+40%	4.050	3.578	-0.072	0.000			0.0
5.001	SW6	15 minute 100 year Summer I+40%	3.970	3.342	-0.628	0.000			
8.000	RE6	30 minute 100 year Winter I+40%	3.550	3.271	0.071	0.000			0.0
9.000	RE3	30 minute 100 year Winter I+40%	3.550	3.271	0.121	0.000			0.1
5.002	SW7	30 minute 100 year Winter I+40%	3.600	3.257	0.162	0.000			
10.000	RE4	960 minute 100 year Winter I+40%	3.600	3.252	0.102	0.000			0.0
5.003	SW8	960 minute 100 year Winter I+40%	4.050	3.252	0.257	0.000			
11.000	Perm Pav 1	15 minute 100 year Winter I+40%	4.050	3.709	-0.071	0.000			0.0
11.001	RE1	15 minute 100 year Winter I+40%	4.050	3.616	-0.034	0.000			
12.000	Perm Pav 15a	960 minute 100 year Winter I+40%	3.350	3.251	0.191	0.000			0.1
13.000	Perm Pav 15b	960 minute 100 year Winter I+40%	3.350	3.251	0.181	0.000			0.0
12.001	SW15	480 minute 100 year Winter I+40%	3.450	3.262	0.212	0.000			
14.000	SW16	15 minute 100 year Summer I+40%	4.800	3.995	0.045	0.000			
14.001	SW17	15 minute 100 year Summer I+40%	4.500	3.879	0.059	0.000			
14.002	Swale	15 minute 100 year Summer I+40%	4.500	3.736	-0.764	0.000			

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022 File 13591-CRH-XX-XX-CA-C-0008-P1_...	Designed by JA Checked by AJH	
XP Solutions	Network 2020.1	

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

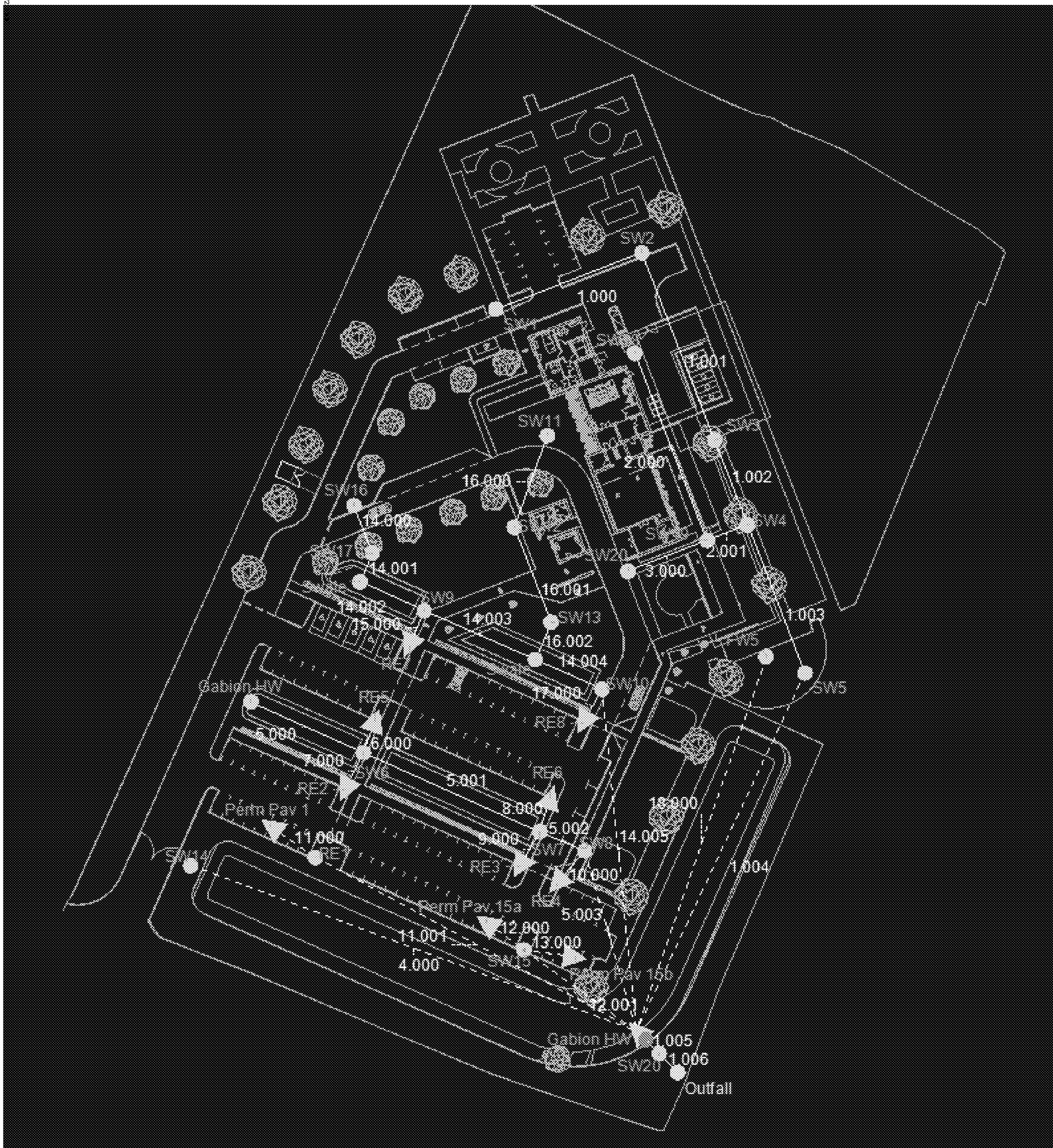
PN	US/MH Name	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1		0.151	21.633		46.0	FLOOD RISK
1.001	SW2		1.706	23.409		40.6	FLOOD
1.002	SW3		1.864	23.409		35.3	FLOOD RISK
2.000	SW18		0.229	19.850		39.1	FLOOD RISK
3.000	SW20		0.205	2.668		5.2	SURCHARGED
2.001	SW19		2.525	22.518		36.9	SURCHARGED
1.003	SW4		1.323	45.325		71.1	SURCHARGED
1.004	SW5		1.447	45.118		70.7	SURCHARGED
4.000	SW14		0.094	11.907		30.6	SURCHARGED
5.000	Gabion HW		0.006	1.779		4.1	OK
6.000	RE5	0.000	0.024	5.928	5	13.6	OK
7.000	RE2	0.000	0.021	5.336	5	12.2	OK
5.001	SW6		0.049	11.646		29.1	OK
8.000	RE6	0.035	0.886	10.558	8	10.8	FLOOD RISK
9.000	RE3	0.135	3.433	8.722	13	6.4	FLOOD RISK
5.002	SW7		11.751	40.087		32.8	SURCHARGED
10.000	RE4	4.278	2.894	-0.060	863	0.1	SURCHARGED
5.003	SW8		0.645	91.696		3.9	SURCHARGED
11.000	Perm Pav 1	0.010	0.304	5.326	4	12.1	OK
11.001	RE1		0.055	5.326		11.9	OK
12.000	Perm Pav 15a	6.056	5.842	31.191	191	1.3	FLOOD RISK
13.000	Perm Pav 15b	5.258	5.475	2.417	446	0.8	FLOOD RISK
12.001	SW15		0.256	31.310		2.5	FLOOD RISK
14.000	SW16		0.054	6.616		17.0	SURCHARGED
14.001	SW17		0.205	6.616		16.9	SURCHARGED
14.002	Swale		0.071	9.790		24.9	OK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Prop SW Network - Infiltration Rev P1	
Date 04/05/2022	Designed by JA	
File 13591-CRH-XX-XX-CA-C-0008-P1_...	Checked by AJH	
XP Solutions		Network 2020.1

