Technical note

Project	66 Pollard Hill North	**Date**	01 January 2024
Note	Drainage Strategy	**Ref**	22-9600-D101D
Author	Arwyn Norris		

This technical note is produced to accompany the Syntegra Drainage General Arrangement Drawing ref 22-9600-6005 and 22-9600-6006 and 22-9600-6010-6011 in support of discharge of the drainage condition under planning ref 21/03908/FUL. This Note is further updated in response to LLFA comments dated 09/01/2024

The design has been based upon the submitted drainage strategy prepared by Sweco Uk Ltd (July 2021)

In order to simplify maintenance requirements and ownership of the suds systems, the proposed SuDS layouts have been amended. The drainage strategy for the scheme has been modified to take into account the current layout, proposed levels and site constraints.

Attenuation will be provided via a combination of cellular attenuation systems and permeable paving systems with flow control devices. In line with LLFA comments permeable paving systems have been added to all driveways.

The existing discharge rates as per the approved drainage strategy were calculated as follows:

Storm	Existing Runoff Rate l/s
1 in1 year	1.5
1 in 30 year	4.8
1 in 100 year	7.3

Table 1 Greenfield runoff rates

In undertaking the detailed design, consultation was undertaken with Thames Water. I was agreed that a single point of connection was to be provided for a foul and surface water and that a discharge rate for surface water of approximately 2l/s was to be provided. This is controlled using a hydrobrake system prior to discharge.

A new connection to the surface water sewer within Beach Road was previously agreed and will be utilised. Therefore In accordance with Thames Water policy the connections and discharge rates are in line with the drainage and connection hierarchy. Consent for the connections has been provided.

An increase in discharge rates over the proposed strategy is required due to the increase in impermeable areas and change in levels, as such a small increase is required and has been agreed. Whilst the LLFA note that previous discharge rates were less, it is not possible to provide further reductions without reducing the orifice size (to which the LLFA was against) and providing significant additional storage which space is limited. Hydraulically due to topography the proposed strategy represents the most stable and efficient system. In addition Thames Water have no issue with the rates proposed which have been developed in consultation and have accepted the proposals.

Proposed impermeable areas are calculated as 0.149ha. Of note is that some of these areas relate to garden paths to which runoff would not be conveyed to the drainage system but the garden areas. The existing impermeable area of the site is indicated as 0.016ha.

Water butts are proposed to each property to further reduce runoff and provide water for irrigation.

The attenuation has been sized to accommodate the rainfall events up to and including the 1% AEP event inclusive of 40% climate change

Storm	Proposed Runoff Rate l/s	Existing Runoff Rate l/s
1 in 2 year	1.9	1.5 (1 in 1)
1 in 30 year	2.0	4.8
1 in 100 year	2.0	7.3
1 in 100 year +40% CC	2.0	n/a

Table 2 Proposed vs Existing runoff rates

1 in 2 year discharge rates are provided as FEH13 data does not allow for simulations at 1 in 1 year rates. The LLFA have stipulated use of FEH13 data which has been used.

See drawing 6010 for Drainage Standard Details to provide details on connectivity and attenuation systems.

Management and Maintenance

All drainage will be required to be maintained by the contractor during construction, following which the post construction phase maintenance would apply as per manufacturer recommendations and as appended to this document.

The proposed drainage system for the site adopts a series of SuDS measures to control the rate of storm water discharge and the quality of the water in line with current practice. A site management company will be in place to maintain the drainage to ensure that SuDS elements operate effectively for their lifetime.

This document should be read in conjunction with the drainage system drawings. Responsibility of maintenance will lie with the client and an appropriate management company is to be appointed to oversee future maintenance.

Overview of Maintenance

All drainage systems, whether piped systems or SuDS systems require regular maintenance. The maintenance of the SuDS system should be included alongside other regular maintenance tasks. The table below gives an overview of typical maintenance tasks and the frequency with which they need to be undertaken.

Activity	Indicative frequency	Typical tasks
Routine/regular maintenance	Monthly to annually (for normal care of SuDS)	Litter picking Inspection of inlets, outlets and control structures
Occasional maintenance	Annually up to 25 years (dependent on the design)	Silt control around components Vegetation management around components Suction sweeping of permeable paving Silt removal from catchpits, soakaways and cellular storage
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism)	Inlet/outlet repair Erosion repairs Reinstatement of edgings Reinstatement following pollution Removal of silt build up

Typical maintenance tasks and frequency for SUDs drainage

The required maintenance for each of the elements that make up the SuDS systems, is scheduled below. The following guidance is based on CIRIA C753 – The SuDS Manual.

Permeable Pavements

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing. It is proposed that the access and parking areas will be constructed utilising permeable paving techniques to mimic the natural process of water percolating into the underlying strata.

Regular inspection and maintenance is important for the effective operation of the pervious pavement. Maintenance responsibility for the pavement and its surrounding area should be placed with Landowner via a management company.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency

Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48 hours after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance\inspection	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosates applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered	As required.

	detrimental to the structural performance or a hazard to users.	
	Rehabilitation of surface and upper sub-structure. This could include replacement of the jointing and bedding material. The upper geotextiles layer may also need replacing if clogged and Terram 1000 has a life span of 25 years.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)

Geocellular Systems

Regular inspection and maintenance is required to ensure the effective long-term operation of below ground modular storage systems. Maintenance responsibility for systems should be placed with a responsible organization. Maintenance requirements for modular systems are described in the table below. Maintenance plans and schedules should be developed during the design phase. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Modular systems – operation and maintenance requirements

Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Pipes (Including Oversized) & Manholes

Pipes are intended to be the main conveyance across the development. They are intended to be dry except for during rainfall events. These have been designed to be self-cleansing where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Landowner.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

Flow Control Devices – Hydro Brake, Orifice Plates

Maintenance to be undertaken according to manufacturer's specification. As a general guide, this should include the following:

Maintenance Schedule	Required Action	Typical Frequency
Routine Maintenance	Inspection	Quarterly
	Litter / debris removal	Monthly or as required
Occasional Maintenance	Sediment removal	6 monthly
Remedial Maintenance	Repair (as a result of damage or vandalism)	As required

All drainage will be maintained as required. It is envisaged that minimal maintenance would be needed of the proposed system.

WATER BUTT SAMPLE
Product References:
Charles Bentley 210L Garden Round Plastic Water Butt.
-Includes: Water exit tap, lockable lid, 3 part stand and downpipe filler kit.
-Dimensions: Water Butt - H97 x W57 x D57cm, Stand - L40.5 x W40.5 x H30.5cm.
-Materials: Polypropylene.
-Capacity: 210 litres.
-Weight: 8.2kg.
LINK: https://www.charlesbentley.com/210l-garden-round-plastic-water-butt-set-including-tap-with-stand-and-filler-kit.html

Maintenance:
Annual inspection and removal of any debris accumulated to conserve capacity

FORMPAVE SYSTEM:
80mm thick Aquaflow꜀Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
400mm thick 10-63mm sub-base stone
SC Intergrid
SC Membrane
FORMATION LEVEL=47.60 TBC BASED UPON 35% VOID RATIO

Cellular crate attenuation . SDS Geolight o.s.a. min 0.5m deep units. min 500mm cover Storage =18m2@0.5m depth equivalent to approximately 8.55m³ IL=46.995

Connection to Existing Public Sewer. New Chamber to be formed where existing is not in proximity. Invert level to be verified. Any discrepancies to be reported to the Engineer.

Connection to existing Thames Water surface water sewer. New Chamber to be formed where existing is not in proximity.Invert level to be confirmed prior to construction. Any discrepancies to be reported to the engineer.

Flow Control Chamber. Hydrobrake O.S.A. to contain Flow control set at 2.0l/s for the 1 in 100+40% climate change event.

Propriatery treatment device (Klargester AquaTreat SWT010)

FORMPAVE SYSTEM:
80mm thick Aquaflow꜀Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
400mm thick 10-63mm sub-base stone
SC Intergrid
SC Membrane
FORMATION LEVEL=48.10 TBC BASED UPON 35% VOID RATIO

Cellular crate attenuation below permeable paving. SDS Geolight o.s.a. min 1.0m deep units. min 500mm cover Storage =28m2@1.0m depth equivalent to approximately 26.6m³ IL=46.90

FORMPAVE SYSTEM:
80mm thick Aquaflow꜀Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
400mm thick 10-63mm sub-base stone
SC Intergrid
SC Membrane
FORMATION LEVEL=48.30 TBC BASED UPON 35% VOID RATIO

FORMPAVE SYSTEM:
80mm thick Aquaflow꜀Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
400mm thick 10-63mm sub-base stone
SC Intergrid
SC Membrane
FORMATION LEVEL=48.75 TBC BASED UPON 35% VOID RATIO

Flow Control Chamber. Hydrobrake O.S.A. to contain Flow control set at 2.0l/s for the 1 in 100+40% climate change event.

FORMPAVE SYSTEM:
80mm thick Aquaflow꜀Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
400mm thick 10-63mm sub-base stone
SC Intergrid
SC Membrane
FORMATION LEVEL=49.50 TBC BASED UPON 35% VOID RATIO

Cellular crate attenuation below permeable paving. SDS Geolight o.s.a. 1.5m deep units. min 500mm cover Storage =20m2@1.5m depth equivalent to approximately 28.5m³ IL=47.360

EXISTING DRAINAGE.
1. Where existing runs and chambers are to be reused, their condition and suitability is first to be assessed and levels checked and verified, any discrepancies or required alterations are to be reported to the engineer.

BACKDROPS
2. Backdrops to suit depth of chambers and spurs,

DO NOT SCALE DRAWING -
IF IN DOUBT, ASK

GENERAL
1. Do not scale from drawing.
2. All dimensions are in metres, unless stated otherwise.
3. This drawing to be read & printed in colour.
4. This drawing to be read in conjunction with other contract drawings.

CONSTRUCTION
1. Works shall comply with the current Department of Transport Specification for Highway Works.
2. Filling of voids formed by site clearance operations shall be measured under Series 600 of the Specification.
3. Contractor is to ensure that all voids are to be filled with granular sub base material Type 1.
4. All hard material broken out under the Contract is to be disposed of to contractor's tip.

CDM (RISKS & HAZARDS)
1. Prior to commencement of construction the contractor is to liaise with all relevant statutory undertakers and protect / divert apparatus and to protect the workforce during the works. Any damage caused to the apparatus to be the responsibility of the contractor.
2. Contractor to undertake their own statutory plant checks on site prior to the commencement of excavation exercise.
3. The contractor is to make sure that any excavation should be adequately covered at night to protect both public and wildlife from becoming trapped.
4. Appropriate health and safety measures should be adhered to while working in close proximity to the existing overhead power lines.

DISCLAIMERS
1. The information contained in this drawing is based on a combination of OS and survey data provided by others and we shall not be liable for any inaccuracies or deficiencies.

