

## Sandra Edwards

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**From:** Amanda Scholes on behalf of Planning.Responses  
**Sent:** 10 January 2020 08:29  
**To:** Planning Scanning  
**Subject:** FW: Planning Consultation on A/132/19/DOC  
**Attachments:** C1249\_SW\_Network\_1.pdf

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**From:** Andrew Wood [REDACTED]  
**Sent:** 09 January 2020 17:19  
**To:** Planning.Responses [REDACTED]  
**Subject:** FW: Planning Consultation on A/132/19/DOC

[REDACTED]

Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltrovers Road, Littlehampton, BN17 5LF  
[REDACTED]

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**From:** Chris Slade [REDACTED]  
**Sent:** 17 December 2019 15:17  
**To:** Sarah Burrow [REDACTED]  
**Cc:** Andrew Wood [REDACTED]  
**Subject:** RE: Planning Consultation on A/132/19/DOC

Hi Sarah

Please see attached.

Kind regards

Chris Slade **FIHE**  
**CGS Civils Ltd**



Drainage Design | SuDS | Flood Risk Assessments | Highways | External Works

Richard Cobden House | Lion Street | Chichester | West Sussex | PO19 1LW

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**From:** Sarah Burrow [REDACTED]  
**Sent:** 17 December 2019 15:02  
**To:** Chris Slade [REDACTED]  
**Cc:** Andrew Wood [REDACTED]  
**Subject:** RE: Planning Consultation on A/132/19/DOC

Hi Chris,

Please can you supply your calculations for this project. Thank you.

Sarah Burrow  
Engineering Assistant

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**From:** Andrew Wood [REDACTED]  
**Sent:** 04 December 2019 11:15  
**To:** Sarah Burrow [REDACTED]  
**Subject:** FW: Planning Consultation on A/132/19/DOC

Comments please.

Thank you,

Andrew Wood

Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LE

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**From:** Chris Slade [REDACTED]  
**Sent:** 04 December 2019 10:55  
**To:** Andrew Wood [REDACTED]  
**Cc:** Sarah Burrow [REDACTED]; James Elsey [REDACTED]; Dean Muggeridge [REDACTED]  
**Subject:** RE: Planning Consultation on A/132/19/DOC

Dear Andrew

Please find attached revised drainage design package issued for approval following on from the winter testing.

I trust that all is in order and look forward to your response.

Please do not hesitate to ask if you require any further information or clarification.

Kind regards

Chris Slade **FIHE**  
**CGS Civils Ltd**



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**From:** Andrew Wood <[REDACTED]>  
**Sent:** 16 October 2019 15:30  
**To:** Chris Slade [REDACTED]  
**Subject:** RE: Planning Consultation on A/132/19/DOC

Chris ,

I would advise that you need to do the full winter groundwater monitoring results to be submitted. And infiltration tests must be completed three times and then re-submit in April.

Laura is in until Friday then the new engineer taking over will be [REDACTED] of Monday 21<sup>st</sup> October.

Thank you,

Andrew Wood

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Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

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**From:** Chris Slade [REDACTED]  
**Sent:** 16 October 2019 11:15  
**To:** Andrew Wood [REDACTED]  
**Cc:** James Elsey [REDACTED]  
**Subject:** Re: Planning Consultation on A/132/19/DOC

Hi Andrew

Ok many thanks. Do you have details of the engineer taking over?

Thanks

Chris

Sent from my Samsung Galaxy smartphone.

----- Original message -----

From: Andrew Wood <[REDACTED]>  
Date: 16/10/2019 11:09 (GMT+00:00)  
To: Chris Slade <[REDACTED]>  
Subject: RE: Planning Consultation on A/132/19/DOC

I would note Laura is leaving the authority tomorrow so please provide information as requested for the new engineer.

Thank you,

Andrew Wood

Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

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From: Chris Slade <[REDACTED]>  
Sent: 15 October 2019 16:18  
To: Andrew Wood <[REDACTED]>  
Cc: James Elsey <[REDACTED]>  
Subject: RE: Planning Consultation on A/132/19/DOC

Hi Andrew

Thank you for your email. We will discuss with Laura.

Kind regards

Chris Slade **FIHE**  
**CGS Civils Ltd**



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From: Andrew Wood <[REDACTED]>  
Sent: 15 October 2019 16:00  
To: Chris Slade <[REDACTED]>

**Cc:** James Elsey [REDACTED]

**Subject:** FW: Planning Consultation on A/132/19/DOC

Please provide information as requested below.

Thank you,

Andrew Wood

Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

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**From:** Laura Gibbons [REDACTED]

**Sent:** 15 October 2019 15:56

**To:** Andrew Wood <[REDACTED]>

**Subject:** RE: Planning Consultation on A/132/19/DOC

Hi Andrew,

We require full winter groundwater monitoring results to be submitted. And infiltration tests must be completed three times.