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)
15.000	RE7	15 minute 100 year Winter I+40%	4.050	3.662	-0.028	0.000		0.1	0.033
14.003	SW9	15 minute 100 year Winter I+40%	4.150	3.600	-0.550	0.000			
16.000	SW11	15 minute 100 year Winter I+40%	4.750	4.047	-0.078	0.000			
16.001	SW12	15 minute 100 year Winter I+40%	4.700	3.871	-0.054	0.000			
16.002	SW13	15 minute 100 year Winter I+40%	4.500	3.628	-0.097	0.000			
14.004	Swale	15 minute 100 year Winter I+40%	4.500	3.468	-1.032	0.000			
17.000	RE8	15 minute 100 year Winter I+40%	3.600	3.459	0.209	0.000		0.1	0.093
14.005	SW10	15 minute 100 year Winter I+40%	4.100	3.468	0.318	0.000			
18.000	FW5	960 minute 100 year Winter I+40%	4.300	3.251	0.221	0.000			
1.005	Gabion HW	960 minute 100 year Winter I+40%	4.200	3.251	0.501	0.000		0.7	73.312
1.006	SW20	960 minute 100 year Summer I+40%	4.000	2.020	-0.130	0.000			

PN	US/MH Name	Maximum Vol (m³)	Discharge Vol (m³)	Time (mins)	Pipe Flow (l/s)	Status
15.000	RE7	1.274	5.894	5	11.0	OK
14.003	SW9	0.420	16.858		35.3	OK
16.000	SW11	0.040	15.707		36.0	OK
16.001	SW12	0.290	18.967		43.1	OK
16.002	SW13	0.170	18.967		42.6	OK
14.004	Swale	2.632	35.822		68.8	OK
17.000	RE8	6.989	8.797	7	17.5	FLOOD RISK
14.005	SW10	10.101	52.756		55.1	SURCHARGED
18.000	FW5	0.104	11.441		0.1	SURCHARGED
1.005	Gabion HW	371.726	188.579		2.0	SURCHARGED
1.006	SW20	0.018	185.912		2.0	OK



13591 New Arun Crematorium
 Surface Water Calculations with Infiltration - Key Plan
 13591-CRH-XX-XX-CA-C-008
 Rev P1
 04/05/2022
 Engineer: JA



Notes

1. Do not scale from this drawing on print or electronically. Work from figured dimensions only.
2. No deviation from the details on this drawing is allowed without CampbellReith's prior permission in writing.
3. Read this drawing with all Architect's, Service Engineer's and CampbellReith's relevant details, specifications and drawings.
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5. Drawing status:
P: Preliminary Evolving drawings for approvals, tenders, billings etc.