KEY:
- Existing Drainage

PROPOSED FOUL WATER DRAINAGE
- Foul drain (all pipes to be 100mmØ unless otherwise stated)
- Inspection chamber (450Ø PPIC)
- Soil vent pipe / Floor Gully (point of connection below slab) - for exact locations refer to Architects layouts
- Manhole chamber (PPC Circular or Brick/PCC Rectangular)
- Existing drainage to be re-used where possible

PROPOSED SURFACE WATER DRAINAGE
- Surface water drain (all pipes to be 150mmØ UNO)
- Inspection chamber (450Ø PPIC)
- Manhole chamber (PPC Circular or Brick/PCC Rectangular) # = Catch Pit type (300dp sump)
- Rain water pipe (with rodding access) - for exact locations refer to Architects layouts
- Proposed attenuation storage
- Proposed permeable paving
- Garden Water Butt

NOTES:
1. This drawing should be read in conjunction with the the standard details
2. All building drainage works shall be carried out in accordance with the current britishleuropean standards BS EN 752, the current building regulations and the local authority building control specifications and requirements.
3. For external finished ground levels refer to architects external works drawing.
4. External covers installed in areas of paving to be square with recessed cover and frames suitable for receiving the appropriate paved surface. cover positions to be co-ordinated with the architects external layout drawings to minimise paving cutting.
5. For chambers located beneath decking. Cover levels of chambers to be set at ground level.
6. Cover in vehicular trafficked areas to be class d400. covers in non-vehicular trafficked areas to be class b125.
7. For all setting out, dimensions and current site layout refer to architects drawing. Do not scale from this drawing
8. Exact location of rainwater downpipes and all internal drainage points to be confirmed by architect. rainwater pipe outlets to be rodable.
9. The contractor shall allow for the protection, temporary and permanent support, and temporary and permanent diversion works, as necessary to all existing services
10. The contractor shall allow for keeping trenches and excavations as dry as practicable by pumping from temporary sumps and de-watering as appropriate. the point and method of discharge to be agreed with the drainage authority and environment agency
11. Disused foul and surface water drains up to 225mm diameter, together with any bed or haunch or surround within 1m of formation level shall be removed, drains over 1m below formation shall be left unless they conflict with proposed foundations of structural footprints. the ends of existing drains and sewers no longer required because of alterations to the drainage layout shall be sealed with gen3/c20 concrete. all trenches formed to removed abandoned drains shall be backfilled with selected site won material where available
12. Contractor to verify the route, level and connectivity of the receiving foul and surface water sewers downstream of the site and obtain all necessary approvals from ww prior to commencement.
13. All abandoned sewers to be surveyed by cctv to identify and confirm presence of any retained/live lateral connection
14. Room use and required drainage fixtures to be confirmed by architect
15. Roof barrier where with 5.0m of mature tree canopy
16. Inspection chambers to have min class b125 single seal cover and frame
17. Refer to drainage details.
18. Invert levels of all outfall points to be confirmed prior to commencing drainage works. Position size and depth of all existing drains and services shall be established prior to commencement on site and any discrepancies reported to engineer.
19. All drainage works to be constructed from the outfall towards the head of run to ensure the outfall can be achieved
20. All foul private pipes to be 100mm diameter unless otherwise stated. Where connected to a minimum of 1 WC pipes to be laid at a minimum gradient of 1:80, otherwise min 1:40.
21. All surface private drainage pipes to be 100mm diameter with a min gradient of 1:100 unless otherwise stated.
22. Type Z pipe bedding to be applied where cover is less than 1.2m. For pipe with a cover greater than 1.2m a type S bedding is to be applied. Additionally pipes in the vicinity of buildings.
23. All SVP stacks to terminate with an air admittance valve at the head of a run where the SVP should terminate above roof level.
24. All drainage arrangements are to be carried out to the satisfaction of the Local Authority building Inspector onsite.
25. All pipes below 300mm diameter to be vitrified clay or similar approved. All pipes above 300mm diameter to be concrete or similar.
26. Vitrified clay pipes and fittings shall comply with the relevant provisions of BS EN 295-1.
27. Concrete pipes and fittings shall comply with the relevant provisions of BS EN 1916 and BS 5911-1
28. All private drainage works to be carried out in accordance with Building Regulations Part H.
29. Private foul water drainage route under slab are shown indicatively; bedding, pipe material and penetration of property wall details by others.
30. Locations and levels of existing manholes and outfalls to be verified onsite prior to commencement of works - very important
31. Gradients are indicated for hydraulic not setting-out purposes.
32. Minimum backdrop height shall be 1m
33. All levels shown are levels above Ordnance Datum.
34. Prior to infilling of ditches or abandonment of any existing drainage courses or piped sewers the contractor shall put in place measures to maintain or divert existing drainage routes and sewers pending completion of proposed drainage systems
35. The presence of services on site should be verified prior to any construction work or intrusive investigations.

TYPE(S) OF PAVING
Permeable concrete block paving
REFERENCE
Aquaflow
SIZE
100 x 200 x 80 Thick
COLOURS
Red brindle, Golden brindle, Natural, Charcoal, Burnt red.
SETTING OUT
Aquaflow and Aquasetts:
900 herringbone with double stretcher course around all perimeters.
KERBS
Standard kerb system or Forest Edging: both to be haunched with concrete.
LAYING COURSE*
50mm depth of 5mm. single size clean crushed stone to BS882.
GEOTEXTILE
Inbitex Geotextile as noted

SUB-BASE SPECIFICATION*
The granular sub-base material shall comprise crushed rock or concrete possessing well defined edges. It must be sound, clean, non friable and free from clay or other deleterious matter.

The material must be non plastic when tested in accordance with BS1377 Test No 4 *The crushed stone used for the laying course and sub-base must have a minimum 10% fines value of 150kN when tested in accordance with BS812 Part 111.

The selected test samples not be over dried and should be soaked in water at room temperature for 48-hours before the test. The 100mm deep upper layer of sub-base material should be graded 20mm-5mm to BS882.

The 63-10mm material should be graded as follows:-

BS Sieve size	%passing
100mm	100
63mm	90-100
37.5mm	60-80
20mm	15-30
10mm	0-5

DEPTH OF SUB-BASE
It is recommended that a minimum sub-base depth of 350mm should be used. The depth of sub-base may be varied at the discretion of the engineer.

Intergrid(S) * - SC Intergrid

SURFACE FINISH
The blocks should be vibrated with a vibrating plate Type DVP75/22" or similar. Following the first pass with a vibrating plate a light dressing of 3mm single size clean stone should be applied to the surface and brushed in, approximately 2kg per m2. (available from Formpave in 40 kg bags). Blocks should again be vibrated and any debris brushed off.

Rev	Drawn	App'd	Date	Revision Description
P2	AN	AK	01.02.24	Revised to comments
P1	AN	AK	26.11.23	First Issue

Issue: PRELIMINARY

SYNTEGRA CONSULTING
Syntegra House, 63 Milford Road, Reading, RG1 8LG
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Client: -

Project: 66 Pollard Hill North

Title: PROPOSED FOUL & SW DRAINAGE GA 1 of 2

Scale: 1:100 @ A1 | Drawn By: AN
Date: NOV 2023 | Checked By: AK

Drg. No. 22-9600-6005 | Rev. P2

WATER BUTT SAMPLE
Product References:
Charles Bentley 210L Garden Round Plastic Water Butt.
-Includes: Water exit tap, lockable lid, 3 part stand and downpipe filler kit.
-Dimensions: Water Butt - H97 x W57 x D57cm, Stand - L40.5 x W40.5 x H30.5cm.
-Materials: Polypropylene.
-Capacity: 210 litres.
-Weight: 8.2kg.
LINK: https://www.charlesbentley.com /210l-garden-round-plastic-water-butt-set-including-tap-with-stand-and-filler-kit.html

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Annual inspection and removal of any debris accumulated to conserve capacity

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Proprietary treatment device (Klargester AquaTreat SWT010)

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FORMPAVE SYSTEM:
80mm thick Aquaflow₄Concrete blocks
50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
350mm thick 10-63mm sub-base stone
SC Intergrid
FORMATION LEVEL=52.42 TBC BASED UPON 35% VOID RATIO

FORMPAVE SYSTEM:
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50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
350mm thick 10-63mm sub-base stone
SC Intergrid
FORMATION LEVEL=52.9TBC BASED UPON 35% VOID RATIO

FORMPAVE SYSTEM:
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50mm thick 2-6mm clean crushed stone
Inbitex Geotextile
100mm thick 5-20mm sub-base stone
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FORMATION LEVEL=53.4 TBC BASED UPON 35% VOID RATIO

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3. Contractor is to ensure that all voids are to be filled with granular sub base material Type 1.
4. All hard material broken out under the Contract is to be disposed of to contractor's tip.

CDM (RISKS & HAZARDS)
1. Prior to commencement of construction the contractor is to liaise with all relevant statutory undertakers and protect / divert apparatus and to protect the workforce during the works. Any damage caused to the apparatus to be the responsibility of the contractor.
2. Contractor to undertake their own statutory plant checks on site prior to the commencement of excavation exercise.
3. The contractor is to make sure that any excavation should be adequately covered at night to protect both public and wildlife from becoming trapped.
4. Appropriate health and safety measures should be adhered to while working in close proximity to the existing overhead power lines.

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KEY:
- Existing Drainage

PROPOSED FOUL WATER DRAINAGE
- Foul drain (all pipes to be 100mmØ unless otherwise stated)
- Inspection chamber (450Ø PPIC)
- Soil vent pipe / Floor Gully (point of connection below slab) - for exact locations refer to Architects layouts
- Manhole chamber (PPC Circular or Brick/PCC Rectangular)
- Existing drainage to be re-used where possible

PROPOSED SURFACE WATER DRAINAGE
- Surface water drain (all pipes to be 150mmØ UNO)
- Inspection chamber (450Ø PPIC)
- Manhole chamber (PPC Circular or Brick/PCC Rectangular) # = Catch Pit type (300dp sump)
- Rain water pipe (with rodding access) - for exact locations refer to Architects layouts
- Proposed attenuation storage
- Proposed permeable paving
- Garden Water Butt