I would advise the applicant comes back to us in April and complies with this pre-commencement condition.

Thanks,

Laura Gibbons, MEng, GMICE  
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,  
Maltravers Road, Littlehampton, BN17 5LF

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**From:** Chris Slade [REDACTED]

**Sent:** 14 October 2019 13:33

**To:** Andrew Wood [REDACTED]

**Cc:** Laura Gibbons [REDACTED]; James Elsey [REDACTED]; Dean  
Muggeridge <[REDACTED]>

**Subject:** Re: Planning Consultation on A/132/19/DOC

Dear Andrew

Thank you for your email. As the Consulting Engineers, it has been passed onto us for a response.

I attach an extract from the geotechnical report indicating the soakaway test results and the first recordings of the ground water monitoring which began at the start of the month.

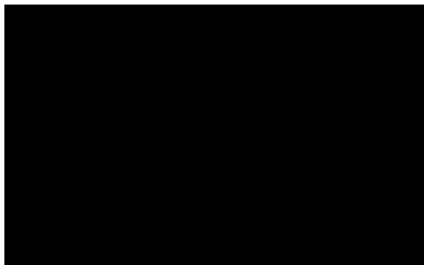
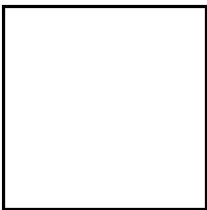
Due to time restrictions on site during the geotechnical testing, the geotechnical engineers only managed to perform one test for all three trial pits. Only TP1 drained fully with TP2 and TP3 being extrapolated. The results from TP1 was satisfactory however TP2 and TP3 were poor and should full testing have been carried out all results would have been poorer during the third test. Therefore, a full infiltration solution was discounted in favour of a hybrid solution i.e. partial discharge and infiltrating porous surfaces. This seems to be the most pragmatic approach given the varied geology.

The geotechnical Engineer working on this scheme also worked on the adjacent site and noted water levels rose to around 0.5m below ground level during peak GW levels. It is therefore anticipated that the groundwater will rise considerably higher than what is shown.

Kind regards

Chris Slade **FIHE**

**CGS Civils Ltd**



**Drainage Design | SuDS | Flood Risk Assessments | Highways | External Works**

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**From:** Andrew Wood [REDACTED]  
**Sent:** 14 October 2019 11:00  
**To:** James Elsey [REDACTED]

**Cc:** Planning.Responses [REDACTED]  
**Subject:** FW: Planning Consultation on A/132/19/DOC

Can you please provide the following information as requested by the Drainage Engineers in the email below.

Thank you,

Andrew Wood

Andrew Wood MRTPI | Senior Planning Officer, Planning Department, Arun District Council |  
Location: 1st Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

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**From:** Laura Gibbons [REDACTED]  
**Sent:** 14 October 2019 11:29  
**To:** Planning.Responses [REDACTED]  
**Cc:** Andrew Wood [REDACTED]  
**Subject:** RE: Planning Consultation on A/132/19/DOC

Engineers Comments Regarding Condition 4

No winter groundwater monitoring or infiltration testing results have been submitted. It is not appropriate to review the surface water drainage strategy without this information.

Engineers Comments Regarding Condition 6

It is not possible to review the proposed flows to watercourse until it has been proven if infiltration is viable or not.

Engineers Comments Regarding Condition 7

It is not appropriate to review maintenance arrangements until the surface water drainage strategy is agreed.

Please re-consult us once winter ground water monitoring and winter infiltration testing has been completed and results are provided. Please note, that this information may not be available until April after the winter monitoring period has ended.

Regards,

Laura Gibbons, MEng, GMICE  
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,  
Maltravers Road, Littlehampton, BN17 5LF

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**From:** [REDACTED]  
**Sent:** 30 September 2019 13:51  
**To:** Land Drainage [REDACTED]  
**Subject:** Planning Consultation on A/132/19/DOC

To: **Engineers (Drainage)**

**NOTIFICATION FROM ARUN DISTRICT COUNCIL**

**TOWN AND COUNTRY PLANNING ACT 1990**

**APPLICATION NO:** A/132/19/DOC

**Registered:** 30-SEP-19

**Site Address:** Merry England Nursery Dappers Lane Angmering BN16 4EN

**Description of Works:** Approval of details reserved by condition imposed under ref A/142/16/OUT relating to Condition Nos 4 - surface water drainage, 6 - flows to watercourses, 7 - SuDs system, maintenance of any watercourse, 11 - Construction Management Plan, 12 - road safety audit, 14 - ecological, 17 - tree protection and 21 contamination.

