STRUCTURAL, CIVIL AND BUILDING CONSULTANTS

LONG ACRE
THE STREET
WALBERTON
ARUNDEL
WEST SUSSEX
BN18 0PY

DRAINAGE STRATEGY REPORT

For:

MAXWELL HOMES LTD

Cowan Consultancy Ltd
3 Turnberry House
4400 Parkway
Whiteley
Fareham
Hampshire
PO15 7FJ

Telephone: 01489 577488
Fax: 01489 579873

www.cowanconsult.co.uk
consultants@cowanconsult.co.uk

Landguard Manor
Landguard Manor Road
Shanklin
Isle of Wight
PO37 7JB

Telephone: 01983 868497
Fax: 01983 865781

www.cowanconsult.co.uk
iow@cowanconsult.co.uk

TB/466543/eg
05 March 2025

INDEX

1.0 INTRODUCTION

1.1 This report has been prepared by Cowan Consultancy Limited (CCL) for Maxwell Homes Ltd.

1.2 This drainage strategy report is required to supplement the drainage strategy for the subject site and forms part of the planning application relating to the drainage.

2.0 GEOLOGY OF THE AREA

2.1.1 The site lies on OS grid reference (Eastings) 496725 (Northings) 106175 and Site GPS Coordinates 50.847068, -0.62739869.

2.1.2 By reference to the British Geological Maps, the site would be expected to lie within a bedrock of London Clay Formation. Overlain by superficial deposits of River Terrace Deposits – Sand, silt and clay.

2.1.3 On site trial pits, used for infiltration testing, showed that clay soils were present from approximately 400mm below ground level.

2.1.4 The infiltration testing at 3 locations on site showed that infiltration rates of between 4.561 E-05 and 2.362 E-06 m/s were achieved.

2.1.5 Winter ground water monitoring data was also collected for the site between December 2023 and January 2024. It showed that ground water reached a peak winter level of 0.149m bgl in January 2024

3.0 SITE DESCRIPTION

3.1.1 The site for the proposed development consists of approximately 0.4450 ha and is part of the gardens attached to the existing bungalow Long Acre.

3.1.2 The site consists of mainly grass with some trees / hedges, but towards the south is an existing access into the site

3.1.3 The site is adjoined to the north by fields which are to be developed in the near future by Barratt Developments. The west the site is existing residential properties and to the east of the site is the access to Field Close. The south of the site is The Street.

3.1.4 The site is relatively flat but with a gradual slope from south east to north west.

3.1.5 The proposed access to the site is via the existing access off The Street.

3.1.6 The proposed site development consists of six houses, together with detached single garages, associated landscaping, amenity space and parking.

4.0 SURFACE WATER DRAINAGE STRATEGY

4.1 Pre-Development

4.2 The site is currently mainly undeveloped land and its previous use was as gardens for Long Acre. The current surface water drainage for Long Acre is currently unknown but it is likely to discharge into the piped watercourse along the southern boundary.

4.3 The site slopes generally from north to south. Any rainfall which does not naturally permeate into the ground will ultimately discharge off site into the road on the south boundary which then drains into the highways drains via road gulleys..

4.4 Southern Water sewer record plans indicate that there are no public surface water or combined sewers in the vicinity of the site.

4.5 Post-Development

4.6 The site is currently undeveloped and therefore any proposed development will increase the impermeable area, thus increasing surface water runoff rates and volumes of water.

4.7 Referencing the site investigation data, it would suggest that disposing of the surface water via infiltration on site is not feasible due to the high groundwater encountered. Even though the infiltration testing on site showed that the soils were permeable, albeit at a relatively slow rate, groundwater was recorded at 0.149m bgl, this meant that a 1.0m freeboard of unsaturated ground beneath infiltration base level is unachievable on site.

4.8 The Arun Watercourse map for the area shows that there is a piped watercourse that runs adjacent to the southern boundary of the site. This pipe runs from east to west and discharges into a pond located to the south west of the site.

4.9 Groundwater was recorded at 0.149m bgl would compromise the attenuation storage features if the underside and sides are permeable, therefore these have been designed as impermeable lined.

4.10 An adjacent large Barratt Developments site has its surface water discharging at a controlled rate into the piped watercourse at Field Close, which is upstream of Long Acre.

4.11 The drainage strategy utilises a shallow attenuation system for the surface water drainage, which conveys the surface water flows to the southern boundary of the site, where it discharges into the piped watercourse. Via the piped watercourse, the surface water enters the pond to the south west

4.12 HR Wallingford Greenfield Run-off calculations (see Appendix C) show that a pre-development greenfield run-off rate (QBAR) for the site is 2.44 l/s, equating to 5.48 l/s/ha. The proposed total impermeable area of the site is 0.1355 ha and therefore the discharge into the piped watercourse should be limited to 0.74 l/s Due to the risk of blockages at the discharge location in the ditch, then a minimum discharge rate of 1 l/s has applied to the design.

4.13 It is common for discharge rates to be set at 2 l/s to minimise the risk of blockages to orifices < 50mm, but, with the inclusion of Contraflow control chambers, trash screens and permeable paving, the risk of blockages is somewhat reduced and, therefore, the run-off rate can be limited to 1 l/s. A comprehensive management & maintenance regime shall be implemented to ensure that the risk of blockages is minimised.

4.14 Attenuation of the storm water will be provided by the access road granular sub-base and the sub-base attenuation. Network calculations within Appendix B shows that there is sufficient storage within the system to prevent flooding in the 1 in 100 year storm event plus a 45% increase allowance for climate change.

4.15 A 300mm depth of a combined Type 3 sub-base and shallow sub-base replacement attenuation crates, have been proposed underneath the permeable paved driveways. Varying depths of Type 3 sub-base have been proposed under the permeable tarmac access road areas. The sub-bases have been designed to attenuate and convey the surface water. Water from roofs is drained to the permeable sub-base via Aco Multi-Drain channels & pipework through diffuser units, with a silt trap proceeding each connection into the sub-base. The permeable access road sub-bases are piped into the piped watercourse via hyro-brake flow control chamber, limiting the discharge to a rate of 1 l/s.

4.16 The scheme has allowed for a climate change allowance of 45%. 10% urban creep has been applied to all impermeable areas except the access roads.

4.17 The proposed Drainage Strategy can be seen in Appendix A

5.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS

5.1 SuDS have been incorporated into the design to intercept rainfall and convey the water to the ditch outfall to the north-east of the site.

5.2 As well as providing storm water storage, the SuDS features are within the design to ensure the water quality entering the surface water body is acceptable.

5.3 In accordance with section 26.3 of CIRIA C753 recommends the use of simple index approach for assessing the minimum water quality management requirements and this method has been used to assess the suitability of above proposals as follows:

(i) From table 26.2, residential roads runoff is considered low pollution hazard

(ii) From table 26.2 the following hazard indices are applicable;
Total suspended solids – 0.5
Metals – 0.4
Hydrocarbons – 0.4

(iii) From table 26.3, the indicative SuDS mitigation indices for permeable paving is as follows;
Total suspended solids – 0.7
Metals – 0.6
Hydrocarbons – 0.7

5.4 From the above it can be seen that the provision of permeable paving exceeds the pollution mitigation requirements.

5.5 The incorporation of SuDS into drainage design shall also seek to provide biodiversity and amenity benefits to the development. The provision of green roofs to the garages provides biodiversity to the scheme. Also a bioretention area has been provided towards the east of the site which is to manage exceedance flows within the site. There are amenity benefits from the inclusion of green roofs and the bioretention area, in that they improve the appearance of the development and improve wildlife habitats.

6.0 FOUL DRAINAGE STRATEGY

6.1 Pre-Development

6.2 The site is currently being used as gardens for the existing property. The Topo survey indicates some manholes within the site, which appear to be flowing towards The Street.

6.3 Southern Water sewer record plans indicate that there is an existing 150mm diameter public foul sewer in The Street.

6.4 Post-Development

6.5 The proposed site consists of 6 residential dwellings. Using the recommendations within Sewers for Adoption 7th Edition for an allowance of 4000 litres per unit per day, this will result in a peak flow of 0.27 l/s from the proposed development.

6.6 The proposals are to create a new connection to the existing foul sewer in The Street.

6.7 As part of this planning application, a pre-planning capacity check with Southern Water is concurrently and expecting to receive feedback in due course.

7.0 LIDSEY TREATMENT CATCHMENT AREA

7.1 The Arun DC interactive maps show the site to be located within the Lidsey Treatment Catchment Area.

7.2 The impact on the foul drainage network shall be reduced by ensuring there is suitable capacity within the Southern Water foul sewer network, see section **6.7.**

7.3 The implementation of greywater harvesting shall be considered to help reduce the pressure on the existing mains sewerage system. Also, careful selection of wastewater producing products will help reduce the foul flows further.

7.4 The planning validation requirements interactive map shows the site to be located within the Lidsey Local Risk Zone LFRZ_003

7.5 Referring to the WSCC Surface Water Management Plan, LFRZ_003 has a medium pluvial flood risk and high risk of fluvial, groundwater and public sewer flood risk.

7.6 Sections **5.2** – **5.4** within this report shows that the proposed surface water drainage system for the site will maintain the appropriate water quality of the surface water.

7.7 Referring to the Preferred Interventions Table 10.5 – LFRZ_003 OPTIONS, the options of intervention which shall be implemented to Long Acre are;

- Option Ref. 7 – *Rainwater harvesting*. The installation of water butts to all properties and garages shall be proposed

- Option Ref. 12 – *Sealing of manhole covers and protecting gullies*. Where appropriate, new manholes across the site can be sealed.

- Option Ref. 26 – *Raising doorway / access threshold*. The proposed FFL's of the plots has been set a minimum 150mm above existing ground levels installation of water butts to all properties and garages shall be proposed

7.8 Implementing options mentioned above and the full surface water drainage system will minimise any further risk to flooding from the development. This is discussed in more detail within the site specific Flood Risk Assessment.

Signature…[redacted]
TIM BUTT [redacted]
For and on behalf of Cowan Consultancy Limited

APPENDIX A

DRAINAGE STRATEGY DRAWING

SURFACE WATER DRAINAGE LAYOUT

1:150

DO NOT SCALE THIS DRAWING

! CDM 2015 - RESIDUAL RISKS !

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NOTES

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8. The Contractor is responsible for specifying product and codes and ordering of drainage materials.

9. Contractor to ensure that new sewers are laid and installed in like for like basis.

10. New adoptable pipework to be vitrified clay type and to be constructed to the following specifications. Systems that are resistant to a jetting pressure of 4000psi. Systems that minimise the number of joints in the system, by using 3metre pipe length. Systems that do not have lip seal joints, hence preventing root ingress.

11. All non-uPVC (adoptable) pipe connection to manholes shall be provided with a 'rocker pipe' of 600mm effective length in accordance with Cl E6.6 of 'Sewers for Adoption'.

12. Precast concrete manhole units shall comply with the relevant provisions of BS EN 1917 and BS 5911-3.

13. The diameter of the pipes to be diverted are 300mm for storm and 150mm for foul. The new pipes are to of 300mm and 150mm for foul diameter respectively. Any abandoned pipes or manholes are to be grubbed out or sealed up.

14. Cover grades are in accordance with BS497 Pt 1
Cover Grades : D400 - carriageways.
B125 - carriageways for slow traffic.
A15 - inaccessible to vehicles

15. All drainage pipes within development site to be 100mm dia unless shown otherwise.

16. All uPVC drainage to be installed to BS5955 Pt6 and in strict accordance with the manufacturers instructions.

17. All uPVC drainage products to conform to BS EN1401 & Kite mark certified in accordance with specification.

18. All adoptable drainage and associated works to comply with the latest Part E - Civil Engineering Specification of 'Sewer for Adoption'.

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20. Any works with tree RPA's are to be to the approval and under the supervision of the arborist.

21. Where existing / proposed trees are to be located within close proximity of drainage features then, side of drainage pipe trenches / sides of permeable paved build-ups to be lined with Green Tech gtRootbarrier 260 Permeable, to protect drainage features from tree root intrusion (refer to Green Tech Installation Guide)

EXISTING DRAINAGE TO THE HOUSE AT LONG ACRE
Informed by the current property owners via email on 08.02.2025

"1982 Original Downpipe fed Garden Pond in front of House. Mid 80's Dug soakaways in front of garden and piped 2 no Downpipes to same. Mid to end of 1990's following Pitched Roof over Garages, Dug large Soakaway in centre of walled Garden and piped 2 no Downpipes into same."

This correspondence shows that none of the existing house drainage system will be disrupted by the new site.

KEY

- Permeable tarmac Access Road & Parking areas with Type 3 Sub-base. Impermeable lined (SEE DETAIL 1)
- Pemeable paved driveway areas with a combination of Type 3 Sub-base and Polypipe Permavoid attenuation crates. Impermeable lined (SEE DETAIL 2)
- Green Roof areas to promote biodiversity and slow down water run-off, by controlling at source.
- ACO Multi-Drain M100D 10.0 constant depth (or similar approved) drainage channel laid with no fall (or to follow ground levels adjacent to the building) and incorporating a sump unit with silt bucket at each outlet
- Surface water drainage pipes
- Surface Water Inspection Chamber
- Concrete Baffle (See Detail)
- +14.100 (+13.500) (0.400) Cover level / (formation level) / Type 3 Sub-base thickness (and / or attenuation crate)
- Diffuser Unit
- Existing overland flow routes
- Exceedance flow routes

Date	By	Revision	QA'D	Chk'd	Ref
04.03.25	TB	Revisions following Arun drainage engineer comments			P1

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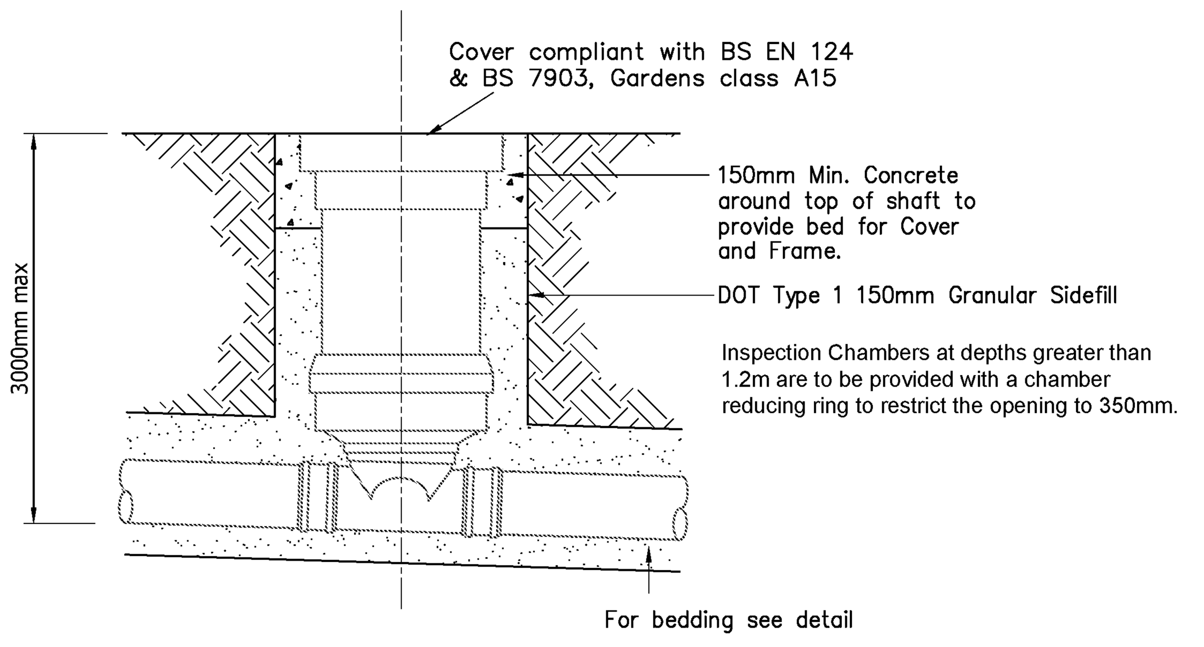
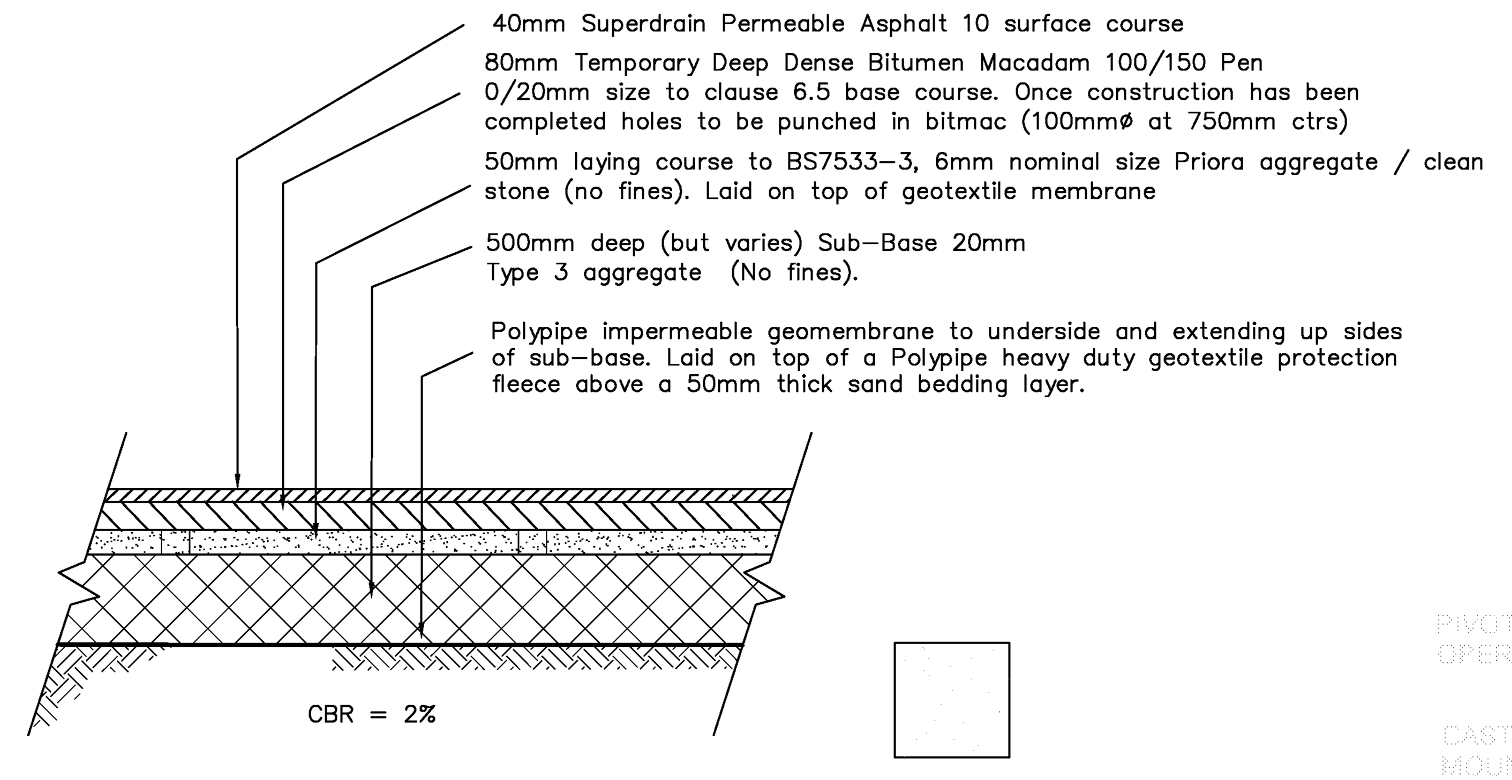
Title: SURFACE WATER DRAINAGE LAYOUT