NOTES:
1. This drawing should be read in conjunction with the the standard details
2. All building drainage works shall be carried out in accordance with the current british/european standards BS EN 752, the current building regulations and the local authority building control specifications and requirements.
3. For external finished ground levels refer to architects external works drawing.
4. External covers installed in areas of paving to be square with recessed cover and frames suitable for receiving the appropriate paved surface. cover positions to be co-ordinated with the architects external layout drawings to minimise paving cutting.
5. For chambers located beneath decking. Cover levels of chambers to be set at ground level.
6. Cover in vehicular trafficked areas to be class d400. covers in non-vehicular trafficked areas to be class b125.
7. For all setting out, dimensions and current site layout refer to architects drawing. Do not scale from this drawing
8. Exact location of rainwater downpipes and all internal drainage points to be confirmed by architect. rainwater pipe outlets to be rodable.
9. The contractor shall allow for the protection, temporary and permanent support, and temporary and permanent diversion works, as necessary to all existing services
10. The contractor shall allow for keeping trenches and excavations as dry as practicable by pumping from temporary sumps and de-watering as appropriate. the point and method of discharge to be agreed with the drainage authority and environment agency
11. Disused foul and surface water drains up to 225mm diameter, together with any bed or haunch or surround within 1m of formation level shall be removed, drains over 1m below formation shall be left unless they conflict with proposed foundations of structural footprints. the ends of existing drains and sewers no longer required because of alterations to the drainage layout shall be sealed with gen3/c20 concrete. all trenches formed to removed abandoned drains shall be backfilled with selected site won material where available
12. Contractor to verify the route, level and connectivity of the receiving foul and surface water sewers downstream of the site and obtain all necessary approvals from ww prior to commencement.
13. All abandoned sewers to be surveyed by cctv to identify and confirm presence of any retained/live lateral connection
14. Room use and required drainage fixtures to be confirmed by architect
15. Root barrier where with 5.0m of mature tree canopy
16. Inspection chambers to have min class b125 single seal cover and frame
17. Refer to drainage details.
18. Invert levels of all outfall points to be confirmed prior to commencing drainage works. Position size and depth of all existing drains and services shall be established prior to commencement on site and any discrepancies reported to engineer.
19. All drainage works to be constructed from the outfall towards the head of run to ensure the outfall can be achieved
20. All foul private pipes to be 100mm diameter unless otherwise stated. Where connected to a minimum of 1 WC pipes to be laid at a minimum gradient of 1:80, otherwise min 1:40.
21. All surface private drainage pipes to be 100mm diameter with a min gradient of 1:100 unless otherwise stated.
22. Type Z pipe bedding to be applied where cover is less than 1.2m. For pipe with a cover greater than 1.2m a type S bedding is to be applied. Additionally pipes in the vicinity of buildings.
23. All SVP stacks to terminate with an air admittance valve at the head of a run where the SVP should terminate above roof level.
24. All drainage arrangements are to be carried out to the satisfaction of the Local Authority building Inspector onsite.
25. All pipes below 300mm diameter to be vitrified clay or similar approved. All pipes above 300mm diameter to be concrete or similar.
26. Vitrified clay pipes and fittings shall comply with the relevant provisions of BS EN 295-1.
27. Concrete pipes and fittings shall comply with the relevant provisions of BS EN 1916 and BS 5911-1
28. All private drainage works to be carried out in accordance with Building Regulations Part H.
29. Private foul water drainage route under slab are shown indicatively; bedding, pipe material and penetration of property wall details by others.
30. Locations and levels of existing manholes and outfalls to be verified onsite prior to commencement of works - very important
31. Gradients are indicated for hydraulic not setting-out purposes.
32. Minimum backdrop height shall be 1m
33. All levels shown are levels above Ordnance Datum.
34. Prior to infilling of ditches or abandonment of any existing drainage courses or piped sewers the contractor shall put in place measures to maintain or divert existing drainage routes and sewers pending completion of proposed drainage systems
35. The presence of services on site should be verified prior to any construction work or intrusive investigations.

TYPE(S) OF PAVING
Permeable concrete block paving
REFERENCE
Aquaflow
SIZE
100 x 200 x 80 Thick
COLOURS
Red brindle, Golden brindle, Natural, Charcoal, Burnt red.
SETTING OUT
Aquaflow and Aquasetts:
90Ø herringbone with double stretcher course around all perimeters.
KERBS
Standard kerb system or Forest Edging: both to be haunched with concrete.
LAYING COURSE*
50mm depth of 5mm. single size clean crushed stone to BS882.
GEOTEXTILE
Inbitex Geotextile as noted

SUB-BASE SPECIFICATION*
The granular sub-base material shall comprise crushed rock or concrete possessing well defined edges. It must be sound, clean, non friable and free from clay or other deleterious matter.

The material must be non plastic when tested in accordance with BS1377 Test No 4 *The crushed stone used for the laying course and sub-base must have a minimum 10% fines value of 150kN when tested in accordance with BS812 Part 111.

The selected test samples not be over dried and should be soaked in water at room temperature for 48-hours before the test. The 100mm deep upper layer of sub-base material should be graded 20mm-5mm to BS882.

The 63-10mm material should be graded as follows:-

BS Sieve size	%passing
100mm	100
63mm	90-100
37.5mm	60-80
20mm	15-30
10mm	0-5

DEPTH OF SUB-BASE
It is recommended that a minimum sub-base depth of 350mm should be used. The depth of sub-base may be varied at the discretion of the engineer.

Intergrid(S) * - SC Intergrid

SURFACE FINISH
The blocks should be vibrated with a vibrating plate Type DVP75/22" or similar. Following the first pass with a vibrating plate a light dressing of 3mm single size clean stone should be applied to the surface and brushed in, approximately 2kg per m2. (available from Formpave in 40 kg bags). Blocks should again be vibrated and any debris brushed off.

Rev	Drawn	App'd	Date	Revision Description
P2	AN	AK	01.02.24	Revised to comments
P1	AN	AK	26.11.23	First Issue

Issue: PRELIMINARY

SYNTEGRA CONSULTING
Syntegra House, 63 Milford Road, Reading, RG1 8LG
Tel: 0118 4028520
mail@syntegragroup.com www.syntegragroup.com

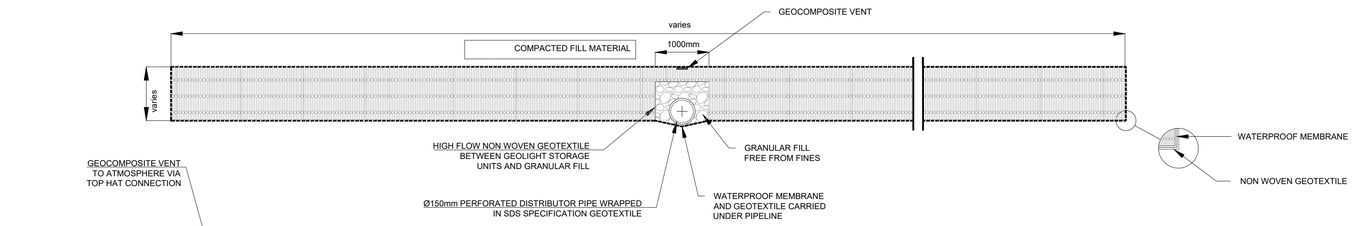
Client: -

Project: 66 Pollards Hill North

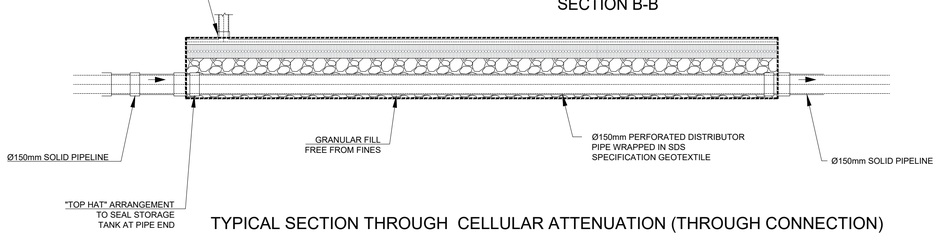
Title: PROPOSED FOUL & SW DRAINAGE GA 2 of 2

Scale: 1:100 @ A1	Drawn By: AN
Date: NOV 2023	Checked By: AK

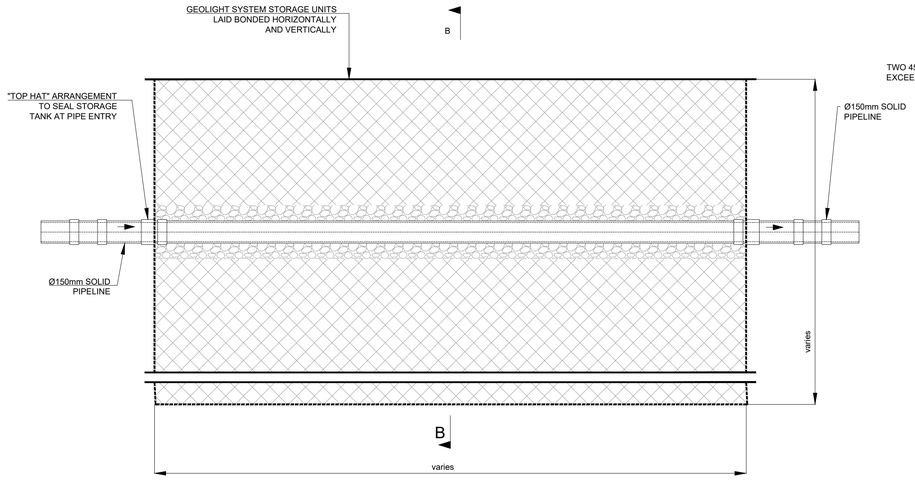
Drg. No. 22-9600-6006 Rev. P2

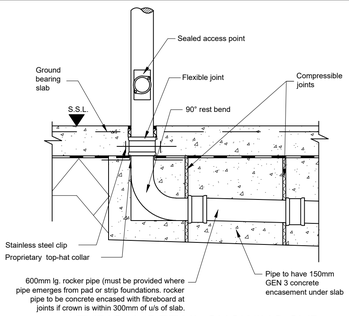


SECTION B-B



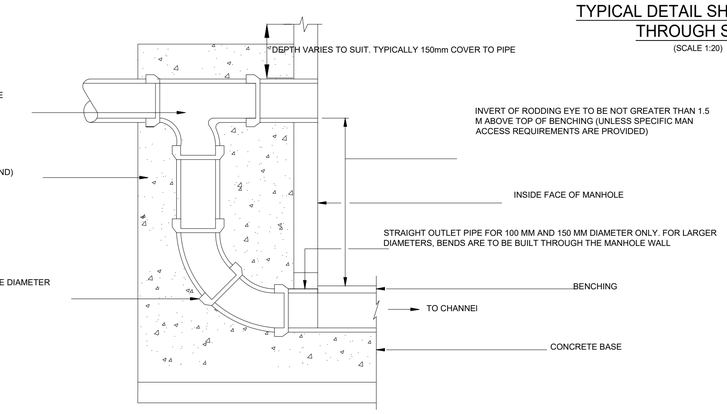
TYPICAL SECTION THROUGH CELLULAR ATTENUATION (THROUGH CONNECTION)



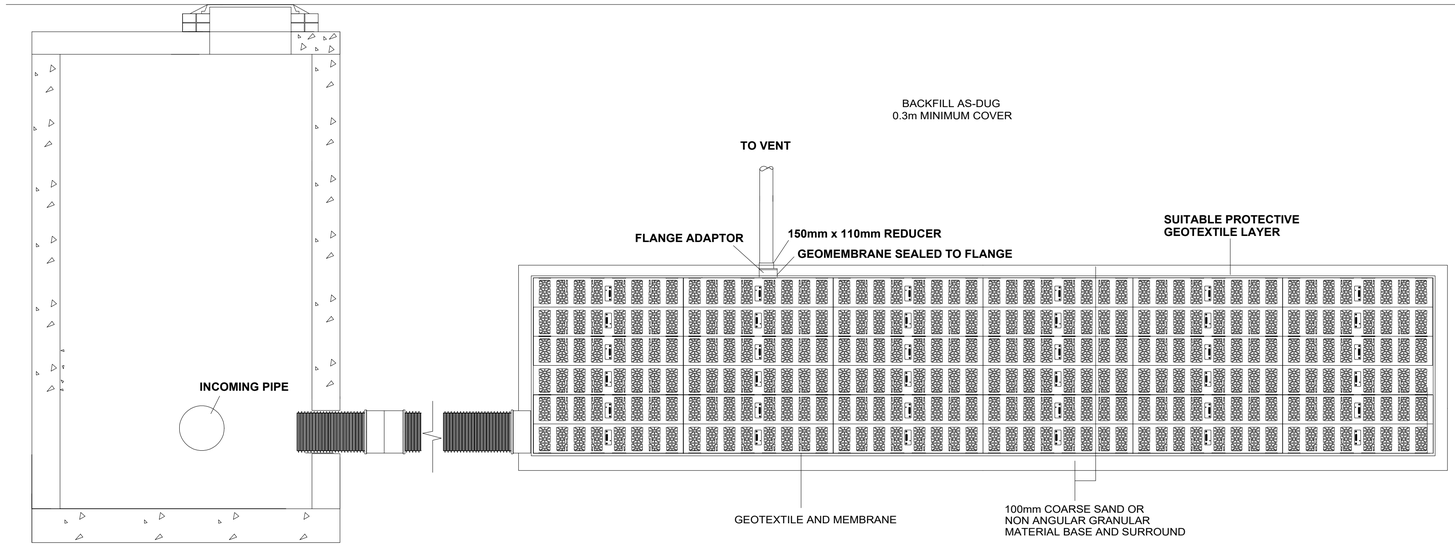


TYPICAL DETAIL SHOWING SVP THROUGH SLAB

(SCALE 1:20)



TYPICAL BACKDROP DETAIL



TYPICAL SECTION THROUGH CELLULAR ATTENUATION (END CONNECTION)

DO NOT SCALE DRAWING -
IF IN DOUBT, ASK

GENERAL
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CONSTRUCTION
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2. Filling of voids formed by site clearance operations shall be measured under Series 600 of the Specification.
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4. All hard material broken out under the Contract is to be disposed of to contractor's tip.