C: Construction Fully developed drawings issued under instructions for construction.
6. Only status C drawings to be used for construction.
7. Suitability code:
Work in progress
S0 - Work in progress
Shared (Non-contractual)
S1 - For coordination, **S2** - For information, **S3** - For internal review and comment, **S4** - For construction approval.
Documentation (For contractors purposes)
D1 - For Costing, **D2** - For Tender, **D3** - For contractor design, **D4** - for manufacture/procurement.
Construction
A - For construction, **B** - For construction but with comments (i.e. areas in abeyance), **CR** - Construction Record (Final Construction ONLY. Any deviations to that which is on site is not the liability of CampbellReith)
8. For full drainage strategy refer to drawings 13591-CRH-XX-XX-DR-C-5050 and 13591-CRH-XX-XX-DR-C-5051.
9. For proposed finished levels refer to drawing 13591-CRH-XX-XX-DR-C-5200.
10. Refer to proposed catchment plan 13591-CRH-XX-XX-DR-C-5250 for details of overall site catchments.
11. This plan should be read with reference to proposed surface water drainage model 13591-CRH-XX-XX-CA-C-0007. Note: colour of ring around manhole indicates node at which area of same colour enters system in the Network model 13591-CRH-XX-XX-CA-C-0007.

LEGEND

- Site boundary (2.765 ha)
- Proposed surface water sewer
- Linear drainage channel
- Surface water manhole
- Surface water inspection chamber
- Rodding eye
- Rainwater pipe
- Surface water gully
- Permeable paving
- Swale
- Attenuation basin
- Gabion basket headwall
- Precast headwall
- Sub-catchment area
*Refer to note 11

TOTAL impermeable area draining to surface water network = 0.574 ha

Rev	Description	Date	By
P2	Minor updates to match proposed drainage	04.05.22	JA
P1	Issued for Information	08.04.22	JA

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Job Title	Central Arun Crematorium
Client	Westerleigh

Proposed Surface Water Drainage
Sub-Catchment Plan

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
JA	April'22	1:500	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5260	P2

Notes

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- All work is to be done in accordance with the relevant specifications issued by CampbellReith, British Standard Codes of Practice, Statutory Requirements and the Contract Documents.
- Drawing status:**
P: Preliminary Evolving drawings for approvals, tenders, billings etc.
C: Construction Fully developed drawings issued under instructions for construction.
- Only status C drawings to be used for construction.
- Suitability code:
Work in progress
S0 - Work in progress
Shared (Non-contractual)
S1 - For coordination, **S2** - For information, **S3** - For internal review and comment, **S4** - For construction approval.
Documentation (For contractors purposes)
D1 - For Costing, **D2** - For Tender, **D3** - For contractor design, **D4** - for manufacture/procurement.
Construction
A - For construction, **B** - For construction but with comments (i.e. areas in abeyance), **CR** - Construction Record (Final Construction ONLY. Any deviations to that which is on site is not the liability of CampbellReith)
- Site layout taken from drawing 154380_001_Site & Boundary Plan by Stride-Treglown as issued 18/11/21
- For landscaping details refer to Indigo Landscaping Plan 954-MP-01.
- For S278 details refer to Paul Basham Associates' plans.
- For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350
- It is assumed that no threshold drainage is required.
- Final site layout to be confirmed by architect/landscape architect and SVP locations to be confirmed by M&E engineer.
- Foul Treatment to be provided by Klargester Biobdisc BB or equivalent approved. Assumed maximum loading based upon information provided by client in May 2021. To be adequately vented and alarmed as per manufacturer's recommendations. Exact location TBC.
- As noted in Factual Ground Investigation Report GL24235 by Harrisons (dated May 2021) there is a medium risk of volume change potential soils on site. Therefore appropriate measures should be taken into account within foul and surface water drainage design including increased gradients and rocker pipes. Refer to drawings 13591-CRH-XX-XX-DR-C-5300 to 5304 for details.
- All manholes/inspection chambers under areas subject to vehicular loading (including footways adjacent to roads) to be load class D400. Cover levels in areas subject to pedestrian loading only to be B125 class.
- Pipes with no specified diameter are to be 150mm for surface and 100mm for foul unless specified otherwise.