Date	SEP 2024	Scale	As Shown @ A1	Drg. No.
Drawn	TB	Chk'd EG	QA'D EG	466543–201P1



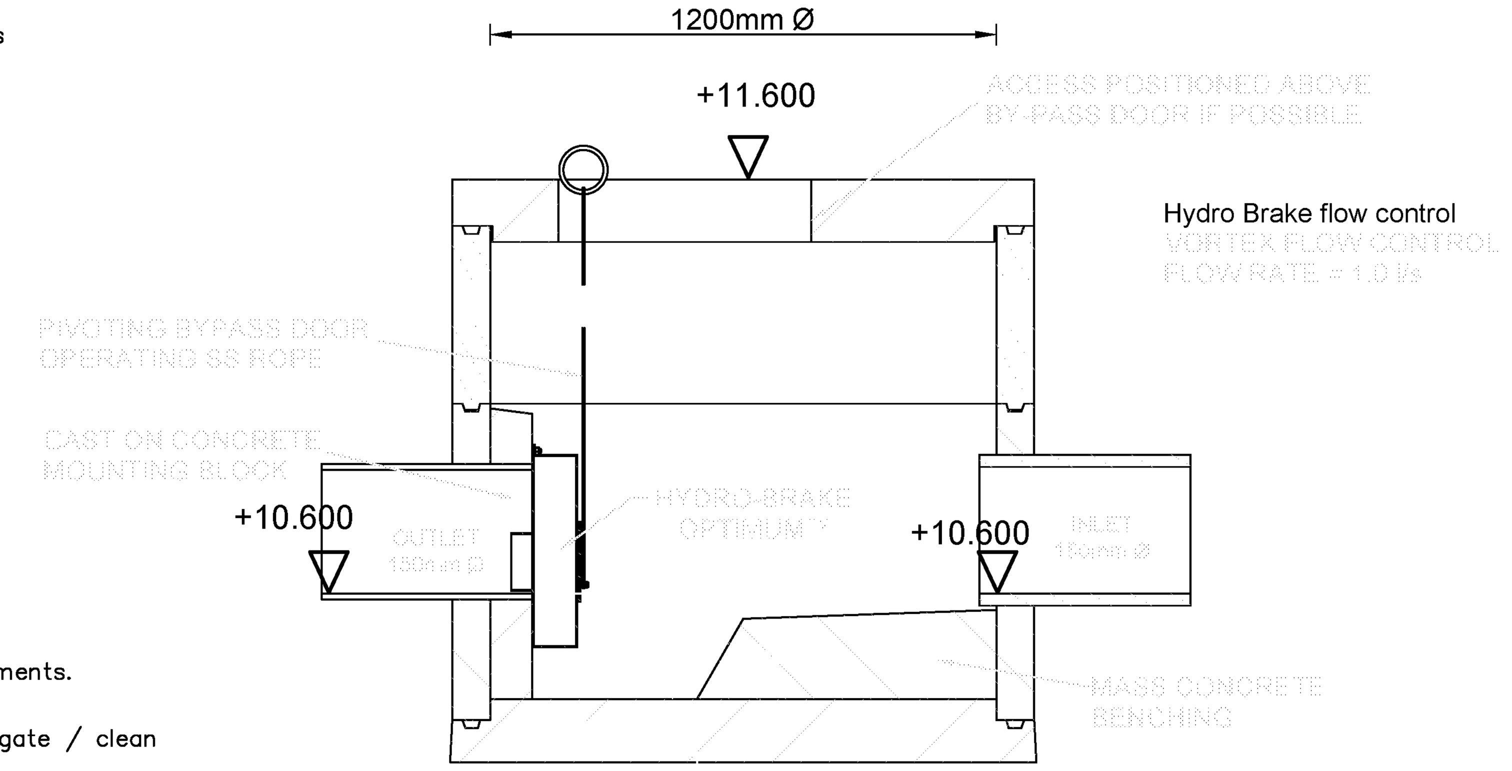
450mmø INSPECTION CHAMBER GRADE 'A' NON-LOAD BEARING INSTALLATION

1:10



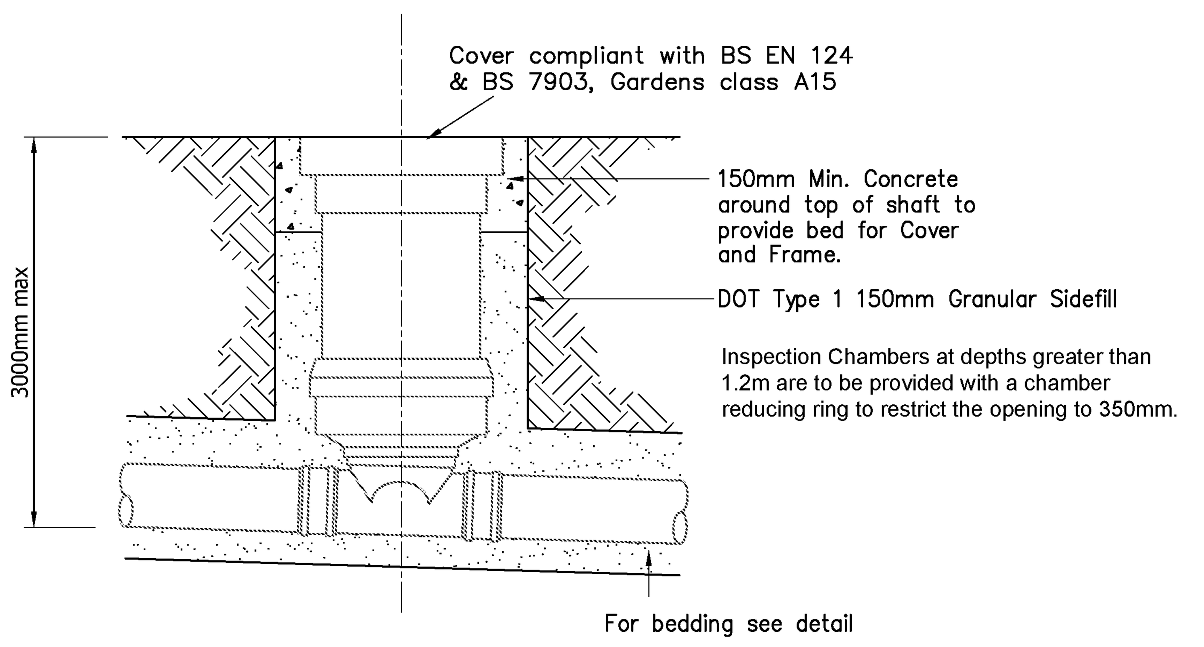
DETAIL 1 - NEW ACCESS ROAD - TYPICAL SECTION

SCALE 1: 20



FLOW CONTROL CHAMBER DETAIL

SCALE 1:15



450mmø INSPECTION CHAMBER GRADE 'A' NON-LOAD BEARING INSTALLATION

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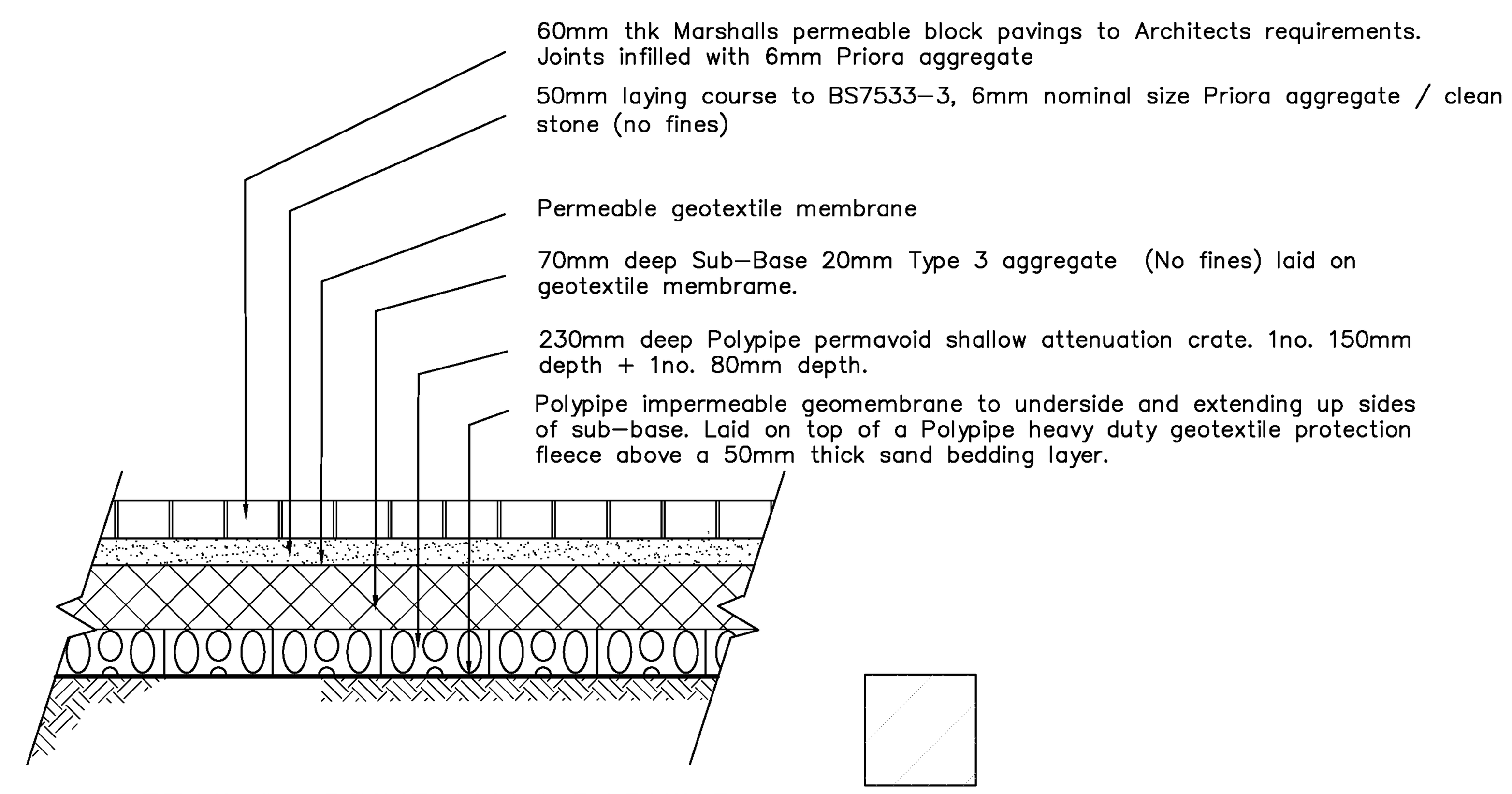

DETAIL 2 - DRIVEWAY & PARKING CONSTRUCTION - TYPICAL SECTION

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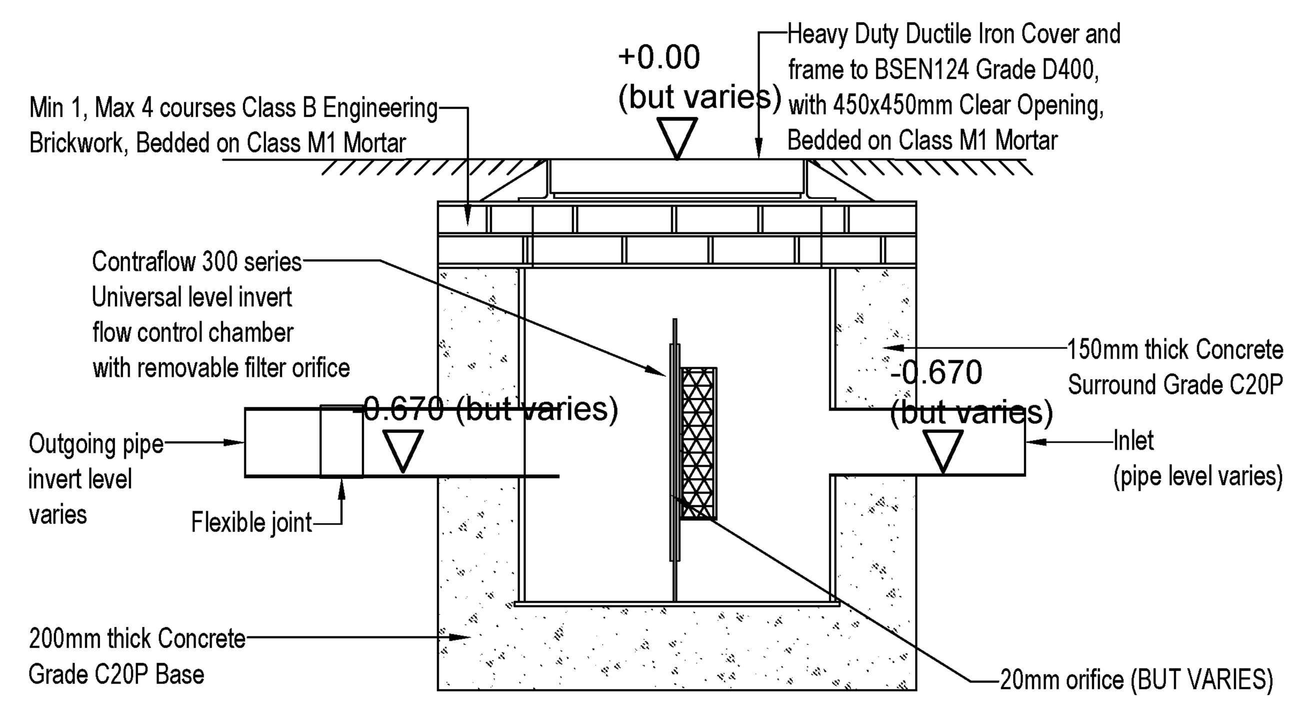
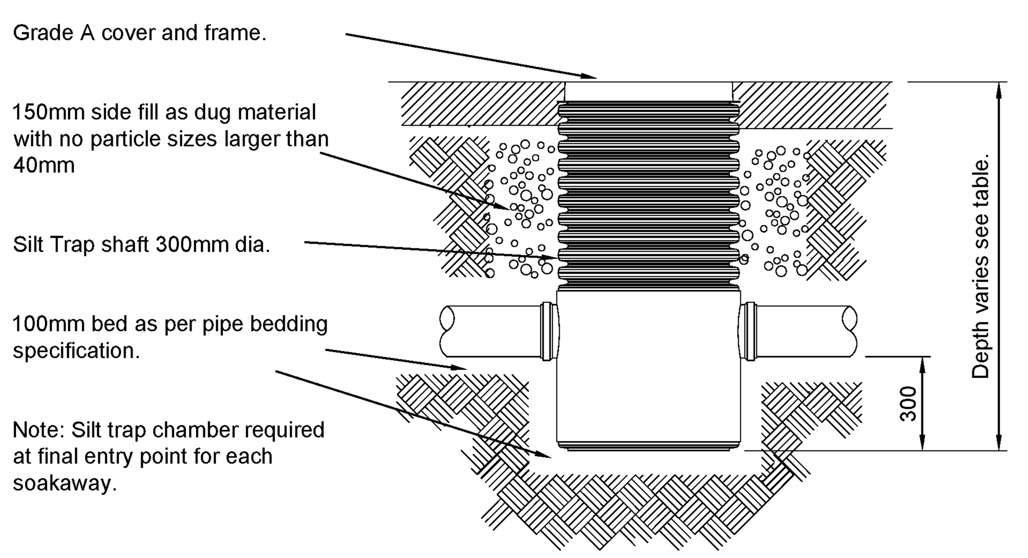