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The Council have received the above application to discharge conditions. I shall be pleased to receive any observations you may wish to make in respect of those conditions relating to your field of expertise.

[Click here to view the Discharge of Condition application](#)

[Click here to view conditions on original application - click on decision tab](#)

**Should you have any comments to make, these should be sent by replying to this email by 14th October 2019.**

[www.arun.gov.uk/planning](http://www.arun.gov.uk/planning)

**Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.**

In the absence of a reply within the period stated, I shall assume that you have no observations to make.

The officer dealing with this application is Andrew Wood who can be contacted on telephone number

Thanking you in anticipation

Planning Case Officer  
Arun District Council

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

DX 57406 Littlehampton

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### Design Settings

|                       |                   |                                      |               |
|-----------------------|-------------------|--------------------------------------|---------------|
| Rainfall Methodology  | FSR               | Maximum Time of Concentration (mins) | 30.00         |
| Return Period (years) | 2                 | Maximum Rainfall (mm/hr)             | 50.0          |
| Additional Flow (%)   | 0                 | Minimum Velocity (m/s)               | 1.00          |
| FSR Region            | England and Wales | Connection Type                      | Level Soffits |
| M5-60 (mm)            | 20.000            | Minimum Backdrop Height (m)          | 0.600         |
| Ratio-R               | 0.400             | Preferred Cover Depth (m)            | 1.200         |
| CV                    | 0.750             | Include Intermediate Ground          | ✓             |
| Time of Entry (mins)  | 5.00              | Enforce best practice design rules   | ✓             |

### Nodes

| Name | Area<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Easting<br>(m) | Northing<br>(m) | Depth<br>(m) |
|------|--------------|------------------|-----------------------|------------------|----------------|-----------------|--------------|
| S1   | 0.064        | 5.00             | 21.320                | 1200             | 507352.312     | 105089.631      | 0.800        |
| S2   | 0.052        | 5.00             | 21.095                | 1200             | 507353.618     | 105073.686      | 1.191        |
| S3   | 0.064        | 5.00             | 20.550                | 1200             | 507366.224     | 105047.965      | 1.087        |
| S4   | 0.020        | 5.00             | 20.900                | 1200             | 507353.786     | 105065.559      | 1.655        |
| S5   | 0.015        | 5.00             | 20.580                | 1200             | 507334.079     | 105060.292      | 1.426        |
| S6   | 0.062        | 5.00             | 20.480                | 1200             | 507320.177     | 105054.080      | 1.394        |
| S7   | 0.011        | 5.00             | 20.300                | 1200             | 507302.989     | 105051.499      | 1.320        |
| S8   |              |                  | 20.190                | 1200             | 507296.994     | 105050.492      | 1.393        |
| S9   | 0.013        | 5.00             | 19.980                | 1200             | 507301.066     | 105033.576      | 1.239        |
| S10  | 0.032        | 5.00             | 19.730                | 1200             | 507305.813     | 105015.324      | 1.058        |
| S11  |              |                  | 19.700                | 1200             | 507290.187     | 105008.599      | 1.096        |
| S12  | 0.038        | 5.00             | 20.750                | 1200             | 507298.237     | 105072.915      | 0.700        |
| S38  | 0.023        | 5.00             | 19.950                | 1200             | 507277.019     | 105047.901      | 0.911        |
| HW1  |              |                  | 19.250                |                  | 507266.606     | 104999.862      | 0.760        |

### Links

| Name  | US<br>Node | DS<br>Node | Length<br>(m) | ks (mm) /<br>n | US IL<br>(m) | DS IL<br>(m) | Fall<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | T of C<br>(mins) | Rain<br>(mm/hr) |
|-------|------------|------------|---------------|----------------|--------------|--------------|-------------|----------------|-------------|------------------|-----------------|
| 1.000 | S1         | S2         | 15.998        | 0.600          | 20.520       | 19.904       | 0.616       | 26.0           | 150         | 5.13             | 50.0            |
| 1.001 | S2         | S4         | 8.129         | 0.600          | 19.904       | 19.320       | 0.584       | 13.9           | 150         | 5.18             | 50.0            |
| 1.002 | S3         | S4         | 21.547        | 0.600          | 19.463       | 19.320       | 0.143       | 150.7          | 150         | 5.44             | 50.0            |
| 2.000 | S4         | S5         | 20.399        | 0.600          | 19.245       | 19.154       | 0.091       | 225.0          | 225         | 5.83             | 50.0            |
| 2.001 | S5         | S6         | 15.227        | 0.600          | 19.154       | 19.086       | 0.068       | 225.0          | 225         | 6.12             | 50.0            |
| 2.002 | S6         | S7         | 17.381        | 0.600          | 19.092       | 18.980       | 0.112       | 155.2          | 225         | 6.40             | 50.0            |
| 2.003 | S7         | S8         | 6.079         | 0.600          | 18.980       | 18.872       | 0.108       | 56.3           | 225         | 6.46             | 50.0            |