Legend

- Site boundary
- Proposed building hatch
- Proposed canopy/covered walkway
- Proposed level
- Proposed surface water sewer
- Proposed foul water sewer
- Linear drainage channel
- Surface water manhole
- Foul water manhole
- Surface water inspection chamber
- Foul water inspection chamber
- Rodding eye
- Rainwater pipe
- Surface water gully
- Permeable paving
- Swale
- Attenuation basin
- Gabion basket headwall
- Precast headwall
- Permeable paving sub base formation level
- Foul water gully
- Foul water pop up
- Foul water pumping station
- Foul water rising main
- Treated foul water sewer

P8	Minor updates to match modelling	04.05.22	JA
P7	Revised to suit LLFA comments - permeable paving FLs and channel drain CLs added	08.04.22	JA
P6	Revised to suit LLFA comments	21.01.22	SH
P5	RWP added as clouded. Reissued for Tender	25.11.21	AJH
P4	VE updates incorporated. Reissued for Tender	24.11.21	SH
P3	Client comments added. Reissued for Tender	15.09.21	AN
P2	Issued for Tender	09.07.21	SH
P1	Issued for Tender	05.07.21	AJH
Rev	Description	Date	By

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Job Title	Central Arun Crematorium
Client	Westerleigh

Proposed Foul and Surface Water Drainage Layout (Sheet 1 of 2)

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
AJH	June'21	1:250	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5050	P8



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 - D1** - For Costing, **D2** - For Tender, **D3** - For contractor design, **D4** - for manufacture/procurement.
 - Construction
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8. Site layout taken from drawing *154380_001_Site & Boundary Plan* by Stride-Treglowan as issued 18/11/21
9. For landscaping details refer to Indigo Landscaping Plan 954-MP-01.
10. For S278 details refer to Paul Basham Associates' plans.
11. For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350
12. It is assumed that no threshold drainage is required.
13. Final site layout to be confirmed by architect/landscape architect and SVP locations to be confirmed by M&E engineer.
14. Foul Treatment to be provided by *Klargester Biодdise BB* or equivalent approved. Assumed maximum loading based upon information provided by client in May 2021. To be adequately vented and alarmed as per manufacturer's recommendations. Exact location TBC.
15. As noted in *Factual Ground Investigation Report GL24235* by Hamisons (dated May 2021) there is a medium risk of volume change potential soils on site. Therefore appropriate measures should be taken into account within full and surface water drainage design including increased gradients and rocker pipes. Refer to drawings 13591-CRH-XX-XX-DR-C-5300 to 5304 for details.
16. All manholes/inspection chambers under areas subject to vehicular loading (including footways adjacent to roads) to be load class D400. Cover levels in areas subject to pedestrian loading only to be E125 class.
17. Pipes with no specified diameter are to be 150mm for surface and 100mm for foul unless specified otherwise.

P7	Minor updates to match modelling	04.05.22	JA
P6	Revised to suit LLFA comments - permeable paving FLs and channel drain CLs added	08.04.22	JA
P5	Revised to suit LLFA comments - pipe details and basin information added	21.01.22	SH
P4	VE updates incorporated. Reissued for Tender	24.11.21	SH
P3	Client comments added. Reissued for tender	15.09.21	AN
P2	Issued for Tender	09.07.21	SH
P1	Issued for Tender	05.07.21	AJH
Rev	Description	Date	By

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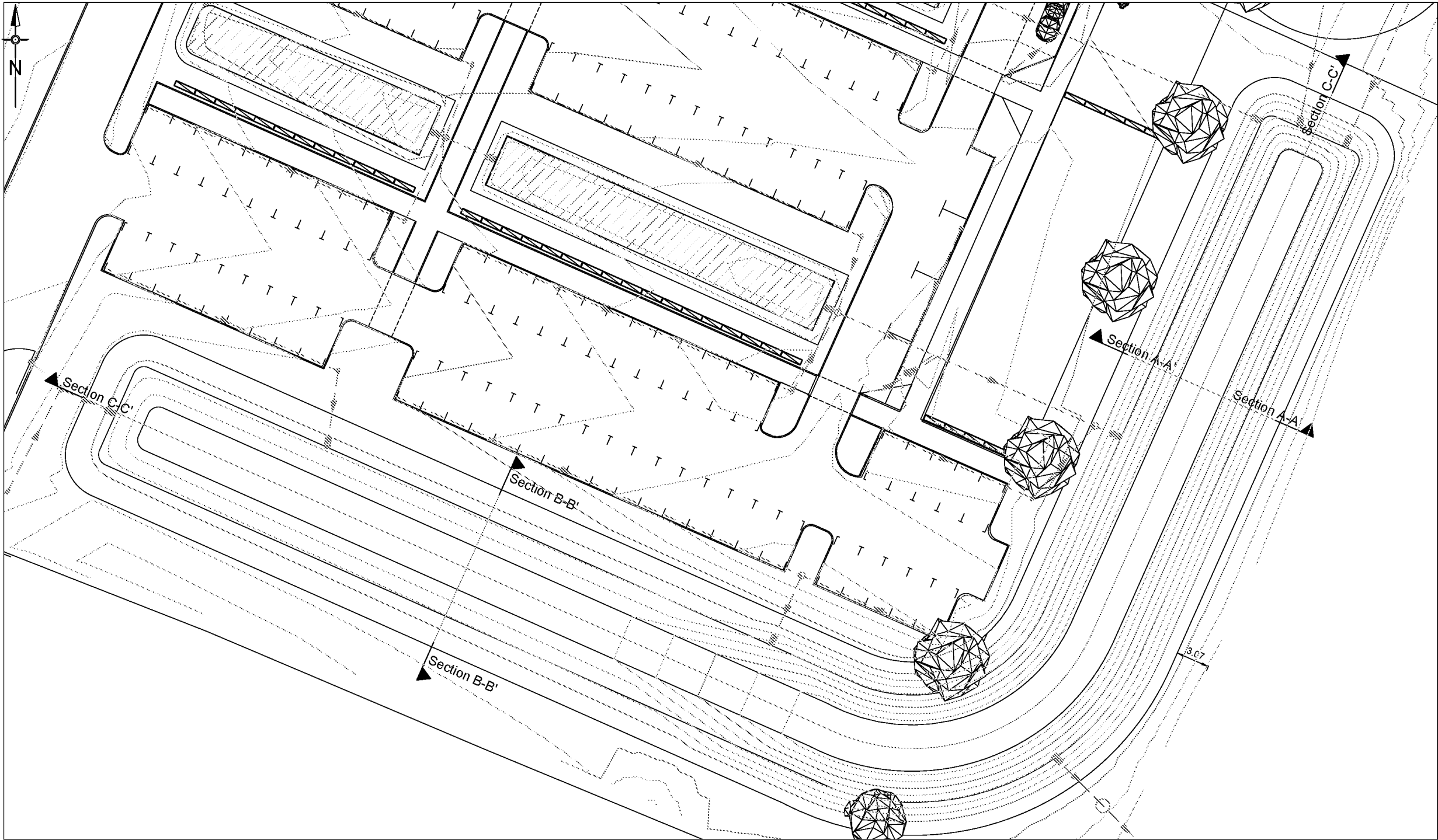
Job Title	Central Arun Crematorium
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Client	Westerleigh
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Proposed Foul and Surface Water Drainage Layout (Sheet 2 of 2)