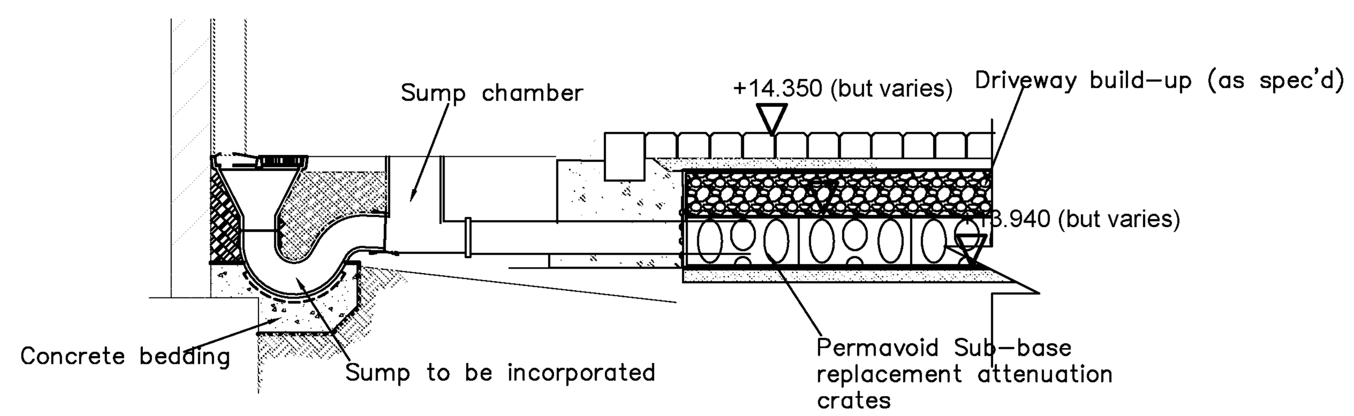
CONTROFLOW FLOW CONTROL CHAMBER DETAIL

SCALE 1:15



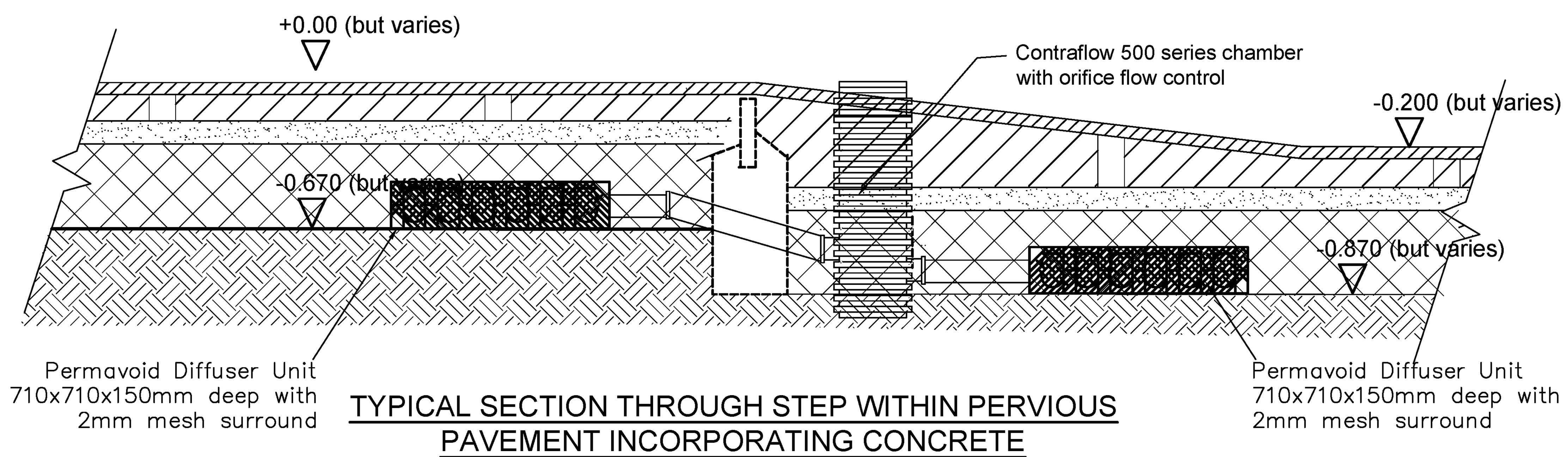
TYPICAL DETAIL FOR SILT TRAP NON-LOAD BEARING AREAS

1:20



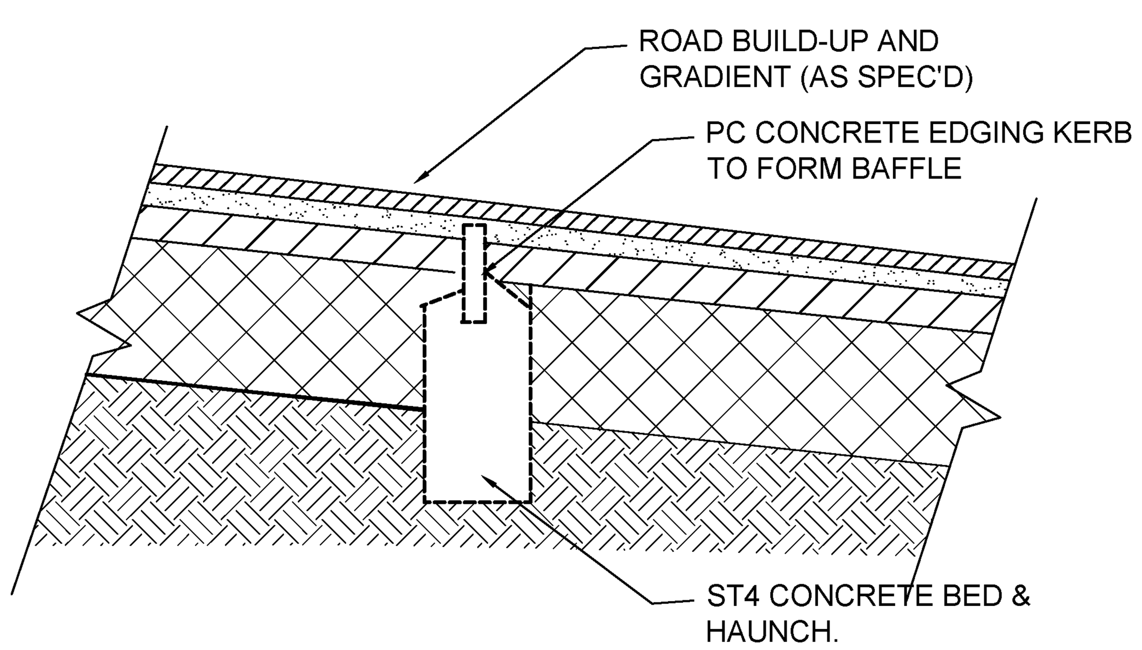
ACO MULTIDRAIN M100D DRAINAGE INTO TYPE PERMAVOID ATTENUATION TYPICAL DETAIL

SCALE 1:20



TYPICAL SECTION THROUGH STEP WITHIN PERVIOUS PAVEMENT INCORPORATING CONCRETE EDGING BAFFLE

SCALE 1: 15



TYPICAL DETAIL - CONCRETE BAFFLE WITHIN PERMEABLE PAVED BUILD-UP

SCALE 1:15

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Date	Scale	Drg. No.
SEP 2024	AS SHOWN @ A1	466543-202P
Drawn: TB	Chk'd: EG / QA'D: EG	

APPENDIX B

NETWORK CALCULATIONS

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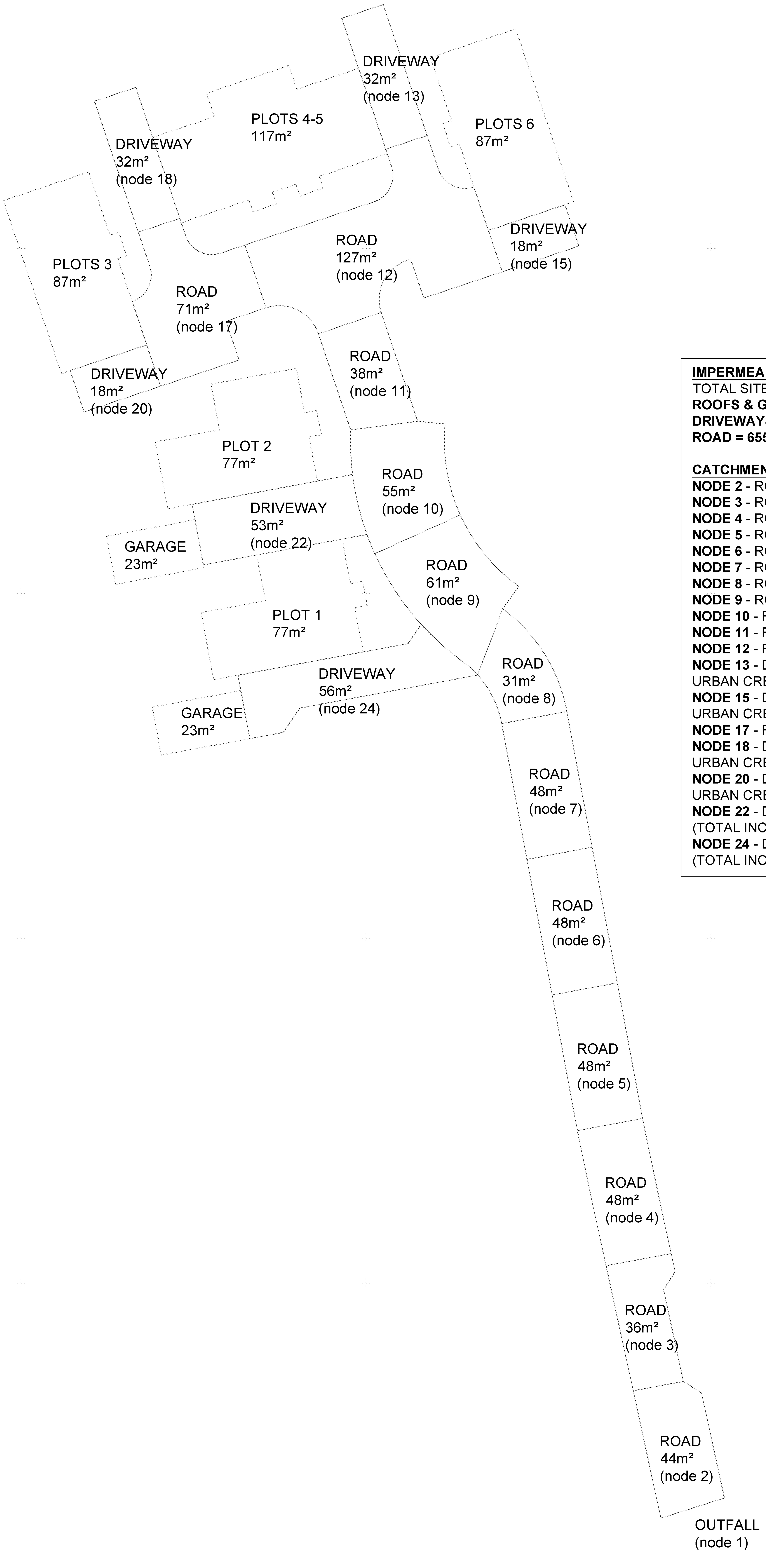

IMPERMEABLE SURFACE AREAS
TOTAL SITE AREA = 4,283m²
ROOFS & GARAGES = 491m²
DRIVEWAYS = 209m²
ROAD = 655m²

CATCHMENT AREAS
NODE 2 - ROAD = 44m²
NODE 3 - ROAD = 36m²
NODE 4 - ROAD = 48m²
NODE 5 - ROAD = 48m²
NODE 6 - ROAD = 48m²
NODE 7 - ROAD = 48m²
NODE 8 - ROAD = 31m²
NODE 9 - ROAD = 61m²
NODE 10 - ROAD = 55m²
NODE 11 - ROAD = 38m²
NODE 12 - ROAD = 127m²
NODE 13 - DRIVEWAY = 44m² + PLOT 5 = 59m² (TOTAL INC 10 % URBAN CREEP = 113m²)
NODE 15 - DRIVEWAY = 18m² + PLOT 6 = 87m² (TOTAL INC 10 % URBAN CREEP = 106m²)
NODE 17 - ROAD = 71m²
NODE 18 - DRIVEWAY = 32m² + PLOT 4 = 59m² (TOTAL INC 10 % URBAN CREEP = 100m²)
NODE 20 - DRIVEWAY = 13m² + PLOT 3 = 87m² (TOTAL INC 10 % URBAN CREEP = 110m²)
NODE 22 - DRIVEWAY = 53m² + PLOT 2 = 77m² + GARAGE = 23m² (TOTAL INC 10 % URBAN CREEP = 168m²)
NODE 24 - DRIVEWAY = 56m² + PLOT 1 = 77m² + GARAGE = 23m² (TOTAL INC 10 % URBAN CREEP = 172m²)

IMPERMEABLE SURFACES LAYOUT
1:150

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Date	SEP 2024	Scale	As Shown @ A1	Drg. No.
Drawn	TB	Chk'd EG	QA'D EG	466543-200P1

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	0.310
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
24	0.015	5.00	13.850		496724.700	106169.395	0.410
22	0.014	5.00	14.100		496718.645	106180.517	0.560
20	0.011	5.00	14.300		496706.863	106190.732	0.410
18	0.009	5.00	14.350		496708.442	106206.704	0.410
17	0.007	5.00	14.250		496711.876	106196.549	0.670
15	0.010	5.00	14.350		496737.167	106200.742	0.410
13	0.009	5.00	14.350		496726.299	106212.599	0.410
12	0.016	5.00	14.200		496722.141	106199.907	0.670
11	0.004	5.00	14.100		496725.023	106191.095	0.670
10	0.006	5.00	14.000		496727.542	106183.363	0.670
9	0.006	5.00	13.850		496731.132	106175.913	0.670
8	0.003	5.00	13.700		496735.667	106168.774	0.670
7	0.005	5.00	13.400		496738.130	106161.150	0.620
6	0.005	5.00	13.100		496739.957	106151.236	0.620
5	0.005	5.00	12.800		496741.784	106141.436	0.620
4	0.005	5.00	12.500		496743.715	106131.695	0.620
3	0.004	5.00	12.200		496745.752	106121.442	0.620
2	0.004	5.00	11.900		496747.513	106112.905	0.620
1			11.600	1200	496748.698	106108.729	1.000

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW-IC 01			11.490	900	496750.235	106106.348	1.290

Links (Results)

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2	4.014	70.9	24.7	0.470	0.850	0.137	0.0	61	3.666
3	1.874	33.1	23.9	0.470	0.470	0.132	0.0	95	2.038
4	1.711	30.2	23.3	0.470	0.470	0.129	0.0	99	1.882
5	1.755	31.0	22.4	0.470	0.470	0.124	0.0	95	1.909
6	1.752	31.0	21.5	0.470	0.470	0.119	0.0	92	1.891
7	1.742	30.8	20.7	0.470	0.470	0.114	0.0	90	1.865
8	1.784	31.5	19.8	0.520	0.470	0.110	0.0	86	1.884
9	1.342	23.7	16.5	0.520	0.520	0.091	0.0	92	1.448
10	1.357	24.0	15.4	0.520	0.520	0.085	0.0	88	1.440
22	1.159	9.1	2.5	0.460	0.570	0.014	0.0	36	0.996
11	1.115	19.7	11.9	0.520	0.520	0.066	0.0	84	1.166
12	1.044	18.4	11.2	0.520	0.520	0.062	0.0	85	1.094
17	0.680	12.0	4.9	0.520	0.520	0.027	0.0	67	0.645
15	1.277	10.0	1.8	0.310	0.570	0.010	0.0	29	0.963
13	1.356	10.7	1.6	0.310	0.570	0.009	0.0	26	0.974
20	1.557	12.2	2.0	0.310	0.570	0.011	0.0	27	1.138
18	1.419	11.1	1.6	0.310	0.570	0.009	0.0	26	1.019
6.000	1.497	11.8	2.7	0.310	0.570	0.015	0.0	32	1.212
1.013	1.898	33.5	24.7	0.850	0.840	0.137	0.0	96	2.071

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	✓	2 year (l/s)	0.3	500 year (l/s)	1.8
Summer CV	1.000	Drain Down Time (mins)	240	10 year (l/s)	0.6	Check Discharge Volume	✓
Winter CV	1.000	Additional Storage (m³/ha)	0.0	30 year (l/s)	1.0	100 year 360 minute (m³)	35
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	100 year (l/s)	1.3		

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	10	0	0	100	45	0	0
10	40	0	0	500	45	0	0
30	40	0	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	SPR	0.37	Growth Factor 100 year	3.19	Q 10 year (l/s)	0.6
Greenfield Method	IH124	Region	7	Growth Factor 500 year	4.49	Q 30 year (l/s)	1.0
Positively Drained Area (ha)	0.133	Growth Factor 2 year	0.88	Betterment (%)	0	Q 100 year (l/s)	1.3
SAAR (mm)	722	Growth Factor 10 year	1.62	QBar	0.4	Q 500 year (l/s)	1.8
Soil Index	3	Growth Factor 30 year	2.40	Q 2 year (l/s)	0.3		

Pre-development Discharge Volume

Site Makeup	Greenfield	Soil Index	3	Return Period (years)	100	Betterment (%)	0
Greenfield Method	FSR/FEH	SPR	0.37	Climate Change (%)	0	PR	0.376
Positively Drained Area (ha)	0.133	CWI	108.444	Storm Duration (mins)	360	Runoff Volume (m³)	35

Node SW-IC 01 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.375	1440	0.375

Node 1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	10.600	Product Number	CTL-SHE-0054-1000-0500-1000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node 2 Online Orifice Control

Flap Valve	x	Invert Level (m)	11.280	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.030		

Node 3 Online Orifice Control

Flap Valve	x	Invert Level (m)	11.580	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.030		

Node 4 Online Orifice Control

Flap Valve	x	Invert Level (m)	11.880	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.030		

Node 5 Online Orifice Control

Flap Valve	x	Invert Level (m)	12.180	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.030		

Node 6 Online Orifice Control

Flap Valve	x	Invert Level (m)	12.480	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.028		

Node 7 Online Orifice Control

Flap Valve	x	Invert Level (m)	12.780	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.028		

Node 8 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.030	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.026		

Node 9 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.180	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.027		

Node 10 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.330	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.028		

Node 11 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.430	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.026		

Node 12 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.530	Design Flow (l/s)	0.6	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Depth (m)	0.300	Diameter (m)	0.026		

Node 13 Offline Orifice Control

Flap Valve	x	Loop to Node	12	Invert Level (m)	13.940	Diameter (m)	0.010	Discharge Coefficient	0.600

Node 15 Offline Orifice Control

Flap Valve	x	Loop to Node	12	Invert Level (m)	13.940	Diameter (m)	0.012	Discharge Coefficient	0.600

Node 17 Online Orifice Control

Flap Valve	x	Invert Level (m)	13.580	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.024		

Node 18 Offline Orifice Control

Flap Valve	x	Invert Level (m)	13.940	Design Flow (l/s)	0.5	Discharge Coefficient	0.600
Loop to Node	17	Design Depth (m)	0.300	Diameter (m)	0.010		

Node 20 Offline Orifice Control

Flap Valve	x	Loop to Node	17	Invert Level (m)	13.890	Diameter (m)	0.010	Discharge Coefficient	0.600

Node 22 Offline Orifice Control

Flap Valve	x	Invert Level (m)	13.540	Design Flow (l/s)	0.5	Discharge Coefficient	0.600
Loop to Node	10	Design Depth (m)	0.300	Diameter (m)	0.010		

Node 24 Offline Orifice Control

Flap Valve	x	Loop to Node	8	Invert Level (m)	13.440	Diameter (m)	0.010	Discharge Coefficient	0.600

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.850	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.280	Length (m)	9.450	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	75	Slope (1:X)	30.0		

Node 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	3.900	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.580	Length (m)	9.200	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	30.0		

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	11.880	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	30.0		

Node 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	12.180	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	30.0		

Node 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	12.480	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	150	Slope (1:X)	30.0		

Node 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	12.780	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	104	Slope (1:X)	30.0		

Node 8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.800	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.030	Length (m)	6.458	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	160	Slope (1:X)	30.0		

Node 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	6.100	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.180	Length (m)	8.971	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	200	Slope (1:X)	40.0		

Node 10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.089	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.330	Length (m)	6.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	128	Slope (1:X)	60.0		

Node 11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.917	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.430	Length (m)	4.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	88	Slope (1:X)	60.0		

Node 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	16.323	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.530	Length (m)	7.780	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	72	Slope (1:X)	100.0		

Node 13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	3.200	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.940	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Node 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	3.160	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.940	Length (m)	5.850	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Node 17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.149	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.580	Length (m)	7.760	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	88	Slope (1:X)	100.0		

Node 18 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	3.200	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.940	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Node 20 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	5.850	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.890	Length (m)	3.160	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Node 22 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	4.460	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.540	Length (m)	11.880	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Node 24 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.81	Width (m)	3.730	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	13.440	Length (m)	15.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	500.0		