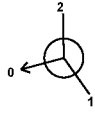
| Name  | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) | US<br>Depth<br>(m) | DS<br>Depth<br>(m) | Σ Area<br>(ha) | Σ Add<br>Inflow<br>(l/s) |
|-------|--------------|--------------|---------------|--------------------|--------------------|----------------|--------------------------|
| 1.000 | 1.983        | 35.0         | 8.7           | 0.650              | 1.041              | 0.064          | 0.0                      |
| 1.001 | 2.714        | 48.0         | 15.7          | 1.041              | 1.430              | 0.116          | 0.0                      |
| 1.002 | 0.816        | 14.4         | 8.7           | 0.937              | 1.430              | 0.064          | 0.0                      |
| 2.000 | 0.867        | 34.5         | 27.1          | 1.430              | 1.201              | 0.200          | 0.0                      |
| 2.001 | 0.867        | 34.5         | 29.1          | 1.201              | 1.169              | 0.215          | 0.0                      |
| 2.002 | 1.047        | 41.6         | 37.5          | 1.163              | 1.095              | 0.277          | 0.0                      |
| 2.003 | 1.747        | 69.4         | 44.2          | 1.095              | 1.093              | 0.326          | 0.0                      |

## Links

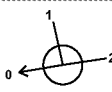
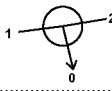
| Name  | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|-------|---------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 3.000 | S8      | S9      | 17.399     | 0.600       | 18.797    | 18.741    | 0.056    | 310.7       | 300      | 6.79          | 50.0         |
| 3.001 | S9      | S10     | 18.859     | 0.600       | 18.741    | 18.672    | 0.069    | 273.3       | 300      | 7.12          | 50.0         |
| 3.002 | S10     | S11     | 17.012     | 0.600       | 18.672    | 18.604    | 0.068    | 250.2       | 300      | 7.41          | 50.0         |
| 3.003 | S11     | HW1     | 25.148     | 0.600       | 18.604    | 18.490    | 0.114    | 220.6       | 300      | 7.80          | 50.0         |
| 4.000 | S12     | S7      | 21.937     | 0.600       | 20.050    | 19.110    | 0.940    | 23.3        | 100      | 5.23          | 50.0         |
| 5.000 | S38     | S8      | 20.142     | 0.600       | 19.039    | 18.950    | 0.089    | 226.3       | 150      | 5.51          | 50.0         |

| Name  | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) |
|-------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|
| 3.000 | 0.886     | 62.7      | 47.3       | 1.093        | 0.939        | 0.349       | 0.0                |
| 3.001 | 0.946     | 66.9      | 49.1       | 0.939        | 0.758        | 0.362       | 0.0                |
| 3.002 | 0.989     | 69.9      | 53.4       | 0.758        | 0.796        | 0.394       | 0.0                |
| 3.003 | 1.054     | 74.5      | 53.4       | 0.796        | 0.460        | 0.394       | 0.0                |
| 4.000 | 1.605     | 12.6      | 5.1        | 0.600        | 1.090        | 0.038       | 0.0                |
| 5.000 | 0.664     | 11.7      | 3.1        | 0.761        | 1.090        | 0.023       | 0.0                |

## Manhole Schedule

| Node | Easting<br>(m) | Northing<br>(m) | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                          | Link | IL<br>(m) | Dia<br>(mm) |     |
|------|----------------|-----------------|-----------|--------------|-------------|--------------------------------------------------------------------------------------|------|-----------|-------------|-----|
| S1   | 507352.312     | 105089.631      | 21.320    | 0.800        | 1200        |  | 0    | 1.000     | 20.520      | 150 |
| S2   | 507353.618     | 105073.686      | 21.095    | 1.191        | 1200        |  | 1    | 1.000     | 19.904      | 150 |
| S3   | 507366.224     | 105047.965      | 20.550    | 1.087        | 1200        |  | 0    | 1.001     | 19.904      | 150 |
| S4   | 507353.786     | 105065.559      | 20.900    | 1.655        | 1200        |  | 0    | 1.002     | 19.463      | 150 |
| S5   | 507334.079     | 105060.292      | 20.580    | 1.426        | 1200        |  | 1    | 1.001     | 19.320      | 150 |
| S6   | 507320.177     | 105054.080      | 20.480    | 1.394        | 1200        |  | 0    | 2.000     | 19.245      | 225 |
|      |                |                 |           |              |             |  | 1    | 2.000     | 19.154      | 225 |
|      |                |                 |           |              |             |  | 0    | 2.001     | 19.154      | 225 |
|      |                |                 |           |              |             |  | 1    | 2.001     | 19.086      | 225 |
|      |                |                 |           |              |             |  | 0    | 2.002     | 19.092      | 225 |

## Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections                                                                          | Link               | IL (m)           | Dia (mm)   |
|------|-------------|--------------|--------|-----------|----------|--------------------------------------------------------------------------------------|--------------------|------------------|------------|
| S7   | 507302.989  | 105051.499   | 20.300 | 1.320     | 1200     |    | 1 4.000<br>2 2.002 | 19.110<br>18.980 | 100<br>225 |
|      |             |              |        |           |          |                                                                                      | 0 2.003            | 18.980           | 225        |
| S8   | 507296.994  | 105050.492   | 20.190 | 1.393     | 1200     |    | 1 5.000<br>2 2.003 | 18.950<br>18.872 | 150<br>225 |
|      |             |              |        |           |          |                                                                                      | 0 3.000            | 18.797           | 300        |
| S9   | 507301.066  | 105033.576   | 19.980 | 1.239     | 1200     |     | 1 3.000            | 18.741           | 300        |
|      |             |              |        |           |          |                                                                                      | 0 3.001            | 18.741           | 300        |
| S10  | 507305.813  | 105015.324   | 19.730 | 1.058     | 1200     |     | 1 3.001            | 18.672           | 300        |
|      |             |              |        |           |          |                                                                                      | 0 3.002            | 18.672           | 300        |
| S11  | 507290.187  | 105008.599   | 19.700 | 1.096     | 1200     |    | 1 3.002            | 18.604           | 300        |
|      |             |              |        |           |          |                                                                                      | 0 3.003            | 18.604           | 300        |
| S12  | 507298.237  | 105072.915   | 20.750 | 0.700     | 1200     |   | 0 4.000            | 20.050           | 100        |
| S38  | 507277.019  | 105047.901   | 19.950 | 0.911     | 1200     |  | 0 5.000            | 19.039           | 150        |
|      |             |              |        |           |          |                                                                                      | 1 3.003            | 18.490           | 300        |
| HW1  | 507266.606  | 104999.862   | 19.250 | 0.760     |          |  |                    |                  |            |

## Simulation Settings

|                      |                   |                            |      |
|----------------------|-------------------|----------------------------|------|
| Rainfall Methodology | FSR               | Drain Down Time (mins)     | 1440 |
| FSR Region           | England and Wales | Additional Storage (m³/ha) | 20.0 |
| M5-60 (mm)           | 20.000            | Check Discharge Rate(s)    | ✓    |
| Ratio-R              | 0.400             | 1 year (l/s)               | 1.9  |
| Summer CV            | 0.750             | 30 year (l/s)              | 5.5  |
| Winter CV            | 0.840             | 100 year (l/s)             | 7.3  |
| Analysis Speed       | Normal            | Check Discharge Volume     | x    |
| Skip Steady State    | x                 |                            |      |

## Storm Durations

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

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 10                    | 40                    | 0                     | 0                     |
| 100                   | 40                    | 0                     | 0                     |

### Pre-development Discharge Rate

|                              |            |                         |      |
|------------------------------|------------|-------------------------|------|
| Site Makeup                  | Greenfield | Growth Factor 30 years  | 2.40 |
| Greenfield Method            | IH124      | Growth Factor 100 years | 3.19 |
| Positively Drained Area (ha) | 1.140      | Betterment (%)          | 0    |
| SAAR (mm)                    | 761        | QBar                    | 2.3  |
| Soil Index                   | 2          | Q 1 year (l/s)          | 1.9  |
| SPR                          | 0.30       | Q 30 year (l/s)         | 5.5  |
| Region                       | 7          | Q 100 year (l/s)        | 7.3  |
| Growth Factor 1 year         | 0.85       |                         |      |

### Node S11 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | ✓      | Sump Available          | ✓                              |
| Invert Level (m)         | 18.604 | Product Number          | CTL-SHE-0072-2300-0996-2300    |
| Design Depth (m)         | 0.996  | Min Outlet Diameter (m) | 0.100                          |
| Design Flow (l/s)        | 2.3    | Min Node Diameter (mm)  | 1200                           |

### Node S1 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 20.520 | Slope (1:X)   | 30.0  |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0      | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 10.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 24.900 |               |       |

### Node S2 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 19.904 | Slope (1:X)   | 100.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 2      | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 10.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 20.000 |               |       |