CDM (RISKS & HAZARDS)
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4. Appropriate health and safety measures should be adhered to while working in close proximity to the existing overhead power lines.

DISCLAIMERS
1. The information contained in this drawing is based on a combination of OS and survey data provided by others and we shall not be liable for any inaccuracies or deficiencies.

Rev	Drawn	App'd	Date	Revision Description
P1	AN	AN	01/02/24	First Issue

Issue: PRELIMINARY

SYNTEGRA CONSULTING

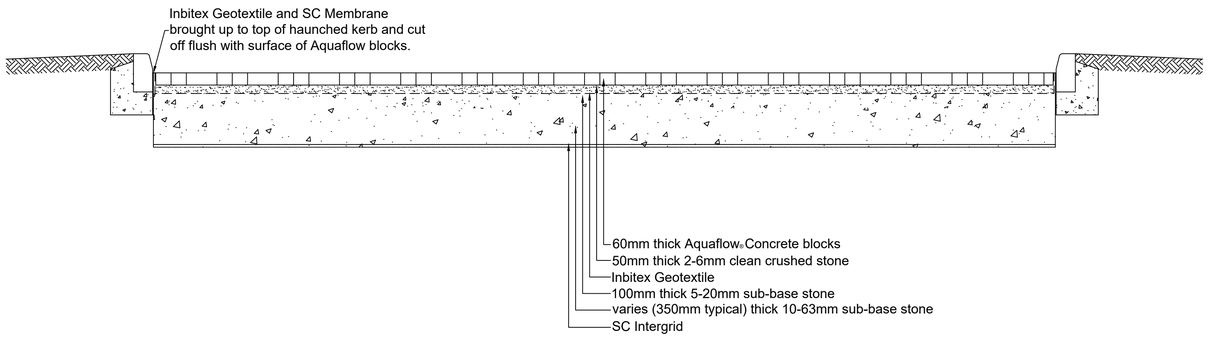
Client

Project: Wamil Court

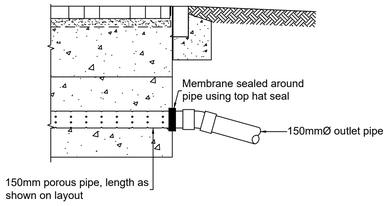
Title: Drainage Standard Details 2 of 2

Scale: 1:125 @ A1	Drawn By: A.Norris
Date: Jan 24	Checked By: A.Norris

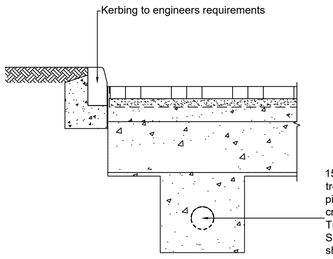
Drg. No. 22-9600-6011 Rev. P1



TYPICAL SECTION THROUGH FORMPAVE AQUAFLOW ATTENUATION SYSTEM

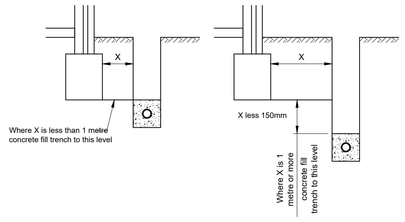


TYPICAL POROUS PIPE OUTLET DETAIL



150mmØ Perforated pipe in a 500 wide trench. 500mm min depth. Backfill to pipe and trench to be 2-6mm clean crushed stone.
Trench walls and base to be lined with SC Membrane. Where paving requires shallow outlet. Pipe to be placed at formation level.

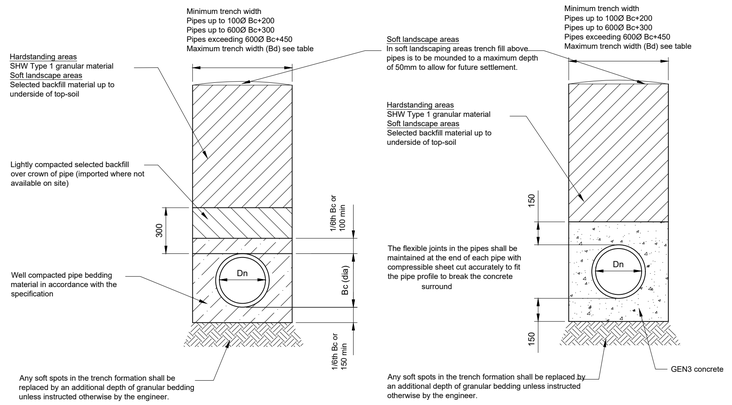
TYPICAL PERFORATED PIPE BELOW PAVING DETAIL



TYPICAL DETAILS WHERE DRAINAGE TRENCH IS DEEPER THAN FOUNDATIONS

(SCALE 1:20)

TYPICAL SECTION THROUGH ATTENUATION SYSTEM



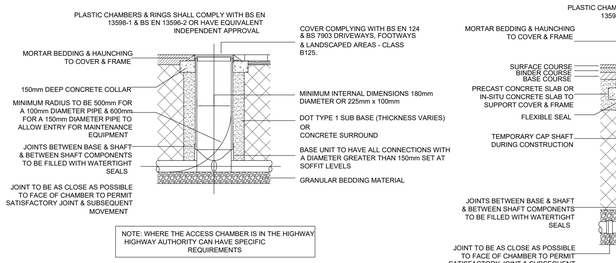
CLASS S - 360° GRANULAR SURROUND PIPE BEDDING DETAIL

(SCALE 1:20)

CLASS Z - CONCRETE BED AND SURROUND PIPE BEDDING DETAIL

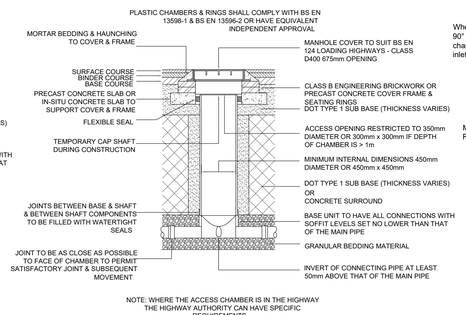
(COVER < 900mm IN VEHICULAR LOADING AND OPEN FIELD.
COVER <600mm ELSEWHERE EXCEPT UNDER BUILDINGS.)

(SCALE 1:20)



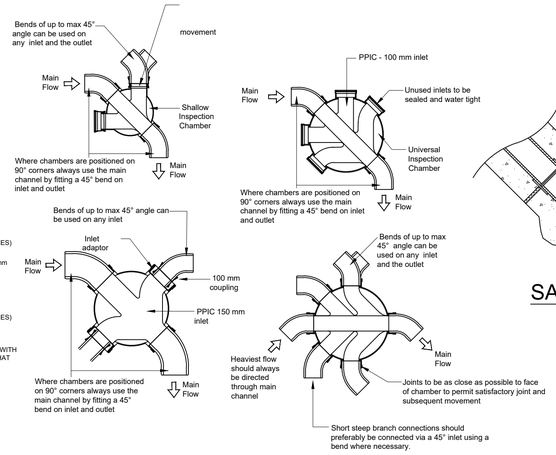
TYPICAL INSPECTION CHAMBER DETAIL 4 (FLEXIBLE MATERIAL DETAIL)

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 2m, NON ENTRY
SCALE 1:25



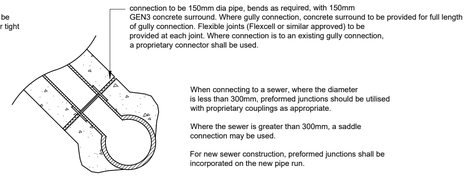
TYPICAL INSPECTION CHAMBER DETAIL 3 (FLEXIBLE MATERIAL DETAIL)

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON ENTRY
SCALE 1:25



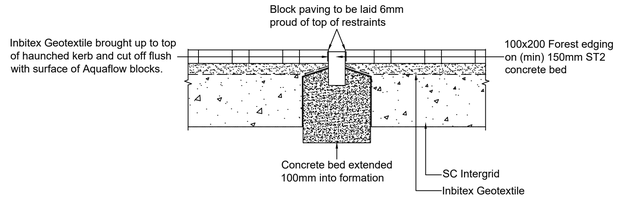
INSPECTION CHAMBER (PPIC) BASE DETAILS

(SCALE 1:20)

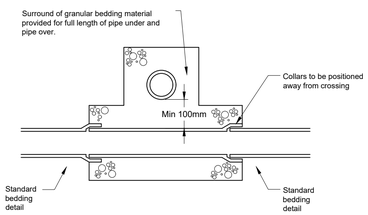


SADDLE CONNECTION TO EXISTING SEWER

(SCALE 1:20)



FULL HEIGHT RESTRAINT DETAIL



PIPE CROSSINGS DETAIL

(SCALE 1:20)

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Rev	Drawn	App'd	Date	Revision Description
P1	AN	AN	01/02/24	First Issue

Issue: PRELIMINARY

SYNTEGRA CONSULTING

Client:

Project: 66 Pollard Hill

Title: Drainage Standard Details

Scale: 1:125 @ A1	Drawn By: A.Norris
Date: Jan 24	Checked By: A.Norris

Drg. No. 22-9600-6010 | Rev. P1

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	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)	1.000
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 (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PS1	0.006	15.00	52.968	450	999.250	888.594	0.960
PS2			53.573	450	1002.771	880.098	1.626
PS3			53.674	450	1005.292	879.514	1.745
PS10	0.007	15.00	52.922	450	1006.680	894.844	0.268
PS11	0.002	15.00	53.585	450	1011.756	882.388	1.703
PS50			53.571	450	1013.300	879.306	1.712
PS6			53.645	450	1013.967	878.076	1.800
PS34	0.013	15.00	52.807	450	1006.506	898.830	1.427
PS35			53.172	450	1011.087	887.843	1.872
PS36			53.228	450	1011.532	886.805	1.935
PS37	0.003	15.00	53.208	450	1017.249	889.158	1.957
PS46			53.400	450	1019.079	885.184	2.178
PS7			53.509	450	1019.924	883.317	2.300
PS38	0.012	15.00	52.378	450	1019.047	904.359	1.032
PS39			52.932	180	1023.737	893.631	1.664
PS47	0.000	15.00	53.273	450	1021.849	891.141	2.026
PS41			53.428	450	1023.970	888.665	2.203
PS40			53.463	450	1024.907	887.513	2.319
PS42	0.004	60.00	51.827	450	1019.386	907.195	0.578
PS43	0.005	60.00	52.834	450	1024.816	895.004	1.673
PS44	0.002	15.00	52.799	450	1028.133	896.148	1.662
PS45	0.004	30.00	52.896	450	1031.083	895.432	1.779
PS8			53.056	450	1031.892	893.571	1.973
PS51			52.659	1200	1039.681	899.545	1.865
TANK 2		5.00	50.000		1027.139	916.226	2.640
S23A	0.019	60.00	50.000	1200	1031.389	921.055	2.650
PS20	0.008	15.00	49.274	450	1014.447	917.193	0.900
PS21	0.004	15.00	49.266	450	1025.694	922.174	1.046
PS22			49.253	450	1024.862	924.261	1.061
PS23			49.701	1200	1028.955	926.225	2.473
PS24			48.967	1200	1025.297	934.723	1.831
PS26	0.013	15.00	48.762	450	1009.033	929.622	0.900
PS27	0.002	15.00	48.701	450	1019.635	934.220	0.984
PS25			48.872	450	1024.641	936.302	1.827
PS19	0.012	15.00	48.712	450	1008.534	931.188	0.900
PS18	0.004	15.00	48.657	450	1018.869	935.527	0.986
PS17			48.729	450	1023.885	938.315	1.729
PS12	0.007	30.00	48.199	450	1003.095	943.668	0.950
PS13	0.004	30.00	48.091	450	1013.621	948.197	1.033
PS14			48.118	450	1016.022	947.006	1.087
PS15			48.100	600	1019.667	948.453	1.108

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PS16			48.172	1200	1020.817	945.415	1.332
PS30			48.650	450	1025.942	947.557	1.866
paving 1	0.002	60.00	48.100		1017.143	944.997	0.500
paving 2	0.002	60.00	48.800		1023.763	930.673	0.500
paving 3	0.002	60.00	49.250		1024.775	927.463	0.500
paving 4	0.002	60.00	48.600		1019.348	939.842	0.500
paving 5	0.002	60.00	50.000		1030.949	916.653	0.500
tank		5.00	52.800		1037.718	899.793	1.950
Tank 4		5.00	48.000		1018.111	946.720	1.005
TANK 3		5.00	48.600		1019.987	943.153	1.700
Paving 6	0.002	30.00	53.900		1010.424	877.694	0.900
paving 7	0.002	30.00	53.510		1016.073	882.742	0.610
paving 8	0.002	30.00	53.350		1025.158	889.965	0.580
paving 9	0.002	30.00	53.000		1028.362	892.618	0.580

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node PS16 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.015	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0067-2000-1000-2000
Invert Level (m)	46.840	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node S23A Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.010	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0061-2000-1500-2000
Invert Level (m)	47.350	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.500	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node PS51 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.009	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0079-2500-0750-2500
Invert Level (m)	50.794	Min Outlet Diameter (m)	0.100
Design Depth (m)	0.750	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.5		

Node TANK 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.360
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	1.500	20.0	0.0	1.501	0.0	0.0

Node Paving 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	14.0	0.0	0.450	14.0	0.0

Node paving 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	52.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	14.0	0.0	0.450	14.0	0.0

Node paving 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	47.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	0.0	0.500	10.0	0.0

Node paving 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	0.0	0.500	10.0	0.0

Node paving 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	0.0	0.500	10.0	0.0

Node paving 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	0.0	0.500	10.0	0.0

Node paving 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	24

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	0.0	0.500	10.0	0.0

Node tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	110

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	17.0	0.0	1.000	17.0	0.0	1.001	0.0	0.0

Node Tank 4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	46.995
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	18.0	0.0	0.500	18.0	0.0	0.501	0.0	0.0

Node TANK 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	46.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	28.0	0.0	1.000	28.0	0.0	1.001	0.0	0.0

Node paving 8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	52.770
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	14.0	0.0	0.450	14.0	0.0

Node paving 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	52.420
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.35	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	14.0	0.0	0.450	14.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS1	13	52.025	0.017	0.4	0.0049	0.0000	OK
15 minute winter	PS2	16	51.965	0.018	0.4	0.0028	0.0000	OK
15 minute winter	PS3	18	51.946	0.017	0.4	0.0027	0.0000	OK
30 minute winter	PS10	25	52.672	0.018	0.5	0.0119	0.0000	OK
30 minute winter	PS11	25	51.910	0.028	1.0	0.0051	0.0000	OK
30 minute winter	PS50	25	51.885	0.026	1.0	0.0041	0.0000	OK
30 minute winter	PS6	25	51.860	0.015	1.1	0.0024	0.0000	OK
30 minute winter	PS34	21	51.405	0.025	0.9	0.0088	0.0000	OK
30 minute winter	PS35	25	51.328	0.028	0.9	0.0045	0.0000	OK
30 minute winter	PS36	25	51.319	0.026	0.9	0.0041	0.0000	OK
15 minute winter	PS37	16	51.280	0.029	1.1	0.0056	0.0000	OK
30 minute winter	PS46	26	51.256	0.034	1.2	0.0054	0.0000	OK
30 minute winter	PS7	26	51.247	0.038	2.3	0.0060	0.0000	OK
15 minute winter	PS38	13	51.374	0.028	0.8	0.0109	0.0000	OK
15 minute winter	PS39	17	51.297	0.029	0.8	0.0007	0.0000	OK
15 minute winter	PS47	17	51.276	0.029	0.8	0.0046	0.0000	OK
30 minute winter	PS41	26	51.256	0.031	0.9	0.0050	0.0000	OK
30 minute winter	PS40	26	51.194	0.050	3.2	0.0080	0.0000	OK
15 minute summer	PS42	29	51.258	0.009	0.1	0.0027	0.0000	OK
120 minute winter	PS43	96	51.176	0.015	0.3	0.0034	0.0000	OK
180 minute winter	PS44	120	51.154	0.017	0.4	0.0031	0.0000	OK
120 minute winter	PS45	84	51.141	0.024	0.7	0.0049	0.0000	OK
30 minute winter	PS8	26	51.119	0.036	3.8	0.0057	0.0000	OK
30 minute winter	PS51	34	50.911	0.117	3.8	0.1323	0.0000	OK
180 minute winter	TANK 2	144	47.595	0.235	1.3	4.4666	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	PS1	1.000	PS2	0.4	0.354	0.028	0.0106	
15 minute winter	PS2	1.001	PS3	0.4	0.384	0.027	0.0029	
15 minute winter	PS3	1.002	PS11	0.4	0.249	0.028	0.0120	
30 minute winter	PS10	2.000	PS11	0.5	0.440	0.028	0.0153	
30 minute winter	PS11	1.003	PS50	1.0	0.467	0.069	0.0074	
30 minute winter	PS50	1.004	PS6	1.0	0.688	0.056	0.0021	
30 minute winter	PS6	1.005	PS7	1.1	0.537	0.022	0.0174	
30 minute winter	PS34	3.000	PS35	0.9	0.426	0.062	0.0254	
30 minute winter	PS35	3.001	PS36	0.9	0.420	0.065	0.0024	
30 minute winter	PS36	3.002	PS37	0.9	0.407	0.062	0.0137	
15 minute winter	PS37	3.003	PS46	1.1	0.424	0.076	0.0116	
30 minute winter	PS46	3.004	PS7	1.2	0.410	0.085	0.0066	
30 minute winter	PS7	1.006	PS40	2.3	0.534	0.129	0.0281	
15 minute winter	PS38	4.000	PS39	0.8	0.444	0.163	0.0213	
15 minute winter	PS39	4.001	PS47	0.8	0.428	0.162	0.0059	
15 minute winter	PS47	4.002	PS41	0.8	0.463	0.162	0.0065	
30 minute winter	PS41	4.003	PS40	0.9	0.453	0.182	0.0030	
30 minute winter	PS40	1.007	PS8	3.2	0.768	0.222	0.0387	
15 minute summer	PS42	5.000	PS43	0.1	0.182	0.007	0.0075	
120 minute winter	PS43	5.001	PS44	0.3	0.324	0.021	0.0036	
180 minute winter	PS44	5.002	PS45	0.4	0.293	0.028	0.0041	
120 minute winter	PS45	5.003	PS8	0.7	0.400	0.050	0.0036	
30 minute winter	PS8	1.008	PS51	3.8	0.780	0.124	0.0844	
30 minute winter	PS51	Hydro-Brake®	S23A	2.3				
180 minute winter	TANK 2	6.000	S23A	-1.3	-0.192	-0.130	0.0555	

Results for 2 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	S23A	144	47.595	0.245	2.9	0.3122	0.0000	SURCHARGED
30 minute winter	PS20	23	48.394	0.020	0.6	0.0068	0.0000	OK
30 minute winter	PS21	23	48.247	0.027	0.9	0.0064	0.0000	OK
30 minute winter	PS22	23	48.205	0.013	0.9	0.0020	0.0000	OK
120 minute winter	PS23	74	47.264	0.036	2.0	0.0411	0.0000	OK
120 minute winter	PS24	76	47.159	0.023	2.0	0.0265	0.0000	OK
30 minute winter	PS26	22	47.889	0.027	0.9	0.0120	0.0000	OK
30 minute winter	PS27	23	47.732	0.015	1.0	0.0031	0.0000	OK
30 minute winter	PS25	24	47.083	0.038	2.8	0.0060	0.0000	OK
15 minute winter	PS19	13	47.837	0.025	0.8	0.0106	0.0000	OK
15 minute winter	PS18	14	47.687	0.016	1.1	0.0039	0.0000	OK
180 minute winter	PS17	172	47.048	0.048	3.3	0.0077	0.0000	OK
30 minute summer	PS12	32	47.262	0.013	0.3	0.0041	0.0000	OK
120 minute winter	PS13	84	47.078	0.020	0.5	0.0048	0.0000	OK
120 minute summer	PS14	84	47.049	0.018	0.5	0.0029	0.0000	OK
180 minute winter	PS15	172	47.048	0.056	0.8	0.0159	0.0000	OK
180 minute winter	PS16	172	47.048	0.208	3.6	0.2354	0.0000	SURCHARGED
15 minute summer	PS30	1	46.784	0.000	1.7	0.0000	0.0000	OK
15 minute summer	paving 1	1	47.600	0.000	0.0	0.0000	0.0000	OK
120 minute summer	paving 2	104	48.306	0.006	0.1	0.0223	0.0000	OK
15 minute summer	paving 3	1	48.750	0.000	0.0	0.0000	0.0000	OK
120 minute summer	paving 4	106	48.106	0.006	0.1	0.0223	0.0000	OK
120 minute summer	paving 5	102	49.506	0.006	0.1	0.0223	0.0000	OK
30 minute winter	tank	34	50.911	0.061	1.5	0.9875	0.0000	OK
180 minute winter	Tank 4	168	47.048	0.053	0.7	0.9048	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)
180 minute winter	S23A	Hydro-Brake®	PS23	1.6				
30 minute winter	PS20	7.000	PS21	0.6	0.423	0.088	0.0174	
30 minute winter	PS21	7.001	PS22	0.9	0.803	0.131	0.0026	
30 minute winter	PS22	7.002	PS23	0.9	1.568	0.032	0.0025	
120 minute winter	PS23	1.011	PS24	2.0	0.798	0.112	0.0233	
120 minute winter	PS24	1.012	PS25	2.0	0.848	0.048	0.0044	
30 minute winter	PS26	8.000	PS27	0.9	0.749	0.133	0.0142	
30 minute winter	PS27	8.001	PS25	1.0	1.336	0.048	0.0041	
30 minute winter	PS25	1.013	PS17	2.8	0.783	0.108	0.0077	
15 minute winter	PS19	9.000	PS18	0.8	0.699	0.118	0.0132	
15 minute winter	PS18	9.001	PS17	1.1	1.345	0.055	0.0047	
180 minute winter	PS17	1.014	PS16	3.3	0.394	0.128	0.0874	
30 minute summer	PS12	10.000	PS13	0.3	0.441	0.038	0.0101	
120 minute winter	PS13	10.001	PS14	0.5	0.490	0.083	0.0028	
120 minute summer	PS14	10.002	PS15	0.5	0.521	0.028	0.0056	
180 minute winter	PS15	10.003	PS16	-0.5	0.401	-0.015	0.0382	
180 minute winter	PS16	Hydro-Brake®	PS30	1.9				22.9
15 minute summer	paving 1	20.000	PS14	0.0	0.000	0.000	0.0000	
120 minute summer	paving 2	16.000	PS27	0.1	0.502	0.007	0.0011	
15 minute summer	paving 3	14.000	PS22	0.0	0.000	0.000	0.0000	
120 minute summer	paving 4	18.000_1	PS18	0.1	0.501	0.007	0.0009	
120 minute summer	paving 5	11.000	S23A	0.1	0.501	0.007	0.0009	
30 minute winter	tank	10.000_1	PS51	-1.5	-0.675	-0.466	0.0105	
180 minute winter	Tank 4	21.000	PS15	-0.7	-0.411	-0.119	0.0135	