Approval Settings

Node Size	✓	Maximum Cover Depth (m)	3.000	Surcharged Depth	✓
Node Losses	✓	Backdrops	✓	Return Period (years)	2
Link Size	✓	Minimum Backdrop Height (m)	0.200	Maximum Surcharged Depth (m)	0.100
Minimum Diameter (mm)	100	Maximum Backdrop Height (m)	1.500	Flooding	✓
Link Length	✓	Full Bore Velocity	✓	Return Period (years)	100
Maximum Length (m)	100.000	Minimum Full Bore Velocity (m/s)	1.000	Time to Half Empty	✓
Coordinates	✓	Maximum Full Bore Velocity (m/s)	3.000	Return Period (years)	2
Accuracy (m)	1.000	Proportional Velocity	✓	Discharge Rates	✓
Crossings	✓	Return Period (years)	2	2 year (l/s)	0.3
Cover Depth	✓	Minimum Proportional Velocity (m/s)	0.750	10 year (l/s)	0.6
Minimum Cover Depth (m)	0.310	Maximum Proportional Velocity (m/s)	3.000	30 year (l/s)	1.0

Approval Settings

100 year (l/s)	1.3	Discharge Volume	✓
500 year (l/s)	1.8	100 year 360 minute (m³)	35

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year +10% CC 15 minute summer	127.183	35.988	10 year +40% CC 30 minute winter	145.953	58.852
2 year +10% CC 15 minute winter	89.251	35.988	10 year +40% CC 60 minute summer	141.079	37.283
2 year +10% CC 30 minute summer	83.190	23.540	10 year +40% CC 60 minute winter	93.730	37.283
2 year +10% CC 30 minute winter	58.379	23.540	10 year +40% CC 120 minute summer	89.256	23.588
2 year +10% CC 60 minute summer	56.522	14.937	10 year +40% CC 120 minute winter	59.300	23.588
2 year +10% CC 60 minute winter	37.552	14.937	10 year +40% CC 180 minute summer	68.726	17.685
2 year +10% CC 120 minute summer	39.472	10.431	10 year +40% CC 180 minute winter	44.673	17.685
2 year +10% CC 120 minute winter	26.224	10.431	10 year +40% CC 240 minute summer	54.072	14.290
2 year +10% CC 180 minute summer	31.717	8.162	10 year +40% CC 240 minute winter	35.924	14.290
2 year +10% CC 180 minute winter	20.617	8.162	10 year +40% CC 360 minute summer	40.586	10.444
2 year +10% CC 240 minute summer	25.561	6.755	10 year +40% CC 360 minute winter	26.382	10.444
2 year +10% CC 240 minute winter	16.982	6.755	10 year +40% CC 480 minute summer	31.412	8.301
2 year +10% CC 360 minute summer	19.671	5.062	10 year +40% CC 480 minute winter	20.870	8.301
2 year +10% CC 360 minute winter	12.787	5.062	10 year +40% CC 600 minute summer	25.332	6.929
2 year +10% CC 480 minute summer	15.456	4.084	10 year +40% CC 600 minute winter	17.308	6.929
2 year +10% CC 480 minute winter	10.268	4.084	10 year +40% CC 720 minute summer	22.276	5.970
2 year +10% CC 600 minute summer	12.599	3.446	10 year +40% CC 720 minute winter	14.971	5.970
2 year +10% CC 600 minute winter	8.608	3.446	10 year +40% CC 960 minute summer	17.896	4.713
2 year +10% CC 720 minute summer	11.172	2.994	10 year +40% CC 960 minute winter	11.855	4.713
2 year +10% CC 720 minute winter	7.508	2.994	10 year +40% CC 1440 minute summer	12.647	3.390
2 year +10% CC 960 minute summer	9.089	2.393	10 year +40% CC 1440 minute winter	8.500	3.390
2 year +10% CC 960 minute winter	6.021	2.393	30 year +40% CC 15 minute summer	409.133	115.770
2 year +10% CC 1440 minute summer	6.546	1.754	30 year +40% CC 15 minute winter	287.111	115.770
2 year +10% CC 1440 minute winter	4.399	1.754	30 year +40% CC 30 minute summer	272.802	77.193
10 year +40% CC 15 minute summer	314.380	88.959	30 year +40% CC 30 minute winter	191.440	77.193
10 year +40% CC 15 minute winter	220.618	88.959	30 year +40% CC 60 minute summer	185.815	49.105
10 year +40% CC 30 minute summer	207.983	58.852	30 year +40% CC 60 minute winter	123.451	49.105

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 120 minute summer	114.024	30.133	100 year +45% CC 480 minute summer	50.058	13.229
30 year +40% CC 120 minute winter	75.755	30.133	100 year +45% CC 480 minute winter	33.258	13.229
30 year +40% CC 180 minute summer	86.685	22.307	100 year +45% CC 600 minute summer	40.329	11.031
30 year +40% CC 180 minute winter	56.348	22.307	100 year +45% CC 600 minute winter	27.555	11.031
30 year +40% CC 240 minute summer	67.740	17.902	100 year +45% CC 720 minute summer	35.432	9.496
30 year +40% CC 240 minute winter	45.005	17.902	100 year +45% CC 720 minute winter	23.813	9.496
30 year +40% CC 360 minute summer	50.524	13.002	100 year +45% CC 960 minute summer	28.389	7.475
30 year +40% CC 360 minute winter	32.842	13.002	100 year +45% CC 960 minute winter	18.805	7.475
30 year +40% CC 480 minute summer	38.965	10.297	100 year +45% CC 1440 minute summer	19.928	5.341
30 year +40% CC 480 minute winter	25.888	10.297	100 year +45% CC 1440 minute winter	13.393	5.341
30 year +40% CC 600 minute summer	31.344	8.573	500 year +45% CC 15 minute summer	683.949	193.534
30 year +40% CC 600 minute winter	21.416	8.573	500 year +45% CC 15 minute winter	479.964	193.534
30 year +40% CC 720 minute summer	27.508	7.373	500 year +45% CC 30 minute summer	466.638	132.043
30 year +40% CC 720 minute winter	18.487	7.373	500 year +45% CC 30 minute winter	327.466	132.043
30 year +40% CC 960 minute summer	22.031	5.801	500 year +45% CC 60 minute summer	323.800	85.571
30 year +40% CC 960 minute winter	14.594	5.801	500 year +45% CC 60 minute winter	215.125	85.571
30 year +40% CC 1440 minute summer	15.490	4.151	500 year +45% CC 120 minute summer	193.137	51.040
30 year +40% CC 1440 minute winter	10.410	4.151	500 year +45% CC 120 minute winter	128.316	51.040
100 year +45% CC 15 minute summer	530.847	150.211	500 year +45% CC 180 minute summer	146.480	37.694
100 year +45% CC 15 minute winter	372.524	150.211	500 year +45% CC 180 minute winter	95.216	37.694
100 year +45% CC 30 minute summer	356.289	100.817	500 year +45% CC 240 minute summer	114.869	30.357
100 year +45% CC 30 minute winter	250.027	100.817	500 year +45% CC 240 minute winter	76.316	30.357
100 year +45% CC 60 minute summer	245.314	64.829	500 year +45% CC 360 minute summer	86.607	22.287
100 year +45% CC 60 minute winter	162.981	64.829	500 year +45% CC 360 minute winter	56.297	22.287
100 year +45% CC 120 minute summer	147.403	38.954	500 year +45% CC 480 minute summer	67.433	17.821
100 year +45% CC 120 minute winter	97.931	38.954	500 year +45% CC 480 minute winter	44.801	17.821
100 year +45% CC 180 minute summer	111.428	28.674	500 year +45% CC 600 minute summer	54.606	14.936
100 year +45% CC 180 minute winter	72.431	28.674	500 year +45% CC 600 minute winter	37.310	14.936
100 year +45% CC 240 minute summer	86.912	22.968	500 year +45% CC 720 minute summer	48.142	12.903
100 year +45% CC 240 minute winter	57.742	22.968	500 year +45% CC 720 minute winter	32.354	12.903
100 year +45% CC 360 minute summer	64.791	16.673	500 year +45% CC 960 minute summer	38.717	10.195
100 year +45% CC 360 minute winter	42.116	16.673	500 year +45% CC 960 minute winter	25.647	10.195

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
500 year +45% CC 1440 minute summer	27.174	7.283	500 year +45% CC 1440 minute winter	18.262	7.283

Results for 2 year +10% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	24	13	13.467	0.027	3.1	0.5636	0.0000	OK
30 minute summer	22	21	13.568	0.028	2.6	0.6675	0.0000	OK
15 minute summer	20	12	13.917	0.027	2.3	0.3356	0.0000	OK
15 minute summer	18	12	13.962	0.022	1.9	0.3246	0.0000	OK
240 minute summer	17	188	13.810	0.230	1.8	4.0747	0.0000	SURCHARGED
15 minute summer	15	12	13.967	0.027	2.1	0.3126	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	24	6.000	8	1.9	0.415	0.162	0.0525	
15 minute summer	24	Orifice	8	0.0				2.0
30 minute summer	22	22	10	1.5	0.278	0.165	0.0447	
30 minute summer	22	Orifice	10	0.0				0.1
15 minute summer	20	20	17	1.9	0.462	0.153	0.0356	
15 minute summer	20	Orifice	17	0.0				1.5
15 minute summer	18	18	17	1.2	0.305	0.110	0.0485	
15 minute summer	18	Orifice	17	0.0				1.6
240 minute summer	17	17	12	0.3	0.089	0.026	0.1901	
15 minute summer	15	15	12	1.6	0.396	0.157	0.0670	
15 minute summer	15	Orifice	12	0.0				2.1

Results for 2 year +10% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	13	12	13.963	0.023	1.9	0.3311	0.0000	OK
360 minute winter	12	344	13.753	0.223	1.5	7.0289	0.0000	SURCHARGED
360 minute winter	11	376	13.648	0.218	0.9	2.0349	0.0000	SURCHARGED
360 minute winter	10	280	13.554	0.224	1.1	2.7665	0.0000	SURCHARGED
480 minute winter	9	360	13.447	0.267	0.8	2.5529	0.0000	SURCHARGED
240 minute summer	8	160	13.355	0.325	1.5	2.0284	0.0000	SURCHARGED
360 minute winter	7	272	13.027	0.247	0.9	1.3344	0.0000	SURCHARGED
720 minute winter	6	495	12.731	0.251	0.9	1.3725	0.0000	SURCHARGED
720 minute winter	5	495	12.390	0.210	0.9	0.9636	0.0000	SURCHARGED
960 minute winter	4	615	12.105	0.225	0.9	1.1038	0.0000	SURCHARGED
720 minute winter	3	465	11.803	0.223	0.9	0.8835	0.0000	SURCHARGED
960 minute winter	2	600	11.513	0.233	0.9	1.1995	0.0000	SURCHARGED
960 minute winter	1	600	10.946	0.346	0.9	0.3910	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 summer	13	13	12	1.2	0.310	0.113	0.0591	
15 minute summer	13	Orifice	12	0.0				1.7
360 minute winter	12	12	11	0.8	0.169	0.044	0.1506	
360 minute winter	11	11	10	0.6	0.119	0.029	0.1350	
360 minute winter	10	10	9	0.7	0.228	0.028	0.1327	
480 minute winter	9	9	8	0.9	0.090	0.039	0.1489	
240 minute summer	8	8	7	0.8	0.301	0.025	0.0747	
360 minute winter	7	7	6	0.8	0.198	0.026	0.0941	
720 minute winter	6	6	5	0.8	0.230	0.026	0.0930	
720 minute winter	5	5	4	0.8	0.172	0.027	0.0928	
960 minute winter	4	4	3	0.9	0.414	0.028	0.0979	
720 minute winter	3	3	2	0.9	0.269	0.026	0.0814	
960 minute winter	2	2	1	0.9	0.168	0.012	0.0396	
960 minute winter	1	1.013	SW-IC 01	0.9	0.050	0.026	0.0499	41.5

Results for 2 year +10% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW-IC 01	1	10.875	0.375	0.0	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)

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	24	168	13.493	0.053	2.3	1.7349	0.0000	OK
480 minute winter	22	520	13.689	0.149	0.8	5.8915	0.0000	SURCHARGED
240 minute winter	20	236	14.012	0.122	1.2	1.7114	0.0000	FLOOD RISK
240 minute winter	18	236	14.012	0.072	0.9	1.6116	0.0000	OK
240 minute winter	17	236	14.012	0.432	2.7	8.3764	0.0000	FLOOD RISK
15 minute summer	15	12	13.986	0.046	5.1	0.5994	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 summer	24	6.000	8	2.1	0.432	0.177	0.0662	
240 minute summer	24	Orifice	8	0.0				0.2
480 minute winter	22	22	10	0.7	0.299	0.072	0.0731	
480 minute winter	22	Orifice	10	0.0				0.2
240 minute winter	20	20	17	1.1	0.199	0.088	0.0601	
240 minute winter	20	Orifice	17	0.0				0.1
240 minute winter	18	18	17	0.9	0.164	0.078	0.0743	
240 minute winter	18	Orifice	17	0.0				0.1
240 minute winter	17	17	12	0.3	0.093	0.024	0.1901	
15 minute summer	15	15	12	4.3	0.661	0.432	0.0853	
15 minute summer	15	Orifice	12	0.1				0.5

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	13	12	13.979	0.039	4.6	0.7412	0.0000	OK
240 minute winter	12	236	13.970	0.440	3.8	15.2654	0.0000	FLOOD RISK
480 minute winter	11	520	13.824	0.394	0.9	4.0422	0.0000	FLOOD RISK
480 minute winter	10	520	13.689	0.359	1.5	4.9908	0.0000	SURCHARGED
480 minute winter	9	456	13.599	0.419	1.0	5.0497	0.0000	FLOOD RISK
240 minute summer	8	176	13.493	0.463	2.5	3.3135	0.0000	FLOOD RISK
360 minute summer	7	328	13.136	0.356	1.9	2.7428	0.0000	FLOOD RISK
360 minute summer	6	328	12.837	0.357	1.4	2.7609	0.0000	FLOOD RISK
360 minute summer	5	336	12.503	0.323	1.3	2.2633	0.0000	FLOOD RISK
360 minute summer	4	336	12.224	0.344	2.8	2.5737	0.0000	FLOOD RISK
360 minute summer	3	440	11.922	0.342	2.3	2.0438	0.0000	FLOOD RISK
360 minute winter	2	600	11.640	0.360	3.3	2.7959	0.0000	FLOOD RISK
360 minute winter	1	600	11.363	0.763	3.9	0.8626	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)
15 minute summer	13	13	12	3.3	0.536	0.314	0.0708	
15 minute summer	13	Orifice	12	0.0				0.4
240 minute winter	12	12	11	0.7	0.281	0.037	0.1632	
480 minute winter	11	11	10	0.8	0.100	0.043	0.1432	
480 minute winter	10	10	9	0.7	0.228	0.027	0.1456	
480 minute winter	9	9	8	0.7	0.109	0.029	0.1489	
240 minute summer	8	8	7	1.5	0.141	0.046	0.1182	
360 minute summer	7	7	6	1.1	0.223	0.035	0.1198	
360 minute summer	6	6	5	1.2	0.420	0.040	0.0973	
360 minute summer	5	5	4	2.8	0.221	0.089	0.1101	
360 minute summer	4	4	3	2.3	0.410	0.076	0.1175	
360 minute summer	3	3	2	3.2	0.252	0.097	0.1050	
360 minute winter	2	2	1	3.9	0.404	0.055	0.0598	
360 minute winter	1	1.013	SW-IC 01	1.0	0.058	0.030	0.0499	29.3

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	SW-IC 01	1	10.875	0.375	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
240 minute summer	24	196	13.532	0.092	2.8	3.4703	0.0000	OK
600 minute winter	22	600	13.750	0.210	0.8	8.5001	0.0000	SURCHARGED
360 minute winter	20	352	14.074	0.184	1.4	2.6155	0.0000	FLOOD RISK
360 minute winter	18	352	14.074	0.134	1.2	3.2160	0.0000	FLOOD RISK
360 minute winter	17	352	14.074	0.494	2.2	9.6954	0.0000	FLOOD RISK
360 minute winter	15	352	14.032	0.092	0.9	1.2822	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
240 minute summer	24	6.000	8	2.2	0.377	0.187	0.0842	
240 minute summer	24	Orifice	8	0.0				0.2
600 minute winter	22	22	10	0.6	0.209	0.069	0.0731	
600 minute winter	22	Orifice	10	0.0				0.2
360 minute winter	20	20	17	0.9	0.165	0.072	0.0601	
360 minute winter	20	Orifice	17	0.0				0.2
360 minute winter	18	18	17	0.8	0.147	0.070	0.0839	
360 minute winter	18	Orifice	17	0.0				0.2
360 minute winter	17	17	12	0.3	0.103	0.025	0.1901	
360 minute winter	15	15	12	0.9	0.161	0.086	0.1154	
360 minute winter	15	Orifice	12	0.0				0.3

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	13	352	14.032	0.092	0.8	2.1158	0.0000	OK
360 minute winter	12	352	14.032	0.502	3.5	17.5861	0.0000	FLOOD RISK
600 minute winter	11	630	13.883	0.453	0.8	4.7168	0.0000	FLOOD RISK
600 minute winter	10	600	13.750	0.420	1.6	5.9930	0.0000	FLOOD RISK
480 minute summer	9	480	13.651	0.471	1.2	5.8948	0.0000	FLOOD RISK
240 minute summer	8	196	13.531	0.501	2.7	3.6627	0.0000	FLOOD RISK
480 minute summer	7	440	13.176	0.396	2.0	3.3185	0.0000	FLOOD RISK
480 minute summer	6	448	12.878	0.398	1.4	3.3503	0.0000	FLOOD RISK
600 minute winter	5	555	12.547	0.367	1.9	2.9046	0.0000	FLOOD RISK
480 minute summer	4	448	12.272	0.392	1.5	3.2668	0.0000	FLOOD RISK
480 minute summer	3	496	11.973	0.393	1.4	2.5925	0.0000	FLOOD RISK
480 minute winter	2	456	11.684	0.404	3.1	3.4082	0.0000	FLOOD RISK
480 minute winter	1	488	11.391	0.791	4.8	0.8949	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)
360 minute winter	13	13	12	0.8	0.146	0.073	0.1024	
360 minute winter	13	Orifice	12	0.0				0.2
360 minute winter	12	12	11	0.7	0.246	0.037	0.1632	
600 minute winter	11	11	10	1.1	0.096	0.053	0.1432	
600 minute winter	10	10	9	0.7	0.137	0.029	0.1456	
480 minute summer	9	9	8	0.6	0.150	0.027	0.1489	
240 minute summer	8	8	7	1.3	0.158	0.040	0.1356	
480 minute summer	7	7	6	1.0	0.218	0.032	0.1504	
480 minute summer	6	6	5	1.5	0.419	0.049	0.1258	
600 minute winter	5	5	4	1.4	0.176	0.044	0.1432	
480 minute summer	4	4	3	1.0	0.411	0.034	0.1520	
480 minute summer	3	3	2	2.2	0.224	0.067	0.1315	
480 minute winter	2	2	1	4.8	0.360	0.067	0.0686	
480 minute winter	1	1.013	SW-IC 01	1.0	0.058	0.030	0.0499	36.1