### Node S3 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 19.463 | Slope (1:X)   | 18.0  |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 4      | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 10.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 21.400 |               |       |

### Node S4 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 19.245 | Slope (1:X)   | 128.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 20     | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 10.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 14.100 |               |       |

### Node S6 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 19.086 | Slope (1:X)   | 31.0  |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 630    | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 30.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 11.860 |               |       |

### Node S7 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 18.980 | Slope (1:X)   | 37.0  |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 1050   | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 10.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 6.900  |               |       |

### Node S9 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 18.741 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.95 | Time to half empty (mins) | 1080   |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 190.0                  | 0.0                        | 0.800     | 190.0                  | 0.0                        | 0.801     | 0.0                    | 0.0                        |

### Node S10 Carpark Storage Structure

|                             |         |                           |        |               |        |
|-----------------------------|---------|---------------------------|--------|---------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 18.672 | Slope (1:X)   | 1000.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) |        | Depth (m)     | 0.394  |
| Safety Factor               | 2.0     | Width (m)                 | 20.000 | Inf Depth (m) |        |
| Porosity                    | 0.30    | Length (m)                | 10.000 |               |        |

### Node S11 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 18.610 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 0.95 | Time to half empty (mins) |        |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 70.0                   | 0.0                        | 0.400     | 70.0                   | 0.0                        | 0.401     | 0.0                    | 0.0                        |

### Node S12 Carpark Storage Structure

|                             |         |                           |        |               |       |
|-----------------------------|---------|---------------------------|--------|---------------|-------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 20.050 | Slope (1:X)   | 74.0  |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 0      | Depth (m)     | 0.394 |
| Safety Factor               | 2.0     | Width (m)                 | 12.000 | Inf Depth (m) |       |
| Porosity                    | 0.30    | Length (m)                | 9.000  |               |       |

**Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 95.88%**

| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute winter  | S1      | 10          | 20.614    | 0.094     | 24.4         | 0.4564        | 0.0000     | OK         |
| 15 minute winter  | S2      | 12          | 20.025    | 0.121     | 43.8         | 2.4351        | 0.0000     | OK         |
| 15 minute winter  | S3      | 12          | 19.780    | 0.317     | 24.4         | 1.6546        | 0.0000     | SURCHARGED |
| 15 minute winter  | S4      | 15          | 19.592    | 0.347     | 64.5         | 12.8182       | 0.0000     | SURCHARGED |
| 15 minute winter  | S5      | 15          | 19.450    | 0.296     | 40.5         | 0.3967        | 0.0000     | SURCHARGED |
| 30 minute winter  | S6      | 24          | 19.330    | 0.244     | 54.8         | 8.7990        | 0.0000     | SURCHARGED |
| 480 minute winter | S7      | 464         | 19.179    | 0.199     | 13.7         | 2.4587        | 0.0000     | OK         |
| 480 minute winter | S8      | 464         | 19.179    | 0.382     | 14.7         | 0.4321        | 0.0000     | SURCHARGED |
| 480 minute winter | S9      | 464         | 19.179    | 0.438     | 15.0         | 79.6407       | 0.0000     | SURCHARGED |
| 480 minute winter | S10     | 464         | 19.179    | 0.507     | 8.9          | 24.2505       | 0.0000     | SURCHARGED |
| 480 minute winter | S11     | 464         | 19.179    | 0.575     | 5.8          | 27.3166       | 0.0000     | SURCHARGED |
| 15 minute winter  | S12     | 11          | 20.134    | 0.084     | 14.5         | 1.1188        | 0.0000     | OK         |
| 480 minute winter | S38     | 464         | 19.179    | 0.140     | 1.0          | 0.2291        | 0.0000     | OK         |
| 15 minute summer  | HW1     | 1           | 18.490    | 0.000     | 2.3          | 0.0000        | 0.0000     | OK         |