Drawn by AJH	Date made June'21	Scale @ A1 1:250	Checked by AJH	Suitability S2	CR Project 13591
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Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5051	P7



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- For S278 details refer to Paul Basham Associates' plans.
- For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350

LEGEND

- PROPOSED VERTICAL PROFILE
- EXISTING GROUND LEVEL

P2	Basin updated to suit drainage design	02.02.22	JA
P1	Issued for planning discharge	25.01.22	SH
Rev	Description	Date	By

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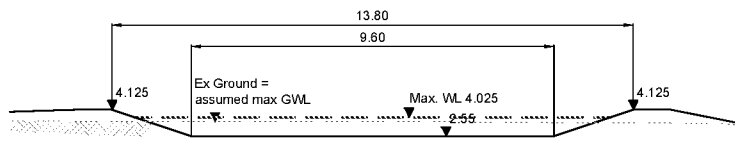
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Job Title	Central Arun Crematorium
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Drainage Construction Details Proposed Basin Detail Sheet 1 of 2

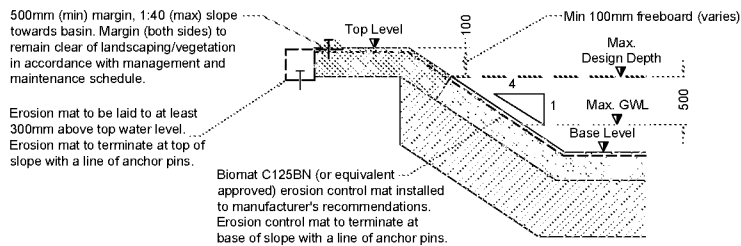
Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
SH	Jan '22	1:250	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5310	P1