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW-IC 01	1	10.875	0.375	0.0	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)

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	24	336	13.606	0.166	2.7	6.8384	0.0000	FLOOD RISK
720 minute winter	22	690	13.977	0.437	1.0	12.3830	0.0000	FLOOD RISK
360 minute winter	20	352	14.234	0.344	1.3	4.3421	0.0000	FLOOD RISK
360 minute winter	18	352	14.234	0.294	1.3	7.3723	0.0000	FLOOD RISK
360 minute winter	17	352	14.234	0.654	2.3	9.8334	0.0000	FLOOD RISK
480 minute winter	15	472	14.194	0.254	0.9	3.7197	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)
360 minute summer	24	6.000	8	1.4	0.251	0.118	0.0860	
360 minute summer	24	Orifice	8	0.0				0.3
720 minute winter	22	22	10	0.5	0.209	0.052	0.0731	
720 minute winter	22	Orifice	10	0.0				0.2
360 minute winter	20	20	17	0.9	0.177	0.077	0.0601	
360 minute winter	20	Orifice	17	0.0				0.2
360 minute winter	18	18	17	0.9	0.172	0.083	0.0839	
360 minute winter	18	Orifice	17	0.0				0.2
360 minute winter	17	17	12	-0.6	0.092	-0.048	0.1901	
480 minute winter	15	15	12	0.9	0.161	0.086	0.1177	
480 minute winter	15	Orifice	12	0.0				0.4

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	13	472	14.194	0.254	1.2	6.3352	0.0000	FLOOD RISK
480 minute winter	12	472	14.194	0.664	3.4	17.5861	0.0000	FLOOD RISK
720 minute winter	11	690	14.077	0.647	0.8	5.2537	0.0000	FLOOD RISK
720 minute winter	10	690	13.977	0.647	1.0	7.3203	0.0000	FLOOD RISK
720 minute winter	9	690	13.824	0.644	0.8	6.3842	0.0000	FLOOD RISK
360 minute summer	8	336	13.606	0.576	1.8	3.6627	0.0000	FLOOD RISK
720 minute winter	7	675	13.287	0.507	1.6	4.1031	0.0000	FLOOD RISK
720 minute winter	6	675	13.012	0.532	1.3	4.1031	0.0000	FLOOD RISK
720 minute winter	5	675	12.692	0.512	1.3	4.1031	0.0000	FLOOD RISK
720 minute winter	4	675	12.415	0.535	1.3	4.1031	0.0000	FLOOD RISK
720 minute winter	3	690	12.097	0.517	1.2	3.2123	0.0000	FLOOD RISK
720 minute winter	2	645	11.799	0.519	2.1	4.0445	0.0000	FLOOD RISK
720 minute winter	1	660	11.466	0.866	2.2	0.9791	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	13	13	12	0.8	0.164	0.073	0.1045	
480 minute winter	13	Orifice	12	0.0				0.2
480 minute winter	12	12	11	0.8	0.198	0.042	0.1632	
720 minute winter	11	11	10	0.6	0.096	0.032	0.1432	
720 minute winter	10	10	9	0.7	0.137	0.028	0.1456	
720 minute winter	9	9	8	0.7	0.123	0.031	0.1489	
360 minute summer	8	8	7	1.2	0.142	0.039	0.1410	
720 minute winter	7	7	6	1.0	0.192	0.034	0.1775	
720 minute winter	6	6	5	1.0	0.250	0.032	0.1755	
720 minute winter	5	5	4	1.0	0.146	0.033	0.1748	
720 minute winter	4	4	3	1.1	0.189	0.035	0.1840	
720 minute winter	3	3	2	1.8	0.211	0.055	0.1535	
720 minute winter	2	2	1	2.2	0.300	0.032	0.0764	
720 minute winter	1	1.013	SW-IC 01	1.1	0.061	0.032	0.0499	49.3

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW-IC 01	1	10.875	0.375	0.9	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)

Results for 500 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	24	256	13.702	0.262	2.3	11.2108	0.0000	FLOOD RISK
480 minute winter	22	312	14.003	0.463	1.8	12.3830	0.0000	FLOOD RISK
240 minute summer	20	144	14.257	0.367	3.5	4.3421	0.0000	FLOOD RISK
240 minute winter	18	152	14.280	0.340	3.7	7.5308	0.0000	FLOOD RISK
720 minute winter	17	420	14.250	0.670	1.9	9.8334	9.6471	FLOOD
240 minute summer	15	148	14.209	0.269	4.8	3.9357	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)
360 minute winter	24	6.000	8	1.3	0.233	0.106	0.0860	
360 minute winter	24	Orifice	8	0.0				0.3
480 minute winter	22	22	10	1.1	0.143	0.117	0.0731	
480 minute winter	22	Orifice	10	0.0				0.2
240 minute summer	20	20	17	1.9	0.291	0.159	0.0601	
240 minute summer	20	Orifice	17	0.0				0.1
240 minute winter	18	18	17	-2.3	-0.291	-0.204	0.0839	
240 minute winter	18	Orifice	17	0.0				0.1
720 minute winter	17	17	12	0.3	0.100	0.024	0.1901	
240 minute summer	15	15	12	2.4	0.394	0.235	0.1177	
240 minute summer	15	Orifice	12	0.0				0.3

Results for 500 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

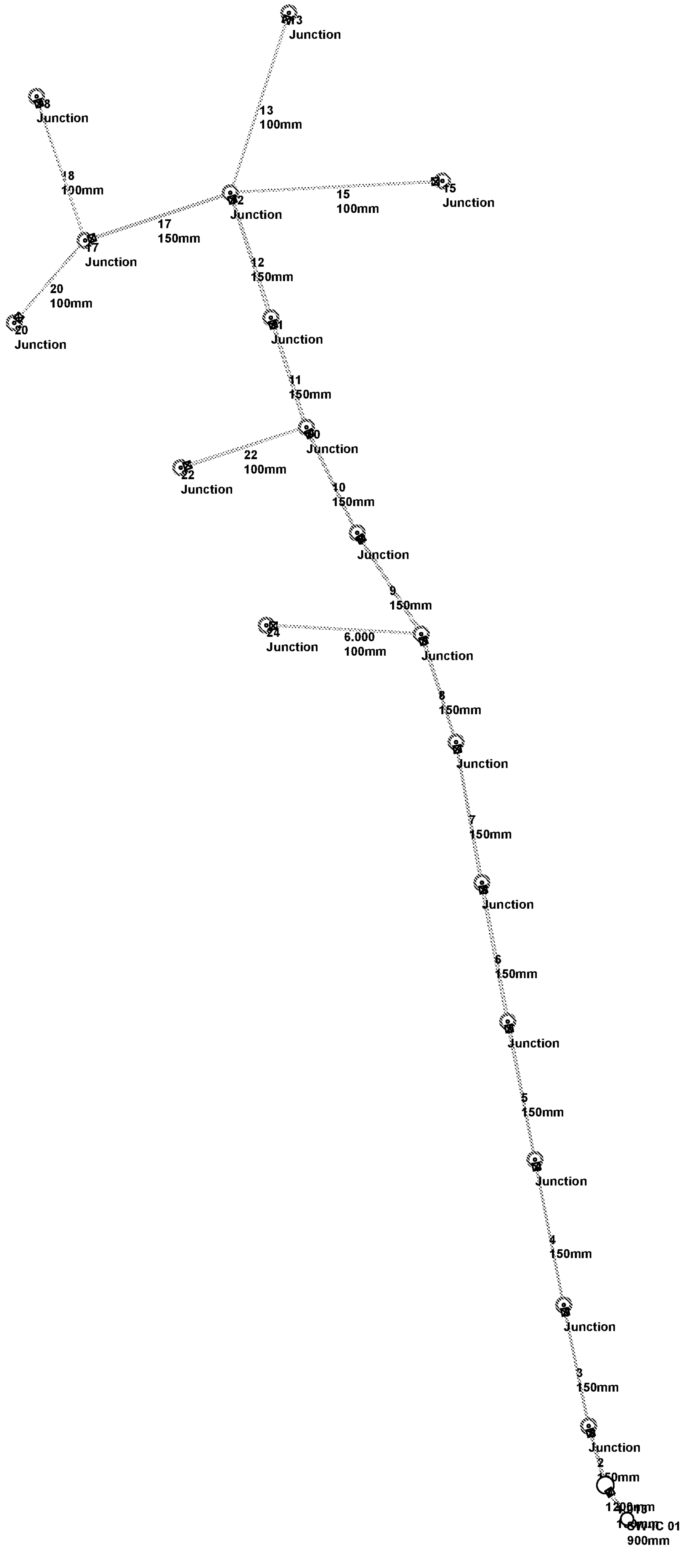
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	13	148	14.206	0.266	5.3	6.6259	0.0000	FLOOD RISK
720 minute winter	12	420	14.200	0.670	2.9	17.5861	16.2615	FLOOD
600 minute summer	11	360	14.100	0.670	1.2	5.2537	1.8034	FLOOD
600 minute winter	10	375	14.000	0.670	1.9	7.3203	5.8072	FLOOD
960 minute summer	9	555	13.850	0.670	1.1	6.3842	4.4046	FLOOD
480 minute summer	8	312	13.700	0.670	1.6	3.6627	4.7424	FLOOD
600 minute summer	7	345	13.400	0.620	1.6	4.1031	0.7489	FLOOD
960 minute summer	6	540	13.100	0.620	1.4	4.1031	2.6794	FLOOD
960 minute summer	5	555	12.800	0.620	1.5	4.1031	0.4852	FLOOD
960 minute summer	4	540	12.500	0.620	1.5	4.1031	2.6725	FLOOD
960 minute summer	3	540	12.200	0.620	1.4	3.2123	1.8169	FLOOD
960 minute summer	2	555	11.900	0.620	2.0	4.0445	0.3694	FLOOD
960 minute winter	1	780	11.536	0.936	3.2	1.0589	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)
240 minute summer	13	13	12	-2.6	0.345	-0.244	0.1045	
240 minute summer	13	Orifice	12	0.0				0.2
720 minute winter	12	12	11	0.7	0.201	0.036	0.1632	
600 minute summer	11	11	10	1.3	0.120	0.067	0.1432	
600 minute winter	10	10	9	0.8	0.127	0.033	0.1456	
960 minute summer	9	9	8	0.8	0.118	0.032	0.1489	
480 minute summer	8	8	7	0.9	0.154	0.028	0.1410	
600 minute summer	7	7	6	0.9	0.130	0.031	0.1775	
960 minute summer	6	6	5	1.0	0.455	0.034	0.1755	
960 minute summer	5	5	4	1.0	0.181	0.033	0.1748	
960 minute summer	4	4	3	1.1	0.195	0.036	0.1840	
960 minute summer	3	3	2	1.6	0.275	0.048	0.1535	
960 minute summer	2	2	1	2.6	0.170	0.037	0.0764	
960 minute winter	1	1.013	SW-IC 01	1.1	0.064	0.034	0.0499	65.7

Results for 500 year +45% CC Critical Storm Duration. Lowest mass balance: 95.08%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	SW-IC 01	1	10.875	0.375	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)



13
Junction
13
100mm
18
Junction
18
100mm
12
Junction
15
100mm
15
Junction
17
150mm
17
Junction
20
100mm
12
150mm
20
Junction
11
Junction
11
150mm
10
Junction
22
100mm
22
Junction
10
150mm
Junction
9
150mm
24
Junction
6.000
100mm
Junction
8
150mm
Junction
7
150mm
Junction
6
150mm
Junction
5
150mm
Junction
4
150mm
Junction
3
150mm
Junction
2
150mm
1200mm
SWIC 01
900mm

APPENDIX C

HR WALLINGFORD GREENFIELD RUN-OFF RATE CALCUALTIONS

hr wallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Hedwilena Silva
Site name:	Long Acre
Site location:	The Street, Walberton

Site Details

Latitude:	50.84690° N
Longitude:	0.62721° W
Reference:	276655399
Date:	Aug 27 2024 15:22

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

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.445

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	1	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	780	780
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.08	2.44
1 in 1 year (l/s):	0.07	2.07
1 in 30 years (l/s):	0.2	5.61
1 in 100 year (l/s):	0.27	7.78
1 in 200 years (l/s):	0.32	9.12

APPENDIX D

GROUNDWATER MONITORING REPORT

MATE GEO-TECHNIC SERVICES
Shirley Herne Lane
Rustington
07768 870097

Site Address : Land at “Long Acre” the Street, Walberton, BN18 0PY

Planning Reference : t.b.c.

Dear sirs

SCOPE

The original Groundwater Monitoring details were broadly as per the Arun DC requirements to be at the location and depth of any expected infiltration structures, to record the peak groundwater levels in the ‘winter periods’ of 2023 - 2024 and to use this data to inform as to the depths for subsequent Soil Infiltration Testing to calculate the ‘Soil Infiltration Rate’.

The soil details recorded are purely from a visual aspect during the 3 Trial Pit excavations for Soil Infiltration Testing. No Particle Size Analysis has been carried out.

Soil Infiltration Testing, otherwise known as Percolation or Porosity Testing was carried out to BRE DG365 principles, with 3 tests being performed ‘in quick succession’, to best simulate saturated soils. The testing was carried out over a period of 5 days in mid / late July 2024, for Surface Water Drainage Disposal, and although being outside of the Arun DC ‘wet winter period’, it was considered to be valid for an initial Planning Application since 2024 so far has been a particularly wet year.

Data from the previous Groundwater Monitoring exercise was used to inform as to the depth of Infiltration Testing, this being shallow. From discussions with the project drainage consultant, it seemed appropriate to have the all of the impermeable main roof areas draining into the entrance roadway, turning and parking areas, for storage and infiltration. These areas are to be of a permeable construction. All the testing was carried out at typical depths of 372mm – 475mm so as to provide some Freeboard.

This set of data to be used in a proposed Planning Application.

WORKS DETAILS – Supplementary Groundwater Monitoring

The Groundwater Monitoring was initially installed in February 2023, and is subject to a separate report. In addition, monitoring was also recorded during the period of Soil Infiltration Testing. During this period, groundwater levels were recorded in each of the 3 monitoring points at a depth of over 2 metres deep.

The full supplementary recorded Groundwater Monitoring Data, both tabular and graphical, is appended.

WORKS DETAILS – Soil Infiltration Testing

Testing for surface water disposal was carried out within 3 Trial Pits, at the locations and expected depths for any proposed permeable paving infiltration structures, consistent with the principles contained within document BRE DG365. Typical dimensions of the trial pits were 1200mm – 1600mm long by 450mm wide and with varying depths of 372mm - 475mm. The increase in depths for Trial Pits TP#1 and TP#3 were as a result of the removal of soil wash-in during the water filling phase. This will provide some Freeboard.

For Trial Pit TP#1 (north)

0	Ground Level
	Topsoil
~300	
	Compact Dry Clay
372	
	Base of Trial Pit

It's size was 1200mm long x 450mm wide with a variable depth over the 3 tests. These were carried out in quick succession, as per BRE DG365, on Tuesday 16th July, Wednesday 17th July and Thursday 18th July 2024.

The results are summarised in the table below with the minimum rate of 4.561 E-05 metres second^{-1}, from test #3 to be used in any calculations for soakaway sizing.

Soil Infiltration Testing for Surface Water Drainage Disposal			
Trial Pit TP#1 (north) 1200mm long x 450mm wide			
	Test #1	Test #2	Test #3
Date of Testing	Tues 16th July	Wed 17th July	Thurs 18th July
Full Depth of Trial Pit (mm)	372	395	395
Calculated Result (m sec^{-1})	5.746 E-05	4.795 E-05	4.561 E-05
Minimum Rate to be used in any Calculations is 4.561 E-05 metres second^{-1}			

The full data, tabular and graphical for Trial Pit TP#1 is appended.

For Trial Pit TP#2 (centre)

0	Ground Level
	Topsoil
260	
	Clayey Topsoil
440	
	Compact Dry Clay (Just Exposed)
445	
	Base of Trial Pit

It's size was 1370mm long x 450mm wide x 445mm deep. The 3 tests were carried out in quick succession, as per BRE DG365, on Tuesday 16th July, Wednesday 17th July and Thursday 18th July. The results are summarised in the table below with the minimum rate of 3.296 E-06 metres second^{-1}, to be used in any calculations for soakaway sizing. Surprisingly the slowest rate was from test #1, which is not normally the case. It was attributed to the fact that the very compact clay encountered at the base of the Trial Pit was 'softened' to be more permeable, from the first test. As can be seen from the graphical plots, all 3 tests were very similar in profile above this clay layer.

Soil Infiltration Testing for Surface Water Drainage Disposal			
Trial Pit TP#2 (centre) 1370mm long x 450mm wide			
	Test #1	Test #2	Test #3
Date of Testing	Tues 16th July	Wed 17th July	Thurs 18th July
Full Depth of Trial Pit (mm)	445	445	445
Calculated Result (m sec^{-1})	3.296 E-06	5.481 E-06	4.892 E-06
Minimum Rate to be used in any Calculations is 3.296 E-06 metres second^{-1}			

The full data, tabular and graphical for Trial Pit TP#2 is appended.

For Trial Pit TP#3 (south)

Depth (mm)	Stratum
0	Ground Level
250	Topsoil
350	Compact Clayey Topsoil
460	Small to Medium Angular Gravel in Silty Matrix
	Base of Trial Pit

Its size was 1600mm long x 450mm wide with a variable depth over the 3 tests. These were carried out in quick succession, as per BRE DG365, on Wednesday 17th July, Thursday 18th July and Sunday 21st July.

The results are summarised in the table below with the minimum rate of 2.362 E-06 metres second^{-1}, from test #1 to be used in any calculations for soakaway sizing. It is considered that the significant increase in infiltration rate obtained from test #3 was due to the fact that it was carried out with a 2 day break from test #2.

Soil Infiltration Testing for Surface Water Drainage Disposal			
Trial Pit TP#3 (south) 1600mm long x 450mm wide			
	Test #1	Test #2	Test #3
Date of Testing	Wed 17th July	Thurs 18th July	Sun 21st July
Full Depth of Trial Pit (mm)	460	475	475
Calculated Result (m sec^{-1})	2.362 E-06	2.711 E-06	7.145 E-06
Minimum Rate to be used in any Calculations is 2.362 E-06 metres second^{-1}			

The full data, tabular and graphical for Trial Pit TP#3 is appended.