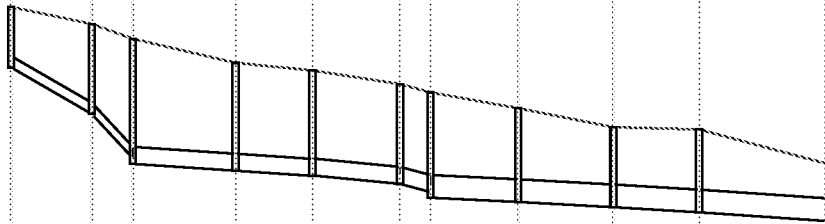
| Link Event (Upstream Depth) | US Node | Link         | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|---------|--------------|---------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter            | S1      | 1.000        | S2      | 23.9          | 1.837          | 0.683    | 0.2115        |                    |
| 15 minute winter            | S2      | 1.001        | S4      | 39.6          | 2.590          | 0.826    | 0.1333        |                    |
| 15 minute winter            | S3      | 1.002        | S4      | 18.5          | 1.049          | 1.279    | 0.3793        |                    |
| 15 minute winter            | S4      | 2.000        | S5      | 38.6          | 0.971          | 1.120    | 0.8113        |                    |
| 15 minute winter            | S5      | 2.001        | S6      | 40.3          | 1.014          | 1.170    | 0.6056        |                    |
| 30 minute winter            | S6      | 2.002        | S7      | 45.4          | 1.244          | 1.090    | 0.6515        |                    |
| 480 minute winter           | S7      | 2.003        | S8      | 13.7          | 1.272          | 0.197    | 0.2339        |                    |
| 480 minute winter           | S8      | 3.000        | S9      | 14.5          | 0.724          | 0.232    | 1.2252        |                    |
| 480 minute winter           | S9      | 3.001        | S10     | 8.0           | 0.522          | 0.120    | 1.3280        |                    |
| 480 minute winter           | S10     | 3.002        | S11     | 5.8           | 0.470          | 0.082    | 1.1980        |                    |
| 480 minute winter           | S11     | Hydro-Brake® | HW1     | 2.3           |                |          |               | 187.5              |
| 15 minute winter            | S12     | 4.000        | S7      | 12.6          | 1.783          | 0.996    | 0.1625        |                    |
| 480 minute winter           | S38     | 5.000        | S8      | 1.2           | 0.418          | 0.105    | 0.3496        |                    |

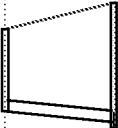
**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 95.88%**

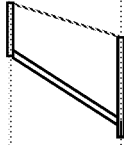
| Node Event        | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status     |
|-------------------|---------|-------------|-----------|-----------|--------------|---------------|------------|------------|
| 15 minute winter  | S1      | 12          | 20.748    | 0.228     | 40.2         | 1.7540        | 0.0000     | SURCHARGED |
| 15 minute winter  | S2      | 15          | 20.175    | 0.271     | 64.5         | 10.8096       | 0.0000     | SURCHARGED |
| 15 minute winter  | S3      | 14          | 20.132    | 0.669     | 40.2         | 5.6010        | 0.0000     | SURCHARGED |
| 30 minute winter  | S4      | 22          | 19.888    | 0.643     | 67.5         | 15.2378       | 0.0000     | SURCHARGED |
| 30 minute winter  | S5      | 23          | 19.654    | 0.500     | 56.0         | 0.6702        | 0.0000     | SURCHARGED |
| 600 minute winter | S6      | 585         | 19.636    | 0.550     | 15.7         | 22.7980       | 0.0000     | SURCHARGED |
| 600 minute winter | S7      | 585         | 19.636    | 0.656     | 18.5         | 7.0907        | 0.0000     | SURCHARGED |
| 600 minute winter | S8      | 585         | 19.635    | 0.838     | 18.4         | 0.9483        | 0.0000     | SURCHARGED |
| 600 minute winter | S9      | 585         | 19.635    | 0.894     | 18.8         | 145.6896      | 0.0000     | SURCHARGED |
| 600 minute winter | S10     | 585         | 19.635    | 0.963     | 9.7          | 25.0427       | 0.0000     | FLOOD RISK |
| 600 minute winter | S11     | 585         | 19.635    | 1.031     | 7.5          | 27.8327       | 0.0000     | FLOOD RISK |
| 15 minute winter  | S12     | 13          | 20.210    | 0.160     | 23.9         | 3.5855        | 0.0000     | SURCHARGED |
| 600 minute winter | S38     | 585         | 19.635    | 0.596     | 1.3          | 0.9758        | 0.0000     | SURCHARGED |
| 15 minute summer  | HW1     | 1           | 18.490    | 0.000     | 2.3          | 0.0000        | 0.0000     | OK         |