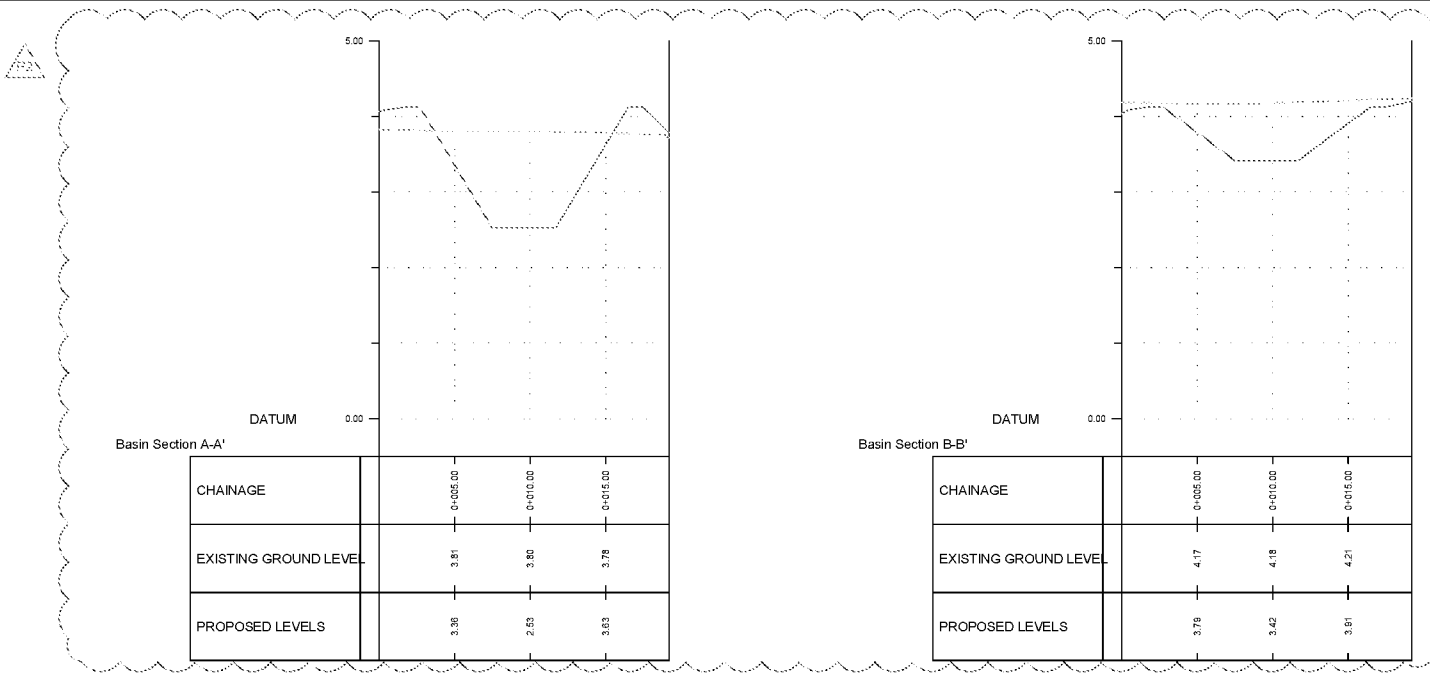
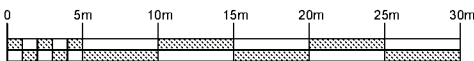
Typical Section

Scale 1:100



Erosion Mat Detail

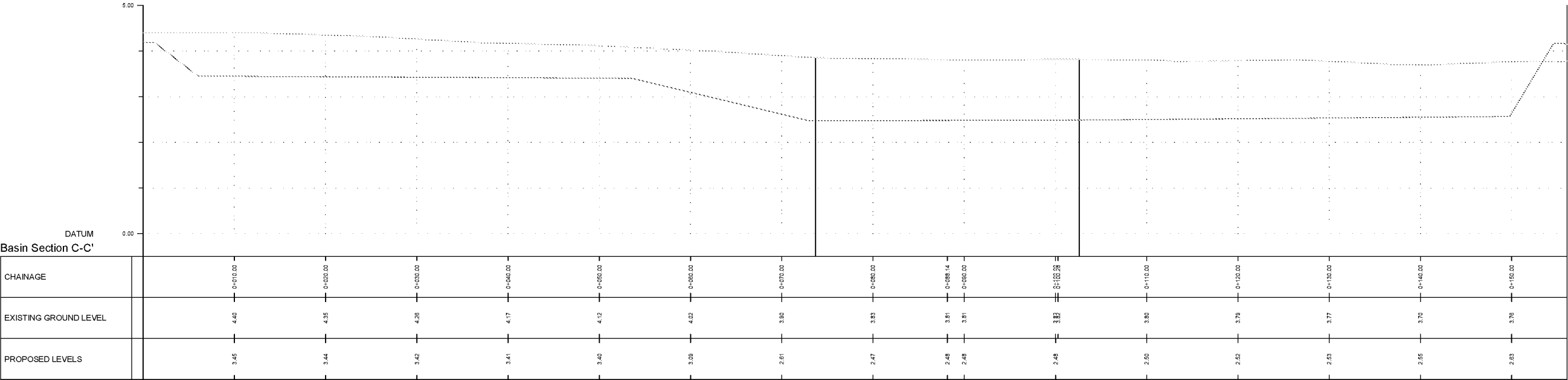
Scale 1:20



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P1	Issued for planning discharge	02.02.22	JA
Rev	Description	Date	By

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Client	Westerleigh

Drainage Construction Details
Proposed Basin Detail
Sheet 2 of 2

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
JA	Feb '22	1:250	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5311	P1

Construction Materials / Thicknesses

- 30mm asphalt concrete surface course binder grade 100/150, AC10 (to PD 6691 Annex B)
- 60mm asphalt concrete binder course binder grade 100/150, AC 20 (to PD 6691 Annex B)
- 100mm asphalt concrete base binder grade 100/150, AC32 (to PD 6691 Annex B).
- 150mm Type 1 granular sub-base material (to CL. 803 SHW and prepared and installed to CL. 802 SHW)
- 450mm Type 6F1 capping layer material (Table 6/1 of SHW)
- TriAX TX-160 geogrid by Tensar or equivalent approved (installed in accordance with manufacturers instructions and specifications)

Detail P1
Heavy Duty Macadam Pavement Construction
(Vehicular)