Results for 2 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	TANK 3	172	47.048	0.148	1.7	3.9346	0.0000	SURCHARGED
15 minute winter	Paving 6	18	53.004	0.004	0.1	0.0001	0.0000	OK
120 minute winter	paving 7	86	52.904	0.004	0.1	0.0191	0.0000	OK
15 minute summer	paving 8	29	52.773	0.003	0.1	0.0136	0.0000	OK
30 minute winter	paving 9	43	52.424	0.004	0.1	0.0203	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)
180 minute winter	TANK 3	18.000	PS16	-1.7	-0.488	-0.442	0.0188	
15 minute winter	Paving 6	3.000_1	PS6	0.1	0.965	0.003	0.0004	
120 minute winter	paving 7	5.000_1	PS46	0.1	1.083	0.003	0.0004	
15 minute summer	paving 8	7.000_1	PS41	0.1	0.412	0.002	0.0017	
30 minute winter	paving 9	9.000_1	PS45	0.1	0.977	0.003	0.0004	

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	PS1	14	52.038	0.030	1.2	0.0085	0.0000	OK
30 minute winter	PS2	25	51.978	0.031	1.2	0.0049	0.0000	OK
30 minute winter	PS3	25	51.958	0.029	1.2	0.0046	0.0000	OK
30 minute winter	PS10	24	52.683	0.029	1.4	0.0198	0.0000	OK
30 minute winter	PS11	25	51.932	0.050	3.0	0.0091	0.0000	OK
30 minute winter	PS50	25	51.904	0.045	3.0	0.0072	0.0000	OK
30 minute winter	PS6	25	51.871	0.026	3.2	0.0041	0.0000	OK
30 minute winter	PS34	22	51.425	0.045	2.7	0.0154	0.0000	OK
30 minute winter	PS35	23	51.351	0.051	2.7	0.0082	0.0000	OK
30 minute winter	PS36	23	51.339	0.046	2.7	0.0074	0.0000	OK
120 minute winter	PS37	108	51.316	0.065	2.0	0.0124	0.0000	OK
120 minute winter	PS46	108	51.316	0.094	2.2	0.0150	0.0000	OK
120 minute winter	PS7	108	51.316	0.107	4.1	0.0171	0.0000	OK
30 minute winter	PS38	22	51.398	0.052	2.5	0.0204	0.0000	OK
30 minute winter	PS39	24	51.325	0.057	2.5	0.0014	0.0000	OK
120 minute winter	PS47	110	51.316	0.069	1.5	0.0110	0.0000	OK
120 minute winter	PS41	110	51.316	0.091	1.7	0.0145	0.0000	OK
120 minute winter	PS40	108	51.316	0.172	5.8	0.0274	0.0000	SURCHARGED
120 minute winter	PS42	108	51.316	0.067	0.3	0.0199	0.0000	OK
120 minute winter	PS43	108	51.316	0.155	0.7	0.0339	0.0000	SURCHARGED
120 minute winter	PS44	110	51.316	0.179	0.9	0.0327	0.0000	SURCHARGED
120 minute winter	PS45	110	51.316	0.199	1.5	0.0405	0.0000	SURCHARGED
120 minute winter	PS8	110	51.316	0.233	7.2	0.0370	0.0000	SURCHARGED
120 minute winter	PS51	110	51.314	0.520	7.2	0.5879	0.0000	SURCHARGED
240 minute winter	TANK 2	256	48.271	0.911	2.1	17.3083	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	PS1	1.000	PS2	1.2	0.472	0.083	0.0234	
30 minute winter	PS2	1.001	PS3	1.2	0.480	0.081	0.0065	
30 minute winter	PS3	1.002	PS11	1.2	0.324	0.083	0.0266	
30 minute winter	PS10	2.000	PS11	1.4	0.595	0.079	0.0316	
30 minute winter	PS11	1.003	PS50	3.0	0.629	0.208	0.0165	
30 minute winter	PS50	1.004	PS6	3.0	0.951	0.169	0.0045	
30 minute winter	PS6	1.005	PS7	3.2	0.667	0.063	0.0402	
30 minute winter	PS34	3.000	PS35	2.7	0.557	0.186	0.0579	
30 minute winter	PS35	3.001	PS36	2.7	0.544	0.194	0.0056	
30 minute winter	PS36	3.002	PS37	2.7	0.519	0.185	0.0322	
120 minute winter	PS37	3.003	PS46	2.0	0.464	0.139	0.0417	
120 minute winter	PS46	3.004	PS7	2.2	0.425	0.155	0.0258	
120 minute winter	PS7	1.006	PS40	4.1	0.614	0.230	0.1013	
30 minute winter	PS38	4.000	PS39	2.5	0.575	0.510	0.0511	
30 minute winter	PS39	4.001	PS47	2.5	0.539	0.507	0.0145	
120 minute winter	PS47	4.002	PS41	1.5	0.462	0.303	0.0217	
120 minute winter	PS41	4.003	PS40	1.7	0.534	0.344	0.0114	
120 minute winter	PS40	1.007	PS8	5.8	0.895	0.402	0.1628	
120 minute winter	PS42	5.000	PS43	0.3	0.247	0.023	0.1676	
120 minute winter	PS43	5.001	PS44	0.7	0.365	0.049	0.0623	
120 minute winter	PS44	5.002	PS45	0.9	0.334	0.059	0.0524	
120 minute winter	PS45	5.003	PS8	1.4	0.483	0.099	0.0361	
120 minute winter	PS8	1.008	PS51	7.2	0.748	0.234	0.1728	
120 minute winter	PS51	Hydro-Brake®	S23A	2.5				
240 minute winter	TANK 2	6.000	S23A	-2.1	-0.240	-0.217	0.0555	

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S23A	256	48.271	0.921	3.8	1.1732	0.0000	SURCHARGED
30 minute winter	PS20	24	48.407	0.033	1.6	0.0112	0.0000	OK
30 minute winter	PS21	22	48.266	0.046	2.4	0.0108	0.0000	OK
30 minute winter	PS22	25	48.213	0.021	2.5	0.0034	0.0000	OK
240 minute winter	PS23	244	47.329	0.101	2.6	0.1143	0.0000	OK
240 minute winter	PS24	244	47.328	0.192	2.6	0.2174	0.0000	SURCHARGED
30 minute winter	PS26	23	47.910	0.048	2.7	0.0215	0.0000	OK
30 minute winter	PS27	23	47.745	0.028	3.2	0.0056	0.0000	OK
240 minute winter	PS25	244	47.328	0.283	7.3	0.0450	0.0000	SURCHARGED
30 minute winter	PS19	23	47.857	0.045	2.5	0.0194	0.0000	OK
30 minute winter	PS18	22	47.700	0.029	3.4	0.0069	0.0000	OK
240 minute winter	PS17	248	47.327	0.327	6.3	0.0521	0.0000	SURCHARGED
240 minute winter	PS12	244	47.327	0.078	0.5	0.0238	0.0000	OK
240 minute winter	PS13	244	47.326	0.268	0.8	0.0633	0.0000	SURCHARGED
240 minute winter	PS14	244	47.327	0.296	1.7	0.0470	0.0000	SURCHARGED
240 minute winter	PS15	244	47.327	0.335	1.9	0.0947	0.0000	SURCHARGED
240 minute winter	PS16	248	47.326	0.486	4.9	0.5501	0.0000	SURCHARGED
15 minute summer	PS30	1	46.784	0.000	1.9	0.0000	0.0000	OK
15 minute summer	paving 1	38	47.606	0.006	0.1	0.0204	0.0000	OK
120 minute winter	paving 2	98	48.309	0.009	0.2	0.0308	0.0000	OK
15 minute summer	paving 3	42	48.756	0.006	0.1	0.0223	0.0000	OK
60 minute winter	paving 4	69	48.109	0.009	0.2	0.0308	0.0000	OK
120 minute winter	paving 5	98	49.509	0.009	0.2	0.0308	0.0000	OK
120 minute winter	tank	110	51.314	0.464	4.3	7.4907	0.0000	SURCHARGED
240 minute winter	Tank 4	244	47.326	0.331	2.1	5.6663	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	S23A	Hydro-Brake®	PS23	1.6				
30 minute winter	PS20	7.000	PS21	1.6	0.558	0.236	0.0354	
30 minute winter	PS21	7.001	PS22	2.4	1.044	0.356	0.0053	
30 minute winter	PS22	7.002	PS23	2.5	2.114	0.091	0.0054	
240 minute winter	PS23	1.011	PS24	2.6	0.876	0.147	0.1400	
240 minute winter	PS24	1.012	PS25	6.2	0.791	0.149	0.0299	
30 minute winter	PS26	8.000	PS27	2.7	0.991	0.399	0.0318	
30 minute winter	PS27	8.001	PS25	3.2	1.849	0.155	0.0182	
240 minute winter	PS25	1.013	PS17	5.1	0.834	0.199	0.0379	
30 minute winter	PS19	9.000	PS18	2.5	0.948	0.368	0.0299	
30 minute winter	PS18	9.001	PS17	3.4	1.836	0.171	0.0243	
240 minute winter	PS17	1.014	PS16	4.9	0.394	0.193	0.1366	
240 minute winter	PS12	10.000	PS13	0.5	0.424	0.064	0.0822	
240 minute winter	PS13	10.001	PS14	1.6	0.492	0.260	0.0208	
240 minute winter	PS14	10.002	PS15	1.2	0.515	0.067	0.0680	
240 minute winter	PS15	10.003	PS16	-1.2	0.235	-0.038	0.0570	
240 minute winter	PS16	Hydro-Brake®	PS30	2.0				49.6
15 minute summer	paving 1	20.000	PS14	0.1	0.479	0.003	0.0005	
120 minute winter	paving 2	16.000	PS27	0.2	0.622	0.015	0.0018	
15 minute summer	paving 3	14.000	PS22	0.1	0.501	0.007	0.0006	
60 minute winter	paving 4	18.000_1	PS18	0.2	0.622	0.015	0.0014	
120 minute winter	paving 5	11.000	S23A	0.2	0.622	0.015	0.0014	
120 minute winter	tank	10.000_1	PS51	-4.3	-0.551	-1.312	0.0155	
240 minute winter	Tank 4	21.000	PS15	-2.1	-0.528	-0.334	0.0410	