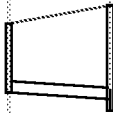
  

| Link Event (Upstream Depth) | US Node | Link         | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|-----------------------------|---------|--------------|---------|---------------|----------------|----------|---------------|--------------------|
| 15 minute winter            | S1      | 1.000        | S2      | 33.7          | 1.991          | 0.962    | 0.2816        |                    |
| 15 minute winter            | S2      | 1.001        | S4      | 41.1          | 2.615          | 0.857    | 0.1431        |                    |
| 15 minute winter            | S3      | 1.002        | S4      | 22.7          | 1.291          | 1.575    | 0.3793        |                    |
| 30 minute winter            | S4      | 2.000        | S5      | 49.9          | 1.256          | 1.448    | 0.8113        |                    |
| 30 minute winter            | S5      | 2.001        | S6      | 55.6          | 1.397          | 1.611    | 0.6056        |                    |
| 600 minute winter           | S6      | 2.002        | S7      | 15.7          | 0.960          | 0.377    | 0.6913        |                    |
| 600 minute winter           | S7      | 2.003        | S8      | 17.3          | 1.277          | 0.248    | 0.2418        |                    |
| 600 minute winter           | S8      | 3.000        | S9      | 18.1          | 0.760          | 0.289    | 1.2252        |                    |
| 600 minute winter           | S9      | 3.001        | S10     | 8.0           | 0.503          | 0.120    | 1.3280        |                    |
| 600 minute winter           | S10     | 3.002        | S11     | 7.5           | 0.501          | 0.107    | 1.1980        |                    |
| 600 minute winter           | S11     | Hydro-Brake® | HW1     | 2.3           |                |          |               | 247.8              |
| 15 minute winter            | S12     | 4.000        | S7      | 12.8          | 1.762          | 1.020    | 0.1716        |                    |
| 600 minute winter           | S38     | 5.000        | S8      | 1.2           | 0.429          | 0.102    | 0.3546        |                    |

| Node Name                                                                                                                                                               | S1     | S2     | S4     | S5     | S6     | S7     | S8     | S9     | S10    | S11    | HW1    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| <p>A4 drawing</p> <p>Hor Scale 1500</p> <p>Ver Scale 100</p> <p>Datum (m) 14.000</p>  |        |        |        |        |        |        |        |        |        |        |        |
| Link Name                                                                                                                                                               | 1.000  | 1.000  | 2.000  | 2.001  | 2.002  | 2.003  | 3.000  | 3.001  | 3.002  | 3.003  |        |
| Section Type                                                                                                                                                            | 150mm  | 150mm  | 225mm  | 225mm  | 225mm  | 225mm  | 300mm  | 300mm  | 300mm  | 300mm  |        |
| Slope (1:X)                                                                                                                                                             | 26.0   | 13.9   | 225.0  | 225.0  | 155.2  | 56     | 310.7  | 273.3  | 250.2  | 220.6  |        |
| Cover Level (m)                                                                                                                                                         | 21.320 | 21.095 | 20.900 | 20.580 | 20.480 | 20.300 | 20.190 | 19.980 | 19.730 | 19.700 | 19.700 |
| Invert Level (m)                                                                                                                                                        | 20.520 | 19.904 | 19.996 | 19.245 | 19.154 | 19.154 | 19.086 | 19.092 | 18.980 | 18.980 | 18.797 |
| Length (m)                                                                                                                                                              | 15.998 | 8.12   | 20.399 | 15.227 | 17.381 | 6.0    | 17.399 | 18.859 | 17.012 | 25.148 |        |

| Node Name                                                                         | S3                                                                                  | S4     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|
| <p>A4 drawing</p> <p>Hor Scale 1500<br/>Ver Scale 100</p> <p>Datum (m) 14.000</p> |  |        |
| Link Name                                                                         | 1.002                                                                               |        |
| Section Type                                                                      | 150mm                                                                               |        |
| Slope (1:X)                                                                       | 150.7                                                                               |        |
| Cover Level (m)                                                                   | 20.550                                                                              | 20.550 |
| Invert Level (m)                                                                  | 19.463                                                                              | 19.320 |
| Length (m)                                                                        | 21.547                                                                              |        |

| Node Name                                                                         | S12                                                                                 | S7     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|
| <p>A4 drawing</p> <p>Hor Scale 1500<br/>Ver Scale 100</p> <p>Datum (m) 14.000</p> |  |        |
| Link Name                                                                         | 4.000                                                                               |        |
| Section Type                                                                      | 100mm                                                                               |        |
| Slope (1:X)                                                                       | 23.3                                                                                |        |
| Cover Level (m)                                                                   | 20.750                                                                              | 20.750 |
| Invert Level (m)                                                                  | 20.050                                                                              | 19.110 |
| Length (m)                                                                        | 21.937                                                                              |        |

| Node Name                                                                         | S38                                                                                 | S8     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|
| <p>A4 drawing</p> <p>Hor Scale 1500<br/>Ver Scale 100</p> <p>Datum (m) 14.000</p> |  |        |
| Link Name                                                                         | 5.000                                                                               |        |
| Section Type                                                                      | 150mm                                                                               |        |
| Slope (1:X)                                                                       | 226.3                                                                               |        |
| Cover Level (m)                                                                   | 19.950                                                                              | 19.950 |
| Invert Level (m)                                                                  | 19.039                                                                              | 18.950 |
| Length (m)                                                                        | 20.142                                                                              |        |