Construction Materials / Thicknesses

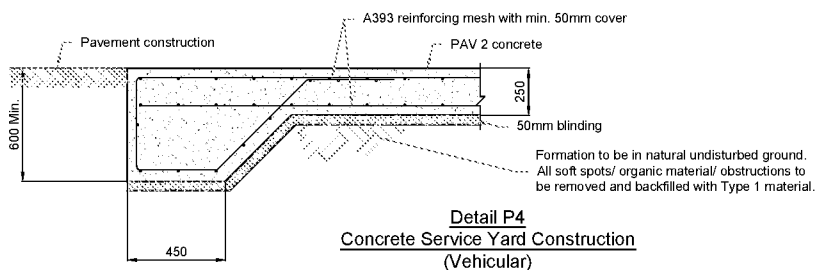
- 80mm concrete block paving to Landscape Architect's specification
- 50mm thickness of Marshalls Priora 2/6mm laying aggregate
- 300mm 4/20mm course graded sub-base (to BS 7533-13:2009 and BS EN 13242:2002) - free draining and free of fines to provided minimum of 30% void ratio for storage
- Marshalls MM120 permeable membrane
- 150mm Type 6F1 capping layer material (Table 6/1 of SHW)
- TriAX TX-160 geogrid by Tensar or equivalent approved (installed in accordance with manufacturers instructions and specifications)

Detail P2
Permeable block paving construction with fin drain
(Vehicular)

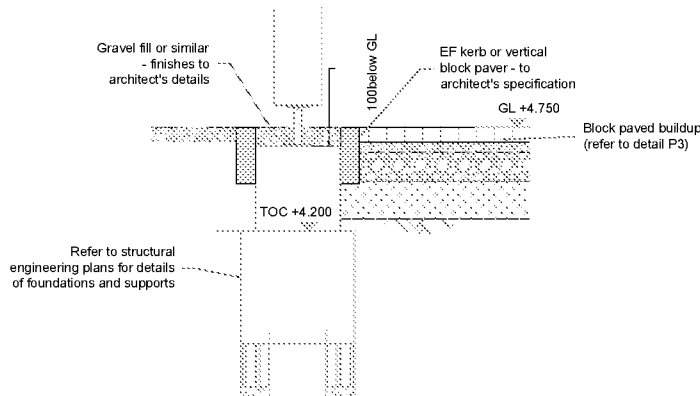
Construction Materials / Thicknesses

- 80mm concrete block paving to Landscape Architect's specification
- 30mm thickness sand laying course
- 150mm Type 1 granular sub-base material. To be in accordance with cl. 803 SHW and prepared and installed to cl. 802 SHW.
- 200mm Type 6F1 capping layer material (Table 6/1 of SHW)

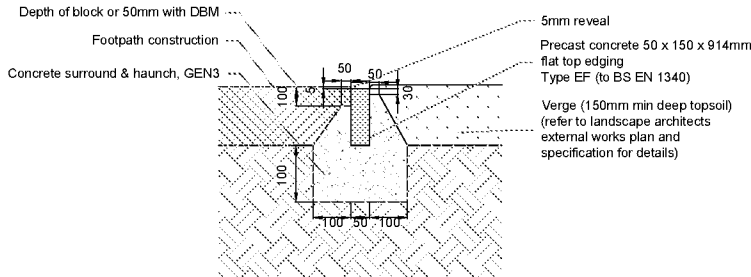
Detail P3
Impermeable block paving construction
(Pedestrian)



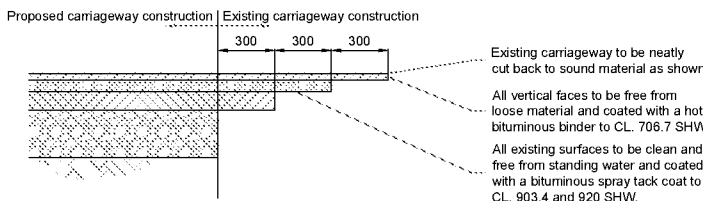
Detail P4
Concrete Service Yard Construction
(Vehicular)



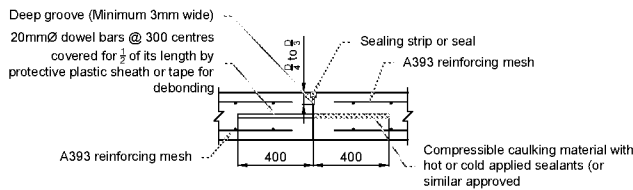
Detail P3A
Impermeable block paving construction - Floral Tribute
(Pedestrian)