WORKS DETAILS – Site Plan Testing Locations

The topographical mapping provisional site plan, overlaid with the locations of the 3 Groundwater Monitoring Points and the 3 shallow Surface Water Trial Pits is appended.

GEOLOGY

The British Geological Survey classifies the area with superficial of “River Terrace Deposits” consisting of Sand, silt and clay, overlying bedrock of the London Clay Formation. During the excavation of the 3 Trial Pits, the London Clay was not encountered, with only the superficial encountered.

CONCLUSION

The rates, at the time of testing, within Trial Pits TP#1 and TP#2 indicate that drainage disposal is viable and within TP#3 is just viable (but it may only need to drain itself with no attributable storage) whilst maintaining some Freeboard.
The soil encountered in Trial Pit TP#3 was vastly different to that encountered within the other 2 Trial Pits, being topsoil overlying compact small to medium angular gravel in a silty matrix.

Regards

For Mate Geo-Technic Services

Ray Cooper
Proprietor

July 28th 2024

Appended

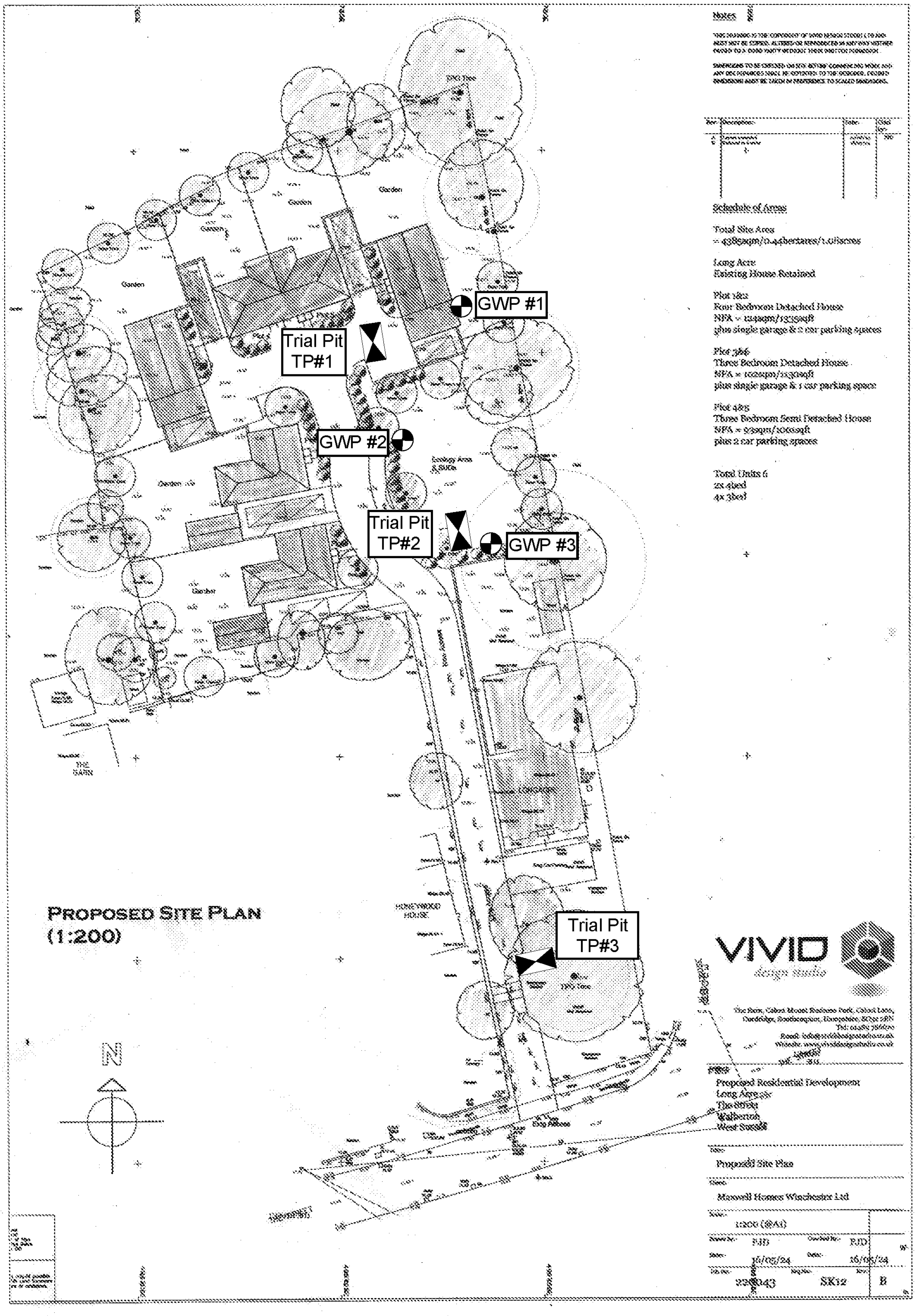
Provisional Site Plan overlaid with Groundwater Monitoring Points (x3) & Trial Pit Locations (x3).

Supplementary Groundwater Monitoring, for groundwater points GWP#1, GWP#2 & GWP#3 full data – tabular and graphical.

Soil Infiltration Testing, for Surface Water Disposal, full data for Trial Pit TP#1 – tabular and graphical.

Soil Infiltration Testing, for Surface Water Disposal, full data for Trial Pit TP#2 – tabular and graphical.

Soil Infiltration Testing, for Surface Water Disposal, full data for Trial Pit TP#3 – tabular and graphical.



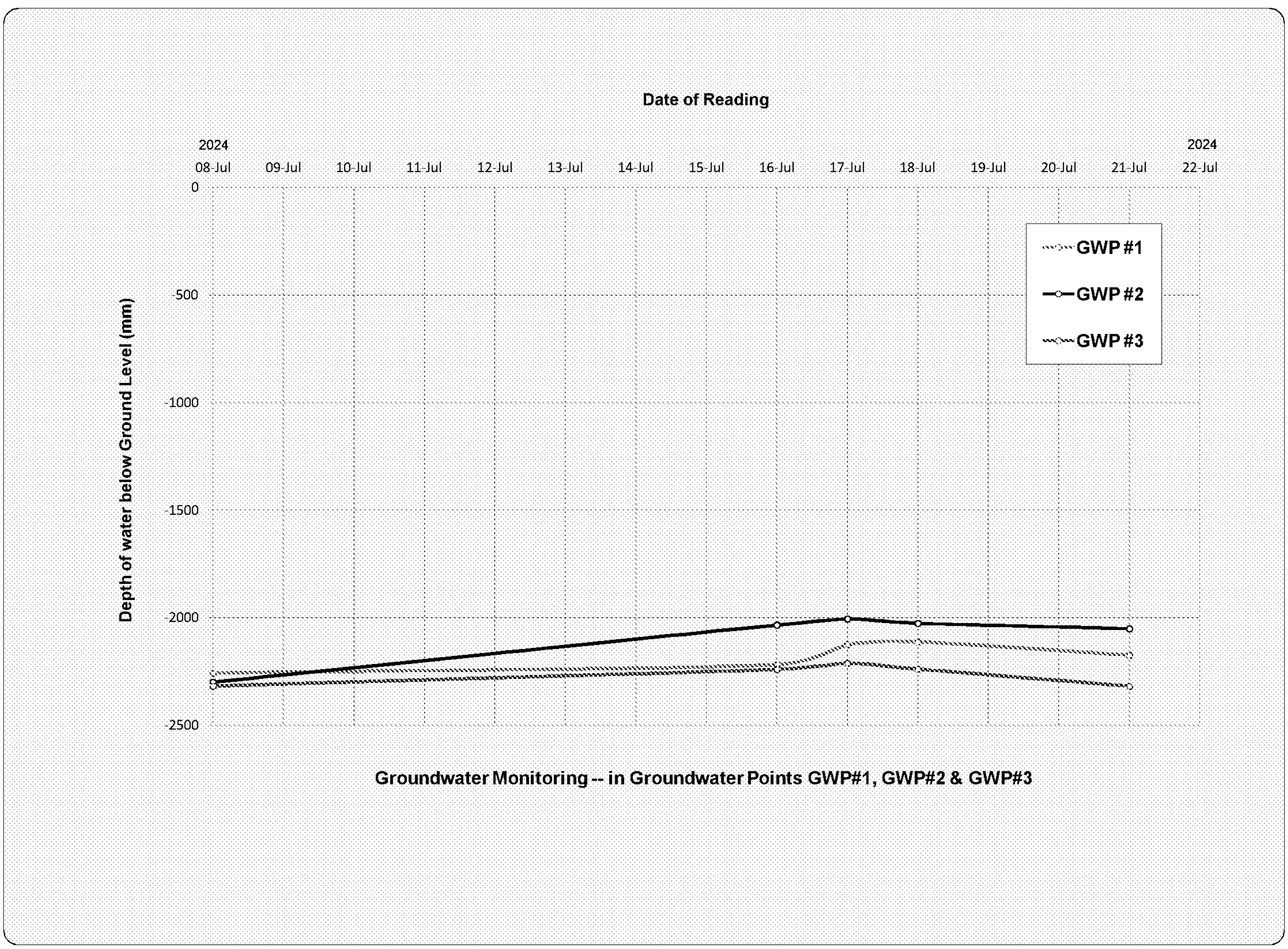
Notes
Garden
Trial Pit TP#1
GWP #1
GWP #2
Trial Pit TP#2
GWP #3
Trial Pit TP#3
Schedule of Areas
Total Site Area
Long Acre
Existing House Retained
Three Bedroom Detached House
Three Bedroom Semi Detached House
plus 2 car parking spaces
Total Units 6
4x 3bed
PROPOSED SITE PLAN
(1:200)
N
VIVID
design studio
Proposed Residential Development
Long Acre
The Street
Walberton
West Sussex
Proposed Site Plan
Maxwell Homes Winchester Ltd
1:200 (@A1)
RJD
SK12
B

Mate Geotechnical Services

Groundwater Monitoring at "Longacre" Walberton during Soil Infiltration Testing July 2024

LOCATION "Longacre" the Street WALBERTON Installed on Wednesday 15th February 2023	Pipe I.D.	Pipe Depth	Pipe Height	A.O.D. Ground Level ToP BGL	DATE Monday 8-Jul	DATE Heavy Rain Overnight Tuesday 16-Jul	DATE Some Rain in the Day Wednesday 17-Jul	DATE Dry Thursday 18-Jul	DATE Dry Sunday 21-Jul
Maximum Depth	GWP #1	2950			2975	2936	2841	2829	2891
Below Ground Level	(north)	-2232	718	14.958	-2257	-2218	-2123	-2111	-2173
Level Above O.D.		12.008		14.240	11.983	12.022	12.117	12.129	12.067
Change from Previous						39	95	12	-62
Water Strike Below Ground Level		-2250							
Maximum Depth	GWP #2	2950			2822	2557	2529	2549	2574
Below Ground Level	(centre)	-2426	524	14.432	-2298	-2033	-2005	-2025	-2050
Level Above O.D.		11.482		13.908	11.610	11.875	11.903	11.883	11.858
Change from Previous						265	28	-20	-25
Water Strike Below Ground Level		-2470							
Maximum Depth	GWP #3	2950			2890	2811	2782	2810	2890
Below Ground Level	(south)	-2378	572	14.357	-2318	-2239	-2210	-2238	-2318
Level Above O.D.		11.407		13.785	11.467	11.546	11.575	11.547	11.467
Change from Previous						79	29	-28	-80
Water Strike Below Ground Level					Into Wet Mud				

END of MONITORING CYCLE



Mate GeoTechnic Services

Tuesday 16th July 2024

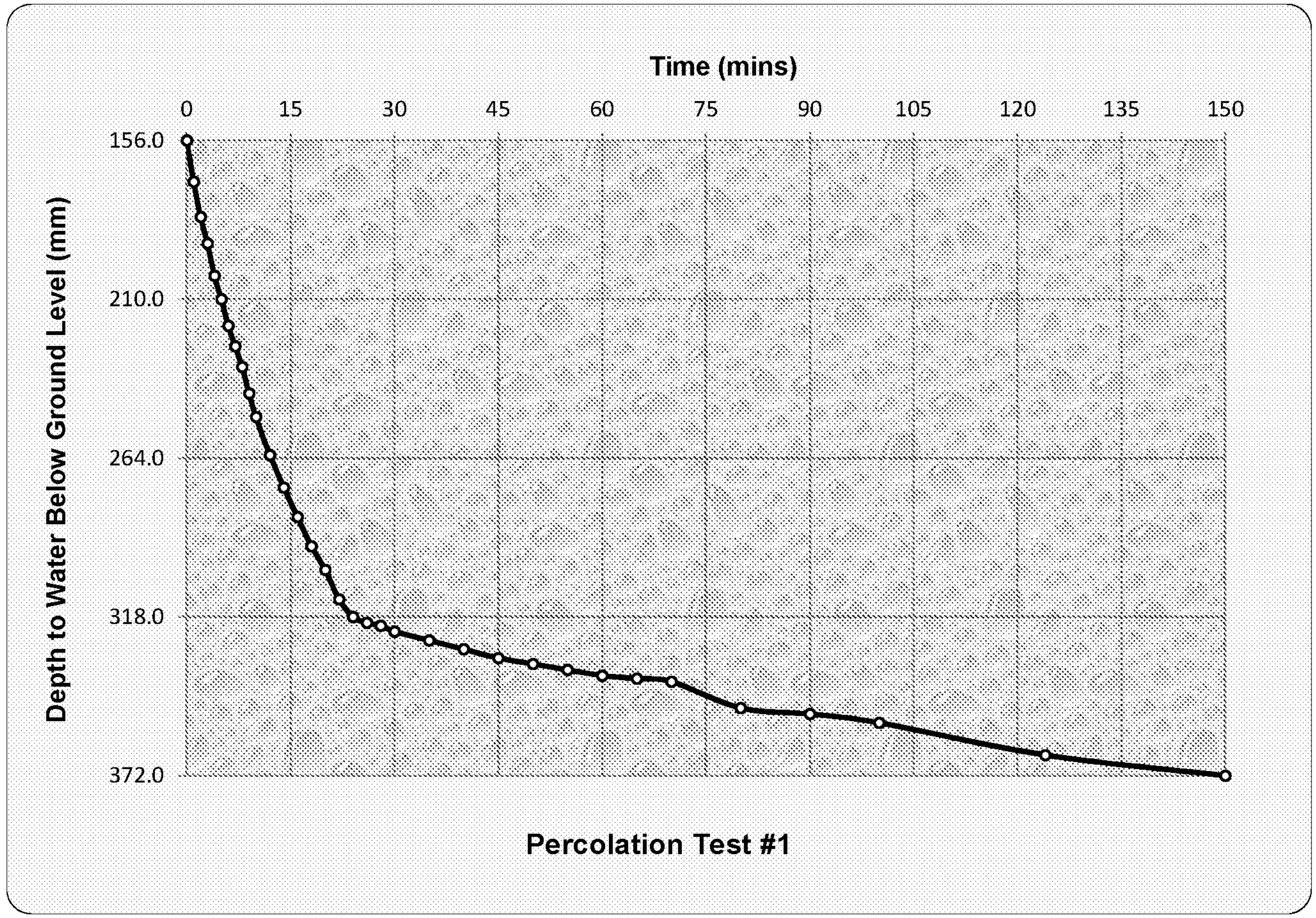
"LongAcre" the Street Walberton

Percolation Trial Pit TP#1 (north)

Percolation Test Number 1

1280mm Length x 450mm Width x 372mm Depth

	Time (mins)	Depth to Water Surface
12:25:00	0	156
	1	170
	2	182
	3	191
	4	202
	5	210
	6	219
	7	226
	8	233
	9	242
	10	250
	12	263
	14	274
	16	284
	18	294
	20	302
	22	312
	24	318
	26	320
	28	321
	30	323
	35	326
	40	329
	45	332
	50	334
	55	336
	60	338
	65	339
	70	340
	80	349
	90	351
	100	354
	124	365
	150	372



Soil infiltration rate: $f = \dfrac{0.062}{0.950 \times 19.0 \times 60} = 5.746E\text{-}05$ m/s

SOIL INFILTRATION RATE IS

5.746E-05 metres/second

Mate GeoTechnic Services

Wednesday 17th July 2024

"LongAcre" the Street Walberton

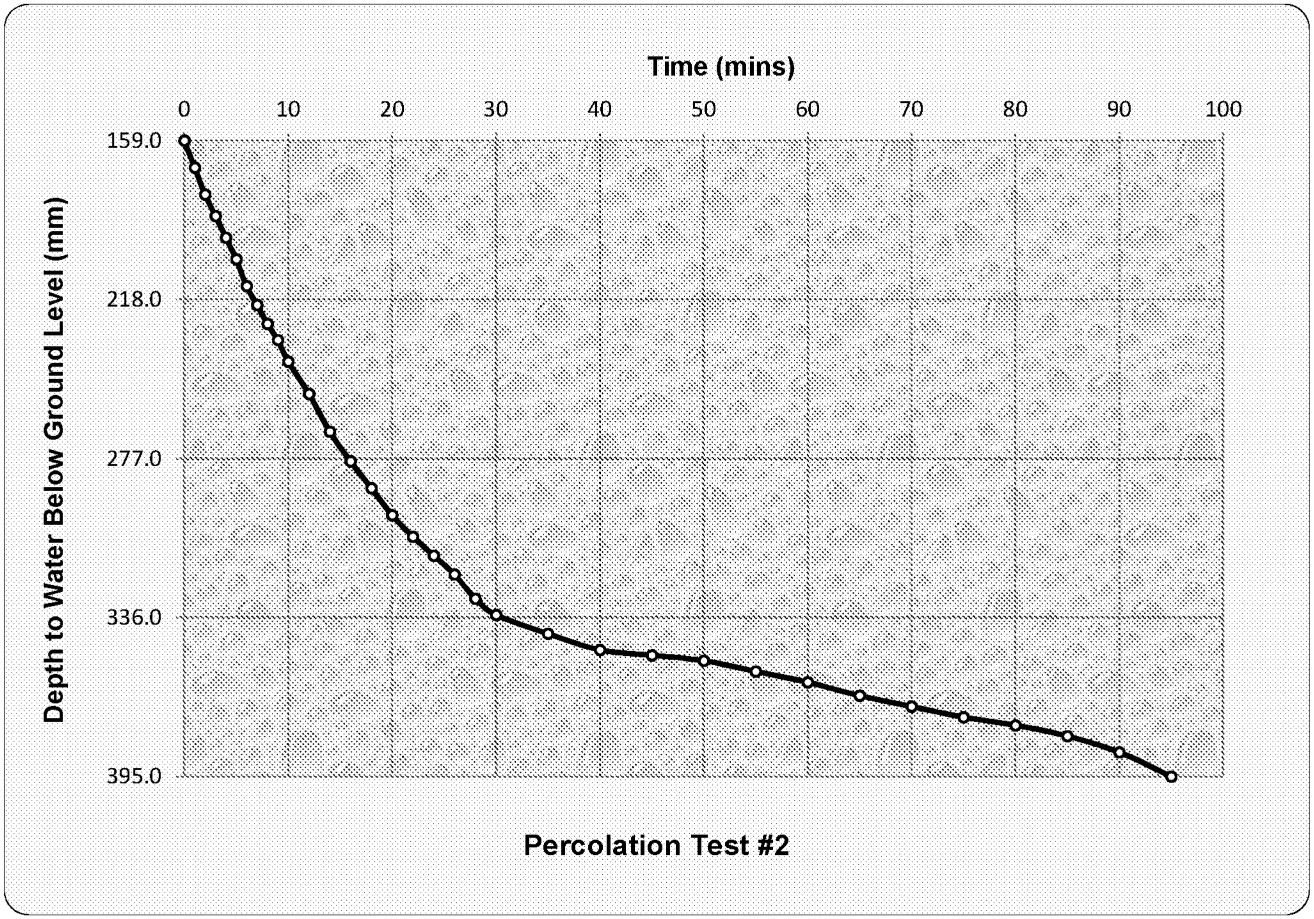
Percolation Trial Pit TP#1 (north)