Results for 30 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	TANK 3	248	47.326	0.426	2.3	11.3399	0.0000	SURCHARGED
15 minute winter	Paving 6	17	53.006	0.006	0.2	0.0002	0.0000	OK
60 minute summer	paving 7	54	52.905	0.005	0.2	0.0260	0.0000	OK
30 minute winter	paving 8	33	52.775	0.004	0.3	0.0224	0.0000	OK
60 minute winter	paving 9	48	52.427	0.007	0.3	0.0331	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	TANK 3	18.000	PS16	-2.3	-0.342	-0.608	0.0188	
15 minute winter	Paving 6	3.000_1	PS6	0.2	1.175	0.006	0.0006	
60 minute summer	paving 7	5.000_1	PS46	0.2	1.316	0.005	0.0010	
30 minute winter	paving 8	7.000_1	PS41	0.3	0.194	0.005	0.0044	
60 minute winter	paving 9	9.000_1	PS45	0.3	1.247	0.009	0.0157	

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PS1	21	52.043	0.035	1.6	0.0098	0.0000	OK
30 minute winter	PS2	25	51.983	0.036	1.6	0.0057	0.0000	OK
30 minute winter	PS3	25	51.963	0.034	1.6	0.0053	0.0000	OK
30 minute winter	PS10	24	52.688	0.034	1.9	0.0231	0.0000	OK
30 minute winter	PS11	24	51.940	0.058	4.0	0.0107	0.0000	OK
30 minute winter	PS50	24	51.911	0.052	4.0	0.0083	0.0000	OK
30 minute winter	PS6	25	51.874	0.029	4.2	0.0047	0.0000	OK
120 minute winter	PS34	120	51.492	0.111	2.1	0.0384	0.0000	OK
120 minute winter	PS35	120	51.495	0.195	2.1	0.0310	0.0000	SURCHARGED
120 minute winter	PS36	114	51.489	0.196	2.4	0.0312	0.0000	SURCHARGED
120 minute winter	PS37	114	51.488	0.237	2.6	0.0450	0.0000	SURCHARGED
120 minute winter	PS46	114	51.487	0.265	2.8	0.0422	0.0000	SURCHARGED
120 minute winter	PS7	116	51.486	0.277	5.4	0.0440	0.0000	SURCHARGED
120 minute winter	PS38	118	51.487	0.141	1.9	0.0554	0.0000	SURCHARGED
120 minute winter	PS39	118	51.486	0.218	1.9	0.0054	0.0000	SURCHARGED
120 minute winter	PS47	118	51.486	0.239	1.9	0.0380	0.0000	SURCHARGED
120 minute winter	PS41	118	51.486	0.261	2.2	0.0414	0.0000	SURCHARGED
120 minute winter	PS40	118	51.485	0.341	7.6	0.0543	0.0000	SURCHARGED
120 minute winter	PS42	118	51.484	0.235	0.5	0.0699	0.0000	SURCHARGED
120 minute winter	PS43	118	51.485	0.324	0.9	0.0710	0.0000	SURCHARGED
120 minute winter	PS44	118	51.485	0.348	1.0	0.0638	0.0000	SURCHARGED
120 minute winter	PS45	118	51.484	0.367	1.7	0.0749	0.0000	SURCHARGED
120 minute winter	PS8	118	51.485	0.402	8.7	0.0639	0.0000	SURCHARGED
120 minute winter	PS51	118	51.482	0.688	8.2	0.7785	0.0000	SURCHARGED
480 minute winter	TANK 2	424	48.591	1.231	2.2	23.3829	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	PS1	1.000	PS2	1.6	0.509	0.111	0.0290	
30 minute winter	PS2	1.001	PS3	1.6	0.518	0.108	0.0080	
30 minute winter	PS3	1.002	PS11	1.6	0.351	0.111	0.0329	
30 minute winter	PS10	2.000	PS11	1.9	0.649	0.107	0.0393	
30 minute winter	PS11	1.003	PS50	4.0	0.679	0.277	0.0204	
30 minute winter	PS50	1.004	PS6	4.0	1.035	0.225	0.0055	
30 minute winter	PS6	1.005	PS7	4.2	0.692	0.084	0.0779	
120 minute winter	PS34	3.000	PS35	2.1	0.525	0.145	0.1883	
120 minute winter	PS35	3.001	PS36	2.3	0.534	0.166	0.0199	
120 minute winter	PS36	3.002	PS37	2.1	0.492	0.144	0.1089	
120 minute winter	PS37	3.003	PS46	2.6	0.489	0.180	0.0770	
120 minute winter	PS46	3.004	PS7	2.8	0.465	0.200	0.0361	
120 minute winter	PS7	1.006	PS40	5.4	0.648	0.305	0.1147	
120 minute winter	PS38	4.000	PS39	1.9	0.542	0.387	0.0916	
120 minute winter	PS39	4.001	PS47	1.9	0.511	0.385	0.0244	
120 minute winter	PS47	4.002	PS41	1.9	0.489	0.384	0.0255	
120 minute winter	PS41	4.003	PS40	2.2	0.569	0.446	0.0116	
120 minute winter	PS40	1.007	PS8	7.4	0.931	0.514	0.1628	
120 minute winter	PS42	5.000	PS43	0.5	0.242	0.032	0.2342	
120 minute winter	PS43	5.001	PS44	0.9	0.352	0.062	0.0623	
120 minute winter	PS44	5.002	PS45	1.5	0.341	0.106	0.0524	
120 minute winter	PS45	5.003	PS8	1.6	0.503	0.116	0.0361	
120 minute winter	PS8	1.008	PS51	8.2	0.734	0.269	0.1728	
120 minute winter	PS51	Hydro-Brake®	S23A	2.5				
480 minute winter	TANK 2	6.000	S23A	-2.2	-0.181	-0.223	0.0555	

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S23A	424	48.591	1.241	3.6	1.5806	0.0000	SURCHARGED
30 minute winter	PS20	23	48.413	0.039	2.2	0.0132	0.0000	OK
30 minute winter	PS21	23	48.275	0.055	3.3	0.0129	0.0000	OK
30 minute winter	PS22	23	48.217	0.025	3.4	0.0040	0.0000	OK
480 minute winter	PS23	480	47.559	0.331	2.3	0.3747	0.0000	SURCHARGED
480 minute winter	PS24	480	47.558	0.422	2.9	0.4771	0.0000	SURCHARGED
30 minute winter	PS26	23	47.918	0.056	3.5	0.0252	0.0000	OK
30 minute winter	PS27	21	47.749	0.032	4.2	0.0063	0.0000	OK
360 minute winter	PS25	368	47.558	0.513	3.6	0.0816	0.0000	SURCHARGED
30 minute winter	PS19	22	47.865	0.053	3.2	0.0224	0.0000	OK
30 minute winter	PS18	24	47.703	0.032	4.5	0.0077	0.0000	OK
480 minute winter	PS17	480	47.557	0.557	5.4	0.0886	0.0000	SURCHARGED
480 minute winter	PS12	480	47.557	0.308	0.4	0.0941	0.0000	SURCHARGED
480 minute winter	PS13	480	47.557	0.499	0.6	0.1177	0.0000	SURCHARGED
480 minute winter	PS14	480	47.557	0.526	0.8	0.0836	0.0000	SURCHARGED
480 minute winter	PS15	480	47.557	0.565	1.5	0.1598	0.0000	SURCHARGED
480 minute winter	PS16	480	47.557	0.717	4.7	0.8104	0.0000	SURCHARGED
15 minute summer	PS30	1	46.784	0.000	2.0	0.0000	0.0000	OK
60 minute winter	paving 1	63	47.608	0.008	0.2	0.0279	0.0000	OK
30 minute summer	paving 2	50	48.309	0.009	0.2	0.0308	0.0000	OK
120 minute winter	paving 3	100	48.759	0.009	0.2	0.0307	0.0000	OK
30 minute summer	paving 4	48	48.109	0.009	0.2	0.0308	0.0000	OK
30 minute summer	paving 5	49	49.509	0.009	0.2	0.0308	0.0000	OK
120 minute winter	tank	118	51.483	0.633	5.3	10.2171	0.0000	SURCHARGED
480 minute winter	Tank 4	480	47.557	0.562	1.8	8.5586	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S23A	Hydro-Brake®	PS23	1.7				
30 minute winter	PS20	7.000	PS21	2.2	0.610	0.325	0.0444	
30 minute winter	PS21	7.001	PS22	3.3	1.133	0.488	0.0066	
30 minute winter	PS22	7.002	PS23	3.4	2.298	0.124	0.0067	
480 minute winter	PS23	1.011	PS24	2.3	0.852	0.132	0.1631	
480 minute winter	PS24	1.012	PS25	2.3	0.804	0.056	0.0299	
30 minute winter	PS26	8.000	PS27	3.5	1.076	0.517	0.0382	
30 minute winter	PS27	8.001	PS25	4.2	1.956	0.202	0.0264	
360 minute winter	PS25	1.013	PS17	3.5	0.804	0.136	0.0379	
30 minute winter	PS19	9.000	PS18	3.2	1.016	0.472	0.0356	
30 minute winter	PS18	9.001	PS17	4.5	1.883	0.223	0.0287	
480 minute winter	PS17	1.014	PS16	4.5	0.473	0.177	0.1366	
480 minute winter	PS12	10.000	PS13	0.4	0.378	0.051	0.0897	
480 minute winter	PS13	10.001	PS14	0.7	0.473	0.122	0.0208	
480 minute winter	PS14	10.002	PS15	1.5	0.446	0.083	0.0680	
480 minute winter	PS15	10.003	PS16	-1.0	0.400	-0.033	0.0570	
480 minute winter	PS16	Hydro-Brake®	PS30	2.0				65.9
60 minute winter	paving 1	20.000	PS14	0.2	0.581	0.005	0.0008	
30 minute summer	paving 2	16.000	PS27	0.2	0.622	0.015	0.0018	
120 minute winter	paving 3	14.000	PS22	0.2	0.620	0.015	0.0010	
30 minute summer	paving 4	18.000_1	PS18	0.2	0.622	0.015	0.0014	
30 minute summer	paving 5	11.000	S23A	0.2	0.622	0.015	0.0014	
120 minute winter	tank	10.000_1	PS51	-5.3	-0.683	-1.626	0.0155	
480 minute winter	Tank 4	21.000	PS15	-1.8	-0.399	-0.287	0.0410	