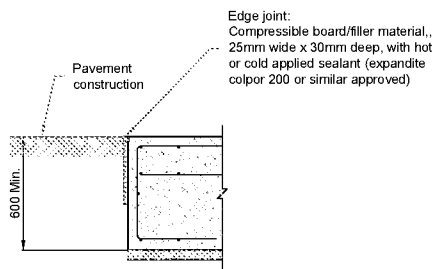
Detail K6
Footpath edging (EF) kerb



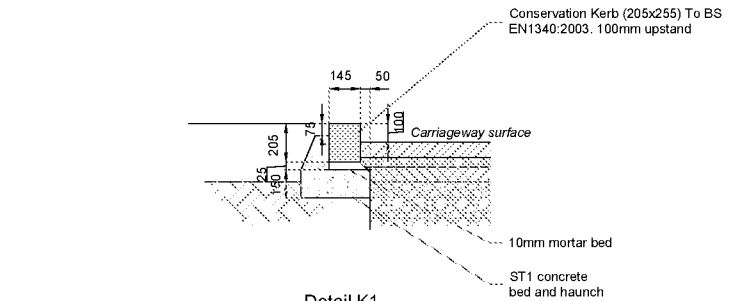
Detail P8
Jointing detail between proposed and existing carriageway
constructions for re-surfacing of existing pavement



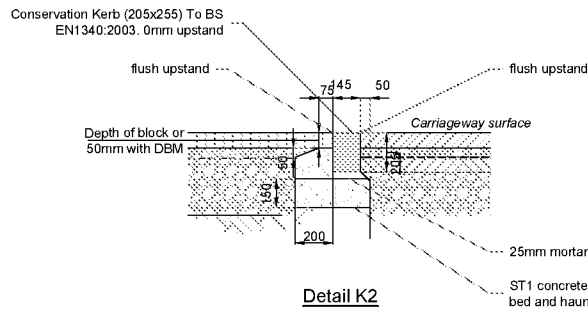
Detail P7
Service Yard slab control joint detail



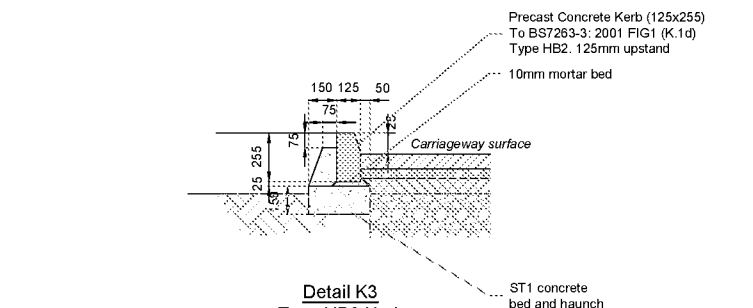
Detail P6
Service Yard slab edge joint detail



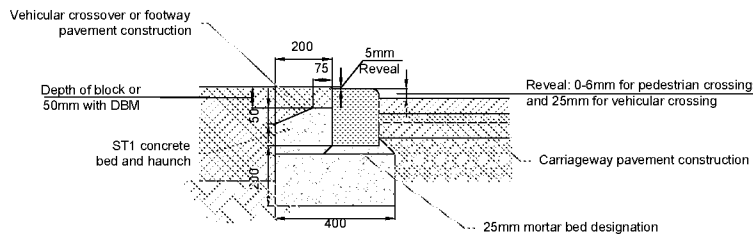
Detail K1
Conservation Kerb



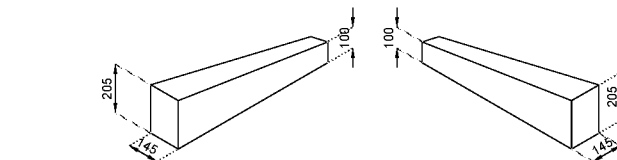
Detail K2
Flush Conservation Kerb



Detail K3
Type HB2 Kerb
125 x 255

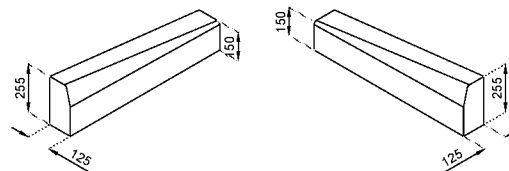


Detail K4
Vehicular crossover dropped (BN2) kerb



Left Hand Conservation Transition DLC

Right Hand Conservation Transition DRC



Left Hand Transition DL

Right Hand Transition DR

Detail K5
Transition kerbs
K1 to K2 and K3 to K4

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- Contractor shall thoroughly proof roll at sub-formation level and remove all soft spots and replace with 6F1 capping material.
- Pavement construction details shown on this drawing are based on a CBR value of 2%. Contractor to test and confirm CBR values of 2% prior to laying of capping and subbase. Ground stabilization may be required by specialist.
- Pavement construction subject to change pending confirmation of specialist surfacing option.
- Contractor to carry out frost susceptibility testing at formation level in accordance with BS 812:124:2009 prior to construction as the in-situ soils at formation level are variable with regard to frost susceptibility. If soils are susceptible to frost heave, excavation shall be carried out to 450mm (total pavement thickness) and the difference shall be replaced with non-frost susceptible soil. Specialist to confirm if required.
- Frost susceptible granite, chalk & limestones shall not be used within the construction make-up.

P3	Permeable paving detail P3 revised	04.05.22	JA
P2	Reinforced gravel detail P5 removed, floral tribute paving detail added. Issued for Tender	09.07.21	SH
P1	Issued for Tender	02.07.21	SH
Rev	Description	Date	By

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Client	Westerleigh

Proposed Pavement Details

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
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Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5350	P3