Percolation Test Number 2

1280mm Length x 450mm Width x 395mm Depth

12:43:00

Time (mins)	Depth to Water Surface
0	159
1	169
2	179
3	187
4	195
5	203
6	213
7	220
8	227
9	233
10	241
12	253
14	267
16	278
18	288
20	298
22	306
24	313
26	320
28	329
30	335
35	342
40	348
45	350
50	352
55	356
60	360
65	365
70	369
75	373
80	376
85	380
90	386
95	395



Soil infiltration rate: $f = \frac{0.068}{0.984 \times 24.0 \times 60} = 4.795E-05$ m/s

SOIL INFILTRATION RATE IS

4.795E-05 metres/second

Mate GeoTechnic Services

Thursday 18th July 2024

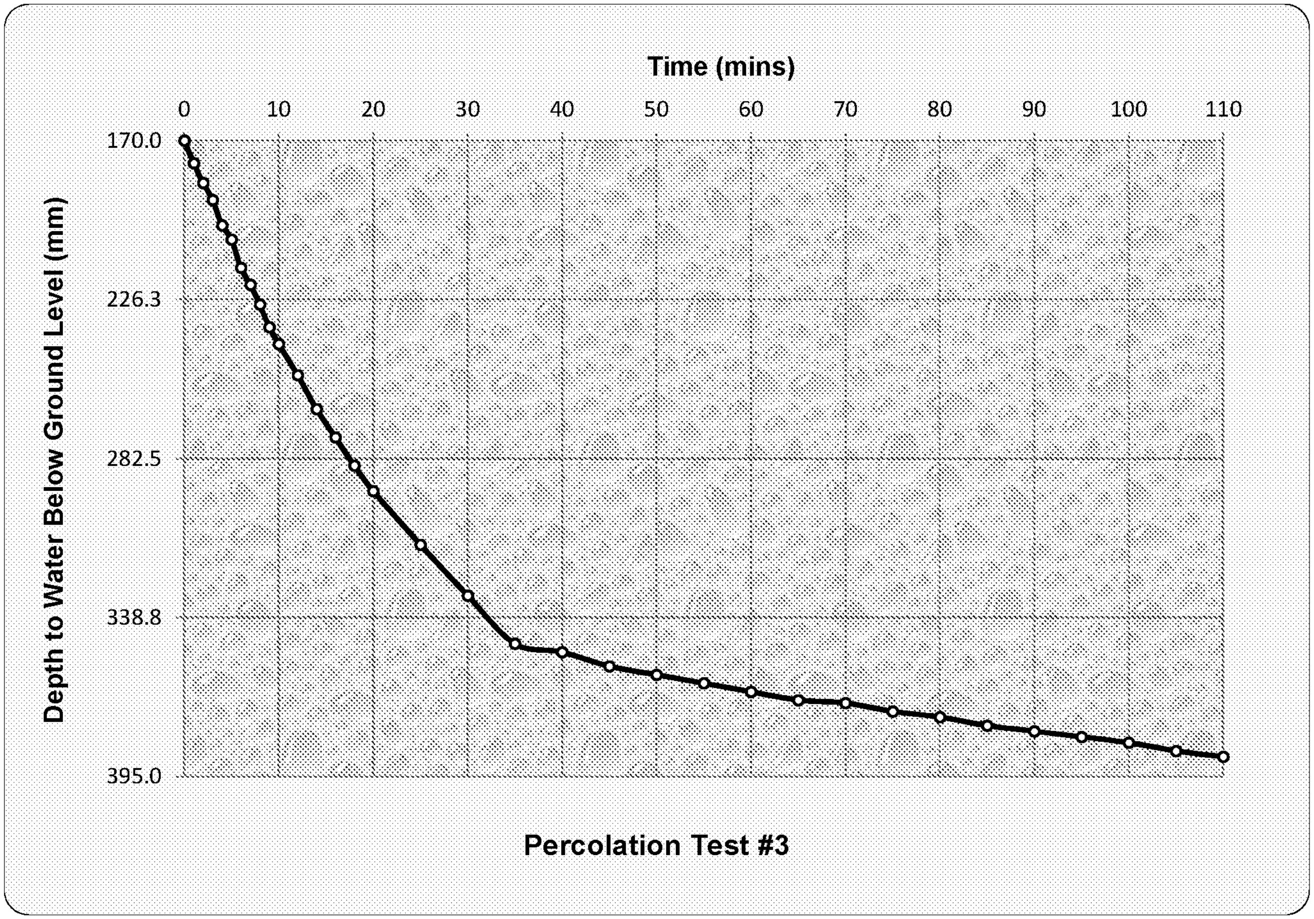
"LongAcre" the Street Walberton

Percolation Trial Pit TP#1 (north)

Percolation Test Number 3

1280mm Length x 450mm Width x 395mm Depth

	Time (mins)	Depth to Water Surface
12:05:00	0	170
	1	178
	2	185
	3	191
	4	200
	5	205
	6	215
	7	221
	8	228
	9	236
	10	242
	12	253
	14	265
	16	275
	18	285
	20	294
	25	313
	30	331
	35	348
	40	351
	45	356
	50	359
	55	362
	60	365
	65	368
	70	369
	75	372
	80	374
	85	377
	90	379
	95	381
	100	383
	105	386
13:55:00	110	388



Soil infiltration rate: $f = \frac{0.065}{0.965 \times 24.5 \times 60} = 4.561E\text{-}05$ m/s

SOIL INFILTRATION RATE IS

4.561E-05 metres/second

Mate GeoTechnic Services

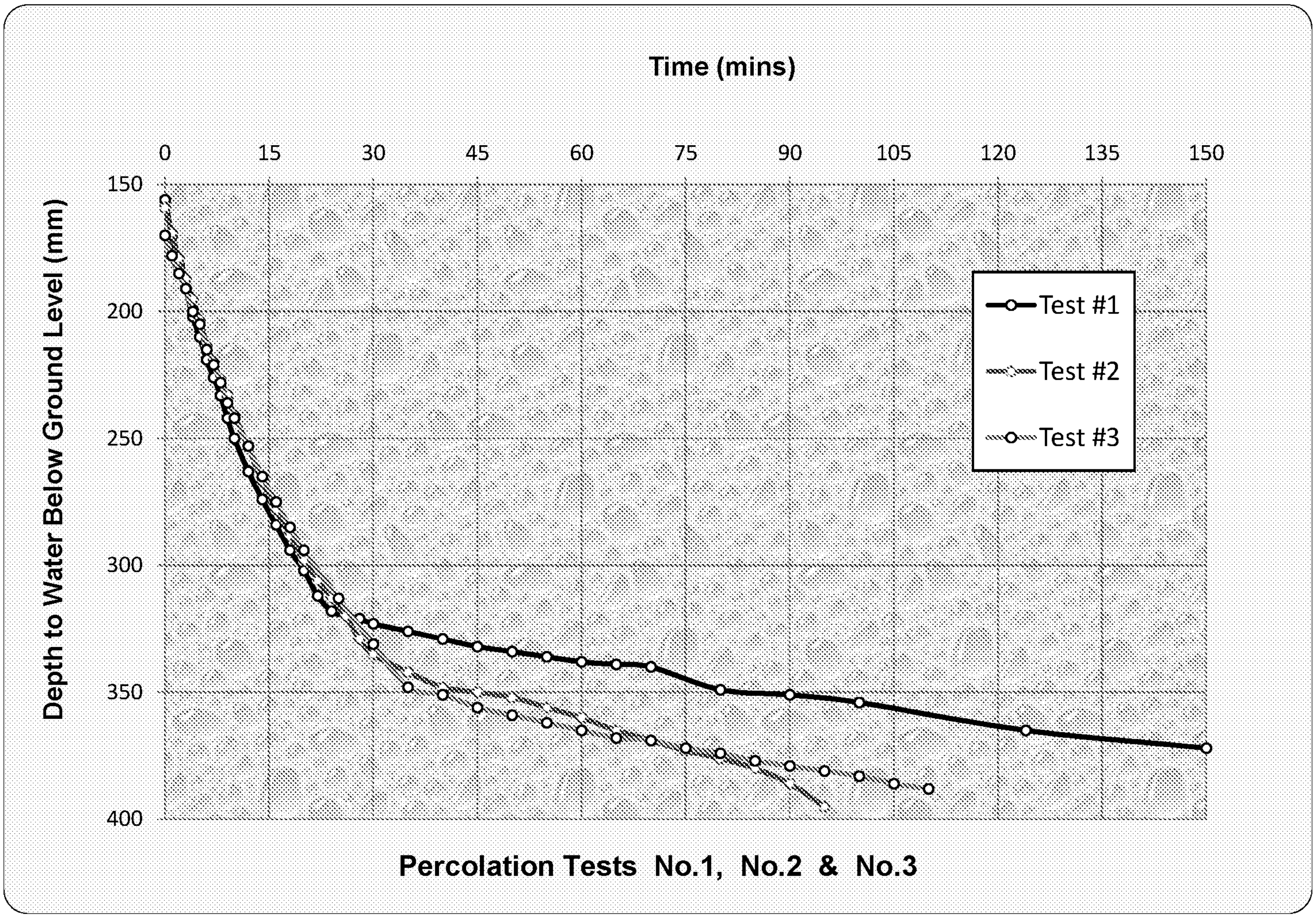
Tuesday 16th, Wednesday 17th & Thursday 18th July 2024

"LongAcre" the Street Walberton

Percolation Trial Pit TP#1 (north)

Percolation Testing Numbers #1, #2 & #3

1280mm Length x 450mm Width



Mate GeoTechnic Services

Tuesday 16th July 2024

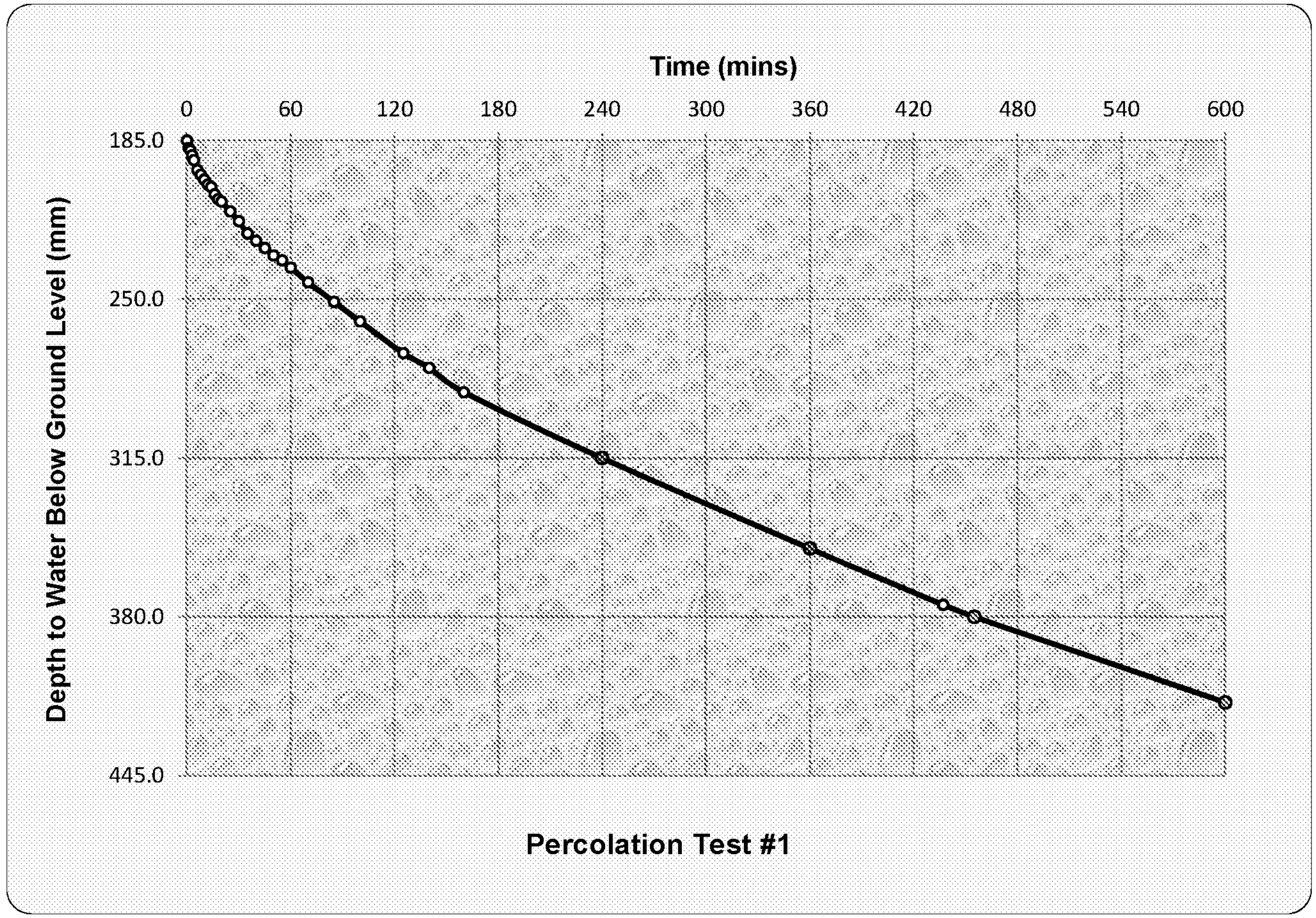
"LongAcre" the Street Walberton

Percolation Trial Pit TP#2 (centre)

Percolation Test Number 1

1370mm Length x 450mm Width x 445mm Depth

	Time (mins)	Depth to Water Surface
13:53:00	0	185
	1	188
	2	189
	3	191
	4	193
	6	197
	8	199
	10	201
	12	203
	14	204
	16	207
	18	209
	20	210
	25	214
	30	218
	35	223
	40	226
	45	229
	50	232
	55	234
	60	237
	70	243
	85	251
15:33:00	100	259
	125	272
	140	278
16:33:00	160	288
	240	315
	360	352
21:10:00	437	375
	455	380
	600	415



Soil infiltration rate: $f = \dfrac{0.080}{1.090 \times 371.9 \times 60} = 3.296\text{E-}06$ m/s

SOIL INFILTRATION RATE IS

3.296E-06 metres/second

Non Reading Smoothing Points in BLUE

Non Reading Extrapolated Points in RED

Mate GeoTechnic Services

Wednesday 17th July 2024

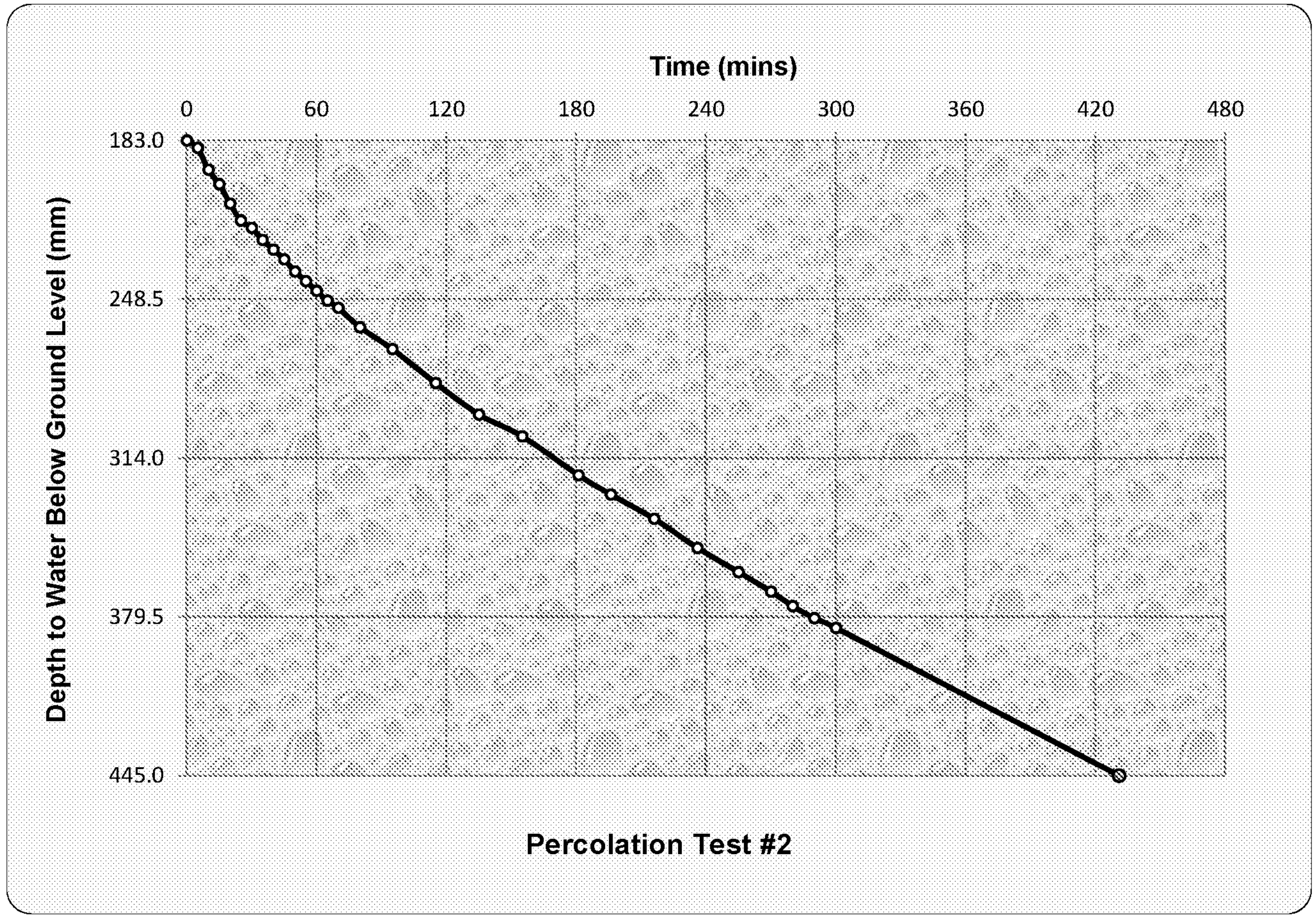
"LongAcre" the Street Walberton

Percolation Trial Pit TP#2 (centre)