Results for 100 year Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	TANK 3	480	47.557	0.657	2.1	17.4642	0.0000	SURCHARGED
30 minute winter	Paving 6	28	53.007	0.007	0.3	0.0002	0.0000	OK
60 minute winter	paving 7	49	52.906	0.006	0.3	0.0305	0.0000	OK
15 minute winter	paving 8	22	52.775	0.004	0.3	0.0224	0.0000	OK
60 minute winter	paving 9	36	52.427	0.007	0.3	0.0336	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)
480 minute winter	TANK 3	18.000	PS16	-2.1	-0.270	-0.532	0.0188	
30 minute winter	Paving 6	3.000_1	PS6	0.3	1.330	0.009	0.0008	
60 minute winter	paving 7	5.000_1	PS46	0.3	1.163	0.008	0.0155	
15 minute winter	paving 8	7.000_1	PS41	0.3	0.120	0.005	0.0063	
60 minute winter	paving 9	9.000_1	PS45	0.3	1.343	0.009	0.0157	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PS1	23	52.050	0.042	2.3	0.0119	0.0000	OK
30 minute winter	PS2	23	51.991	0.044	2.3	0.0069	0.0000	OK
30 minute winter	PS3	23	51.969	0.040	2.3	0.0064	0.0000	OK
30 minute winter	PS10	24	52.694	0.040	2.6	0.0271	0.0000	OK
30 minute winter	PS11	23	51.953	0.071	5.7	0.0130	0.0000	OK
30 minute winter	PS50	23	51.922	0.063	5.7	0.0100	0.0000	OK
30 minute winter	PS6	23	51.880	0.035	6.0	0.0055	0.0000	OK
120 minute winter	PS34	126	51.787	0.407	2.9	0.1401	0.0000	SURCHARGED
120 minute winter	PS35	126	51.794	0.494	2.9	0.0785	0.0000	SURCHARGED
120 minute winter	PS36	120	51.786	0.492	3.6	0.0783	0.0000	SURCHARGED
120 minute winter	PS37	120	51.785	0.534	3.4	0.1016	0.0000	SURCHARGED
120 minute winter	PS46	120	51.785	0.563	3.4	0.0896	0.0000	SURCHARGED
120 minute winter	PS7	120	51.785	0.576	6.6	0.0916	0.0000	SURCHARGED
120 minute winter	PS38	120	51.786	0.440	2.7	0.1734	0.0000	SURCHARGED
120 minute winter	PS39	120	51.786	0.518	2.7	0.0129	0.0000	SURCHARGED
120 minute winter	PS47	120	51.785	0.538	2.5	0.0856	0.0000	SURCHARGED
120 minute winter	PS41	120	51.785	0.560	2.7	0.0891	0.0000	SURCHARGED
120 minute winter	PS40	120	51.785	0.641	8.8	0.1019	0.0000	SURCHARGED
120 minute winter	PS42	120	51.785	0.536	0.6	0.1591	0.0000	FLOOD RISK
120 minute winter	PS43	120	51.785	0.624	1.2	0.1365	0.0000	SURCHARGED
120 minute winter	PS44	120	51.784	0.647	1.3	0.1185	0.0000	SURCHARGED
120 minute winter	PS45	120	51.784	0.667	2.1	0.1361	0.0000	SURCHARGED
120 minute winter	PS8	120	51.784	0.701	9.2	0.1114	0.0000	SURCHARGED
120 minute winter	PS51	122	51.780	0.986	8.8	1.1157	0.0000	SURCHARGED
480 minute winter	TANK 2	536	49.843	2.483	2.5	28.5095	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	PS1	1.000	PS2	2.3	0.557	0.160	0.0380	
30 minute winter	PS2	1.001	PS3	2.3	0.571	0.155	0.0104	
30 minute winter	PS3	1.002	PS11	2.3	0.385	0.159	0.0427	
30 minute winter	PS10	2.000	PS11	2.6	0.709	0.147	0.0493	
30 minute winter	PS11	1.003	PS50	5.7	0.746	0.394	0.0264	
30 minute winter	PS50	1.004	PS6	5.7	1.141	0.320	0.0071	
30 minute winter	PS6	1.005	PS7	6.0	0.720	0.118	0.0821	
120 minute winter	PS34	3.000	PS35	2.9	0.565	0.203	0.2096	
120 minute winter	PS35	3.001	PS36	3.3	0.568	0.238	0.0199	
120 minute winter	PS36	3.002	PS37	2.8	0.518	0.195	0.1089	
120 minute winter	PS37	3.003	PS46	3.2	0.500	0.225	0.0770	
120 minute winter	PS46	3.004	PS7	3.3	0.445	0.237	0.0361	
120 minute winter	PS7	1.006	PS40	6.3	0.654	0.352	0.1147	
120 minute winter	PS38	4.000	PS39	2.7	0.573	0.547	0.0916	
120 minute winter	PS39	4.001	PS47	2.5	0.534	0.498	0.0244	
120 minute winter	PS47	4.002	PS41	2.4	0.506	0.489	0.0255	
120 minute winter	PS41	4.003	PS40	2.6	0.590	0.517	0.0116	
120 minute winter	PS40	1.007	PS8	8.6	0.953	0.601	0.1628	
120 minute winter	PS42	5.000	PS43	0.5	0.242	0.038	0.2342	
120 minute winter	PS43	5.001	PS44	1.2	0.351	0.082	0.0623	
120 minute winter	PS44	5.002	PS45	1.4	0.346	0.098	0.0524	
120 minute winter	PS45	5.003	PS8	1.9	0.510	0.133	0.0361	
120 minute winter	PS8	1.008	PS51	8.8	0.635	0.288	0.1728	
120 minute winter	PS51	Hydro-Brake®	S23A	2.8				
480 minute winter	TANK 2	6.000	S23A	-2.5	-0.203	-0.251	0.0555	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S23A	536	49.843	2.493	4.1	3.1765	0.0000	FLOOD RISK
30 minute winter	PS20	22	48.421	0.047	3.0	0.0157	0.0000	OK
30 minute winter	PS21	22	48.286	0.066	4.5	0.0155	0.0000	OK
30 minute winter	PS22	24	48.222	0.030	4.7	0.0047	0.0000	OK
480 minute winter	PS23	552	47.998	0.770	2.5	0.8713	0.0000	SURCHARGED
480 minute winter	PS24	552	47.997	0.861	2.5	0.9733	0.0000	SURCHARGED
480 minute winter	PS26	552	47.996	0.134	1.1	0.0601	0.0000	SURCHARGED
480 minute winter	PS27	552	47.996	0.279	1.5	0.0558	0.0000	SURCHARGED
480 minute winter	PS25	552	47.996	0.951	5.5	0.1512	0.0000	SURCHARGED
480 minute winter	PS19	552	47.996	0.184	1.0	0.0783	0.0000	SURCHARGED
480 minute winter	PS18	552	47.995	0.324	1.5	0.0776	0.0000	SURCHARGED
480 minute winter	PS17	552	47.995	0.995	6.8	0.1583	0.0000	SURCHARGED
480 minute winter	PS12	552	47.994	0.745	0.6	0.2280	0.0000	FLOOD RISK
480 minute winter	PS13	552	47.994	0.936	0.8	0.2209	0.0000	FLOOD RISK
480 minute winter	PS14	552	47.994	0.963	0.8	0.1531	0.0000	FLOOD RISK
480 minute winter	PS15	552	47.994	1.002	1.6	0.2835	0.0000	FLOOD RISK
480 minute winter	PS16	552	47.994	1.154	5.0	1.3050	0.0000	FLOOD RISK
15 minute summer	PS30	1	46.784	0.000	2.0	0.0000	0.0000	OK
480 minute winter	paving 1	552	47.994	0.394	0.3	1.4029	0.0000	FLOOD RISK
60 minute winter	paving 2	59	48.310	0.010	0.3	0.0373	0.0000	OK
30 minute summer	paving 3	46	48.759	0.009	0.2	0.0307	0.0000	OK
60 minute winter	paving 4	58	48.110	0.010	0.3	0.0374	0.0000	OK
480 minute winter	paving 5	536	49.843	0.343	0.3	1.2291	0.0000	FLOOD RISK
120 minute winter	tank	122	51.781	0.931	5.9	15.0276	0.0000	SURCHARGED
480 minute winter	Tank 4	552	47.994	0.999	2.2	8.5586	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S23A	Hydro-Brake®	PS23	2.2				
30 minute winter	PS20	7.000	PS21	3.0	0.663	0.443	0.0555	
30 minute winter	PS21	7.001	PS22	4.5	1.238	0.667	0.0083	
30 minute winter	PS22	7.002	PS23	4.7	2.505	0.171	0.0208	
480 minute winter	PS23	1.011	PS24	2.5	0.864	0.143	0.1631	
480 minute winter	PS24	1.012	PS25	4.4	0.796	0.107	0.0299	
480 minute winter	PS26	8.000	PS27	1.1	0.779	0.162	0.0904	
480 minute winter	PS27	8.001	PS25	1.5	1.295	0.072	0.0424	
480 minute winter	PS25	1.013	PS17	5.5	0.793	0.212	0.0379	
480 minute winter	PS19	9.000	PS18	1.0	0.739	0.147	0.0877	
480 minute winter	PS18	9.001	PS17	1.5	1.227	0.075	0.0449	
480 minute winter	PS17	1.014	PS16	5.0	0.473	0.195	0.1366	
480 minute winter	PS12	10.000	PS13	0.5	0.359	0.066	0.0897	
480 minute winter	PS13	10.001	PS14	0.7	0.470	0.121	0.0208	
480 minute winter	PS14	10.002	PS15	0.9	0.446	0.053	0.0680	
480 minute winter	PS15	10.003	PS16	-0.8	0.400	-0.027	0.0570	
480 minute winter	PS16	Hydro-Brake®	PS30	2.0				78.4
480 minute winter	paving 1	20.000	PS14	0.4	0.479	0.011	0.0405	
60 minute winter	paving 2	16.000	PS27	0.3	0.701	0.022	0.0023	
30 minute summer	paving 3	14.000	PS22	0.2	0.620	0.015	0.0010	
60 minute winter	paving 4	18.000_1	PS18	0.3	0.701	0.022	0.0019	
480 minute winter	paving 5	11.000	S23A	1.2	0.622	0.089	0.0346	
120 minute winter	tank	10.000_1	PS51	-5.9	-0.757	-1.803	0.0155	
480 minute winter	Tank 4	21.000	PS15	-2.2	-0.358	-0.358	0.0410	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 96.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	TANK 3	552	47.994	1.094	2.9	26.6133	0.0000	SURCHARGED
30 minute winter	Paving 6	28	53.008	0.008	0.4	0.0003	0.0000	OK
60 minute winter	paving 7	48	52.907	0.007	0.4	0.0349	0.0000	OK
30 minute winter	paving 8	33	52.776	0.006	0.5	0.0282	0.0000	OK
60 minute winter	paving 9	49	52.428	0.008	0.5	0.0417	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)
480 minute winter	TANK 3	18.000	PS16	-2.9	-0.366	-0.743	0.0188	
30 minute winter	Paving 6	3.000_1	PS6	0.4	1.452	0.012	0.0010	
60 minute winter	paving 7	5.000_1	PS46	0.4	1.251	0.010	0.0156	
30 minute winter	paving 8	7.000_1	PS41	0.5	0.115	0.009	0.0070	
60 minute winter	paving 9	9.000_1	PS45	0.5	1.336	0.014	0.0159	