Percolation Test Number 2

1370mm Length x 450mm Width x 445mm Depth

	Time (mins)	Depth to Water Surface
11:19:00	0	183
	5	186
	10	195
	15	201
	20	209
	25	216
	30	219
	35	224
	40	228
	45	232
	50	237
	55	241
	60	245
	65	249
	70	252
	80	260
	95	269
	115	283
	135	296
	155	305
14:20:00	181	321
	196	329
	216	339
	236	351
	255	361
	270	369
	280	375
	290	380
16:19:00	300	384
18:30:00	431	446
	Client Observation	



Soil infiltration rate: $f = \dfrac{0.081}{1.093 \times 224.6 \times 60} = 5.481E\text{-}06$ m/s

Non Reading Extrapolated Point in RED

SOIL INFILTRATION RATE IS

5.481E-06 metres/second

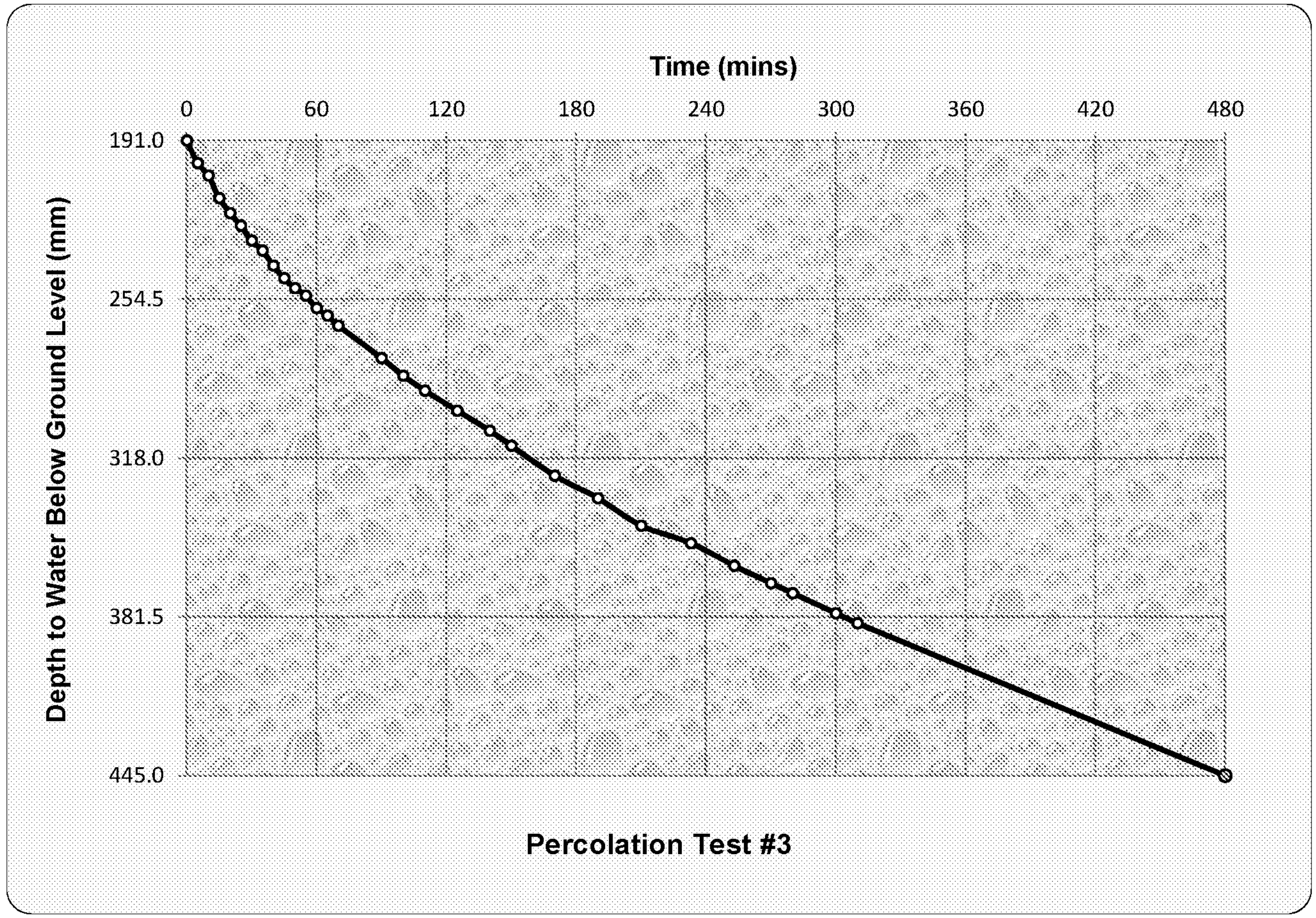
"LongAcre" the Street Walberton

Percolation Trial Pit TP#2 (centre)

Percolation Test Number 3

1370mm Length x 450mm Width x 445mm Depth

	Time (mins)	Depth to Water Surface
10:47:00	0	191
	5	200
	10	205
	15	214
	20	220
	25	225
	30	231
	35	235
	40	241
	45	246
	50	250
	55	253
	60	258
	65	261
11:57:00	70	265
	90	278
	100	285
	110	291
	125	299
	140	307
	150	313
	170	325
	190	334
	210	345
	233	352
	253	361
	270	368
	280	372
15:47:00	300	380
	310	384
	480	445



Soil infiltration rate: $f = \dfrac{0.078}{1.079 \times 247.3 \times 60} = 4.892E\text{-}06$ m/s

Non Reading Extrapolated Point in RED

SOIL INFILTRATION RATE IS

4.892E-06 metres/second

Mate GeoTechnic Services

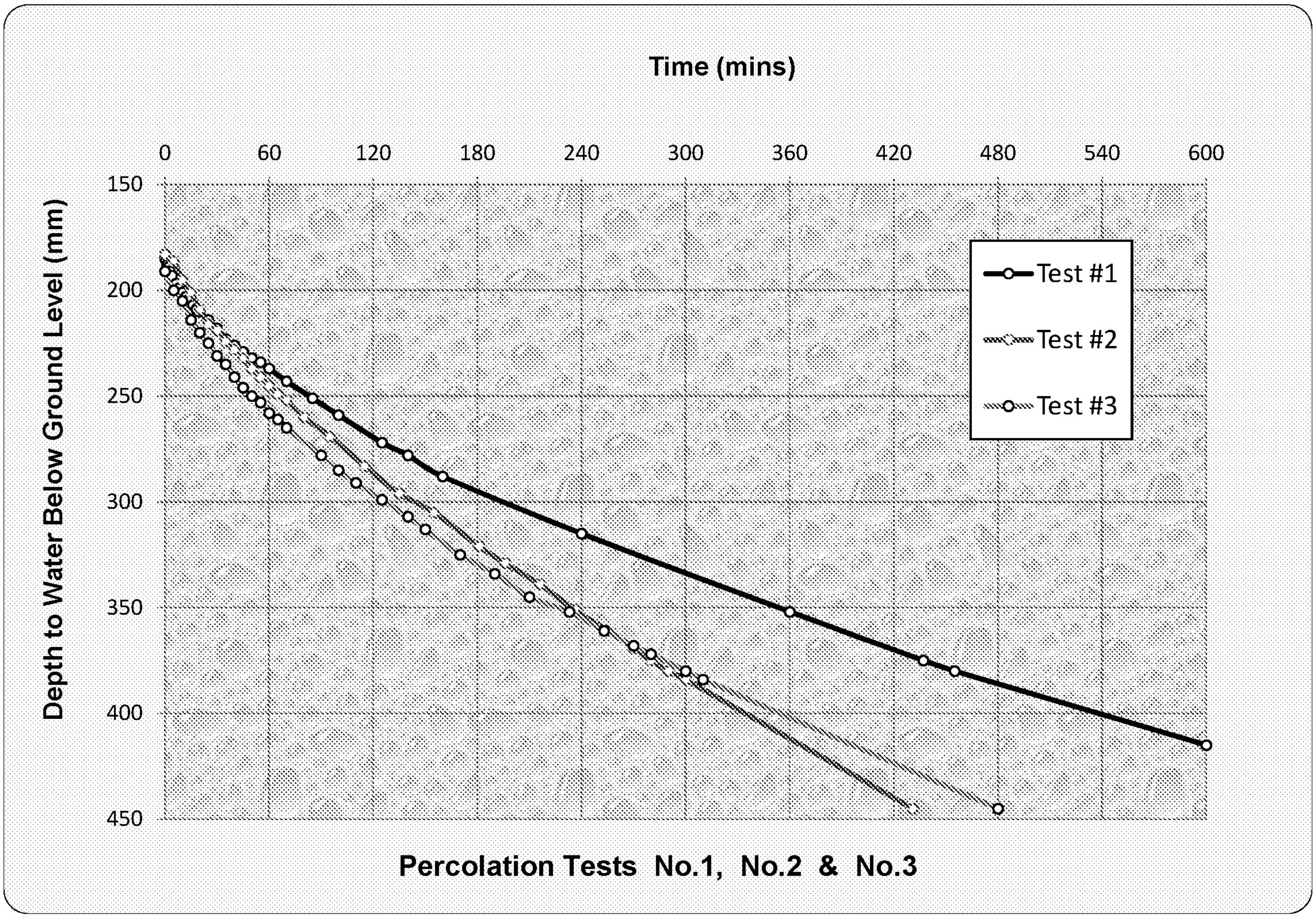
Tuesday 16th, Wednesday 17th & Thursday 18th July 2024

"LongAcre" the Street Walberton

Percolation Trial Pit TP#2 (centre)

Percolation Testing Numbers #1, #2 & #3

1370mm Length x 450mm Width



Mate GeoTechnic Services

Wednesday 17th July 2024

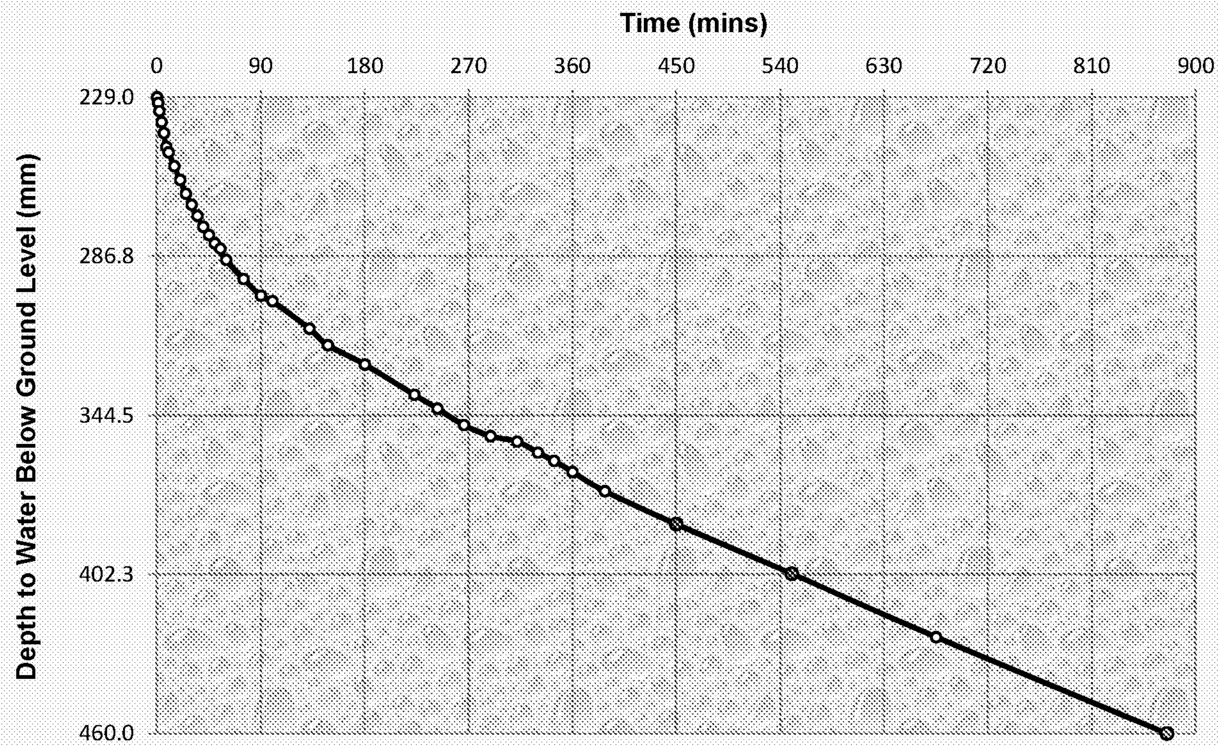
"LongAcre" the Street Walberton

Percolation Trial Pit TP#3 (south)

Percolation Test Number 1

1600mm Length x 450mm Width x 460mm Depth

	Time (mins)	Depth to Water Surface
09:34:00	0	229
	1	231
	2	234
	4	238
	6	242
	8	247
	10	249
	15	254
	20	259
	25	264
	30	268
	35	272
	40	276
	45	279
	50	282
	55	284
	60	288
	75	295
	90	301
11:34:00	100	303
	132	313
	148	319
12:34:00	180	326
	223	337
13:37:00	243	342
	266	348
	289	352
	312	354
	330	358
	344	361
15:34:00	360	365
	388	372
	450	384
	550	402
20:49:00	675	425
	875	460



Percolation Test #1

Soil infiltration rate: $f = \dfrac{0.083}{1.194 \times 491.6 \times 60} = 2.362\text{E-}06$ m/s

SOIL INFILTRATION RATE IS

2.362E-06 metres/second

Non Reading Smoothing Points in BLUE

Non Reading Extrapolated Points in RED

Mate GeoTechnic Services

Thursday 18th July 2024

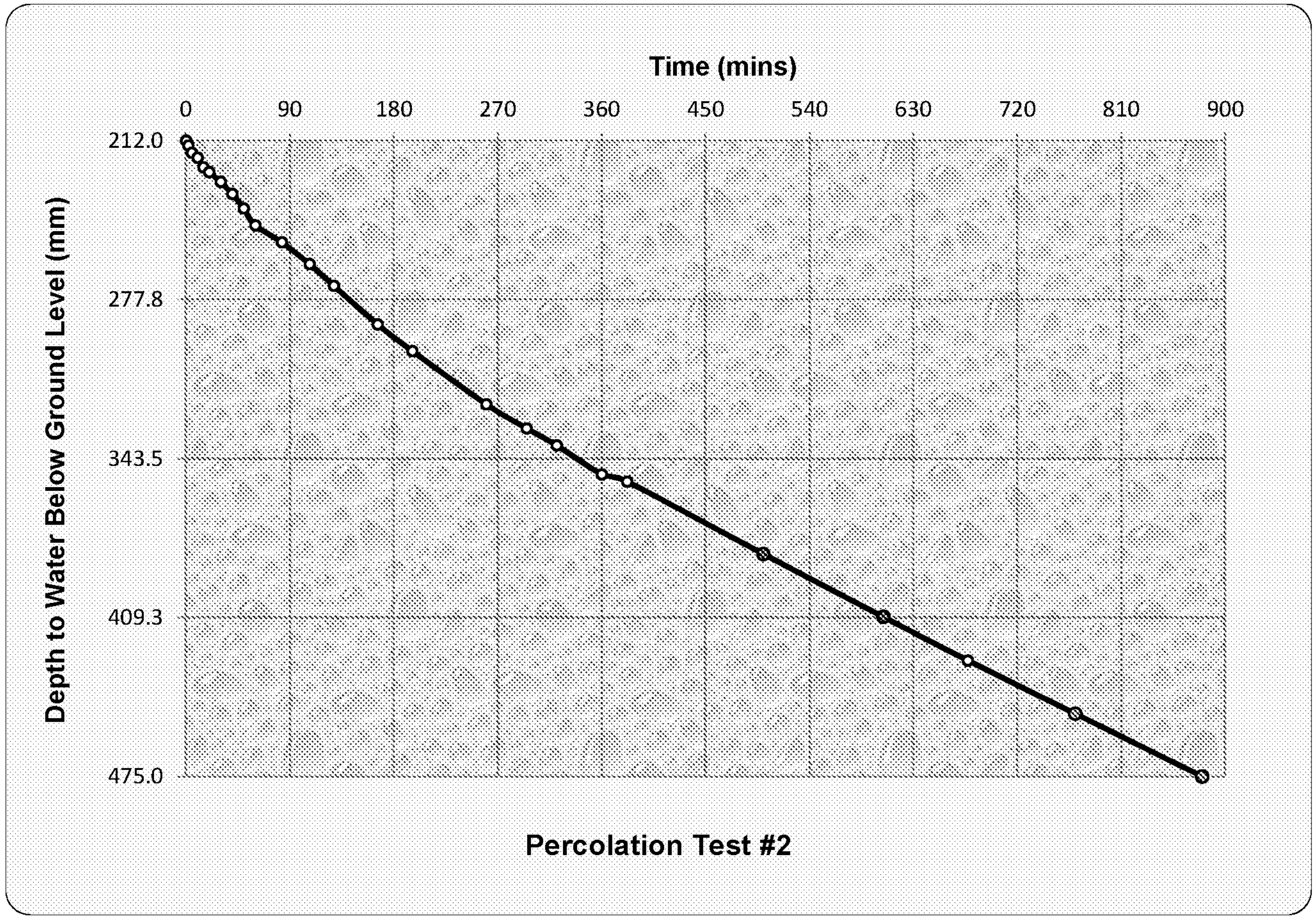
	Time (mins)	Depth to Water Surface
09:42:00	0	212
	2	214
	5	217
	10	219
	15	223
	20	225
	30	229
	40	234
	50	240
	60	247
	83	254
	107	263
11:50:00	128	272
	166	288
	196	299
14:02:00	260	321
	295	331
	321	338
15:42:00	360	350
16:04:00	382	353
	500	383
	604	409
20:59:00	677	427
	770	449
	880	475

"LongAcre" the Street Walberton

Percolation Trial Pit TP#3 (south)

Percolation Test Number 2

1600mm Length x 450mm Width x 475mm Depth



Soil infiltration rate: $f = \frac{0.095}{1.259 \times 462.3 \times 60}$ = 2.711E-06 m/s

SOIL INFILTRATION RATE IS

2.711E-06 metres/second

Mate GeoTechnic Services

Sunday 21st July 2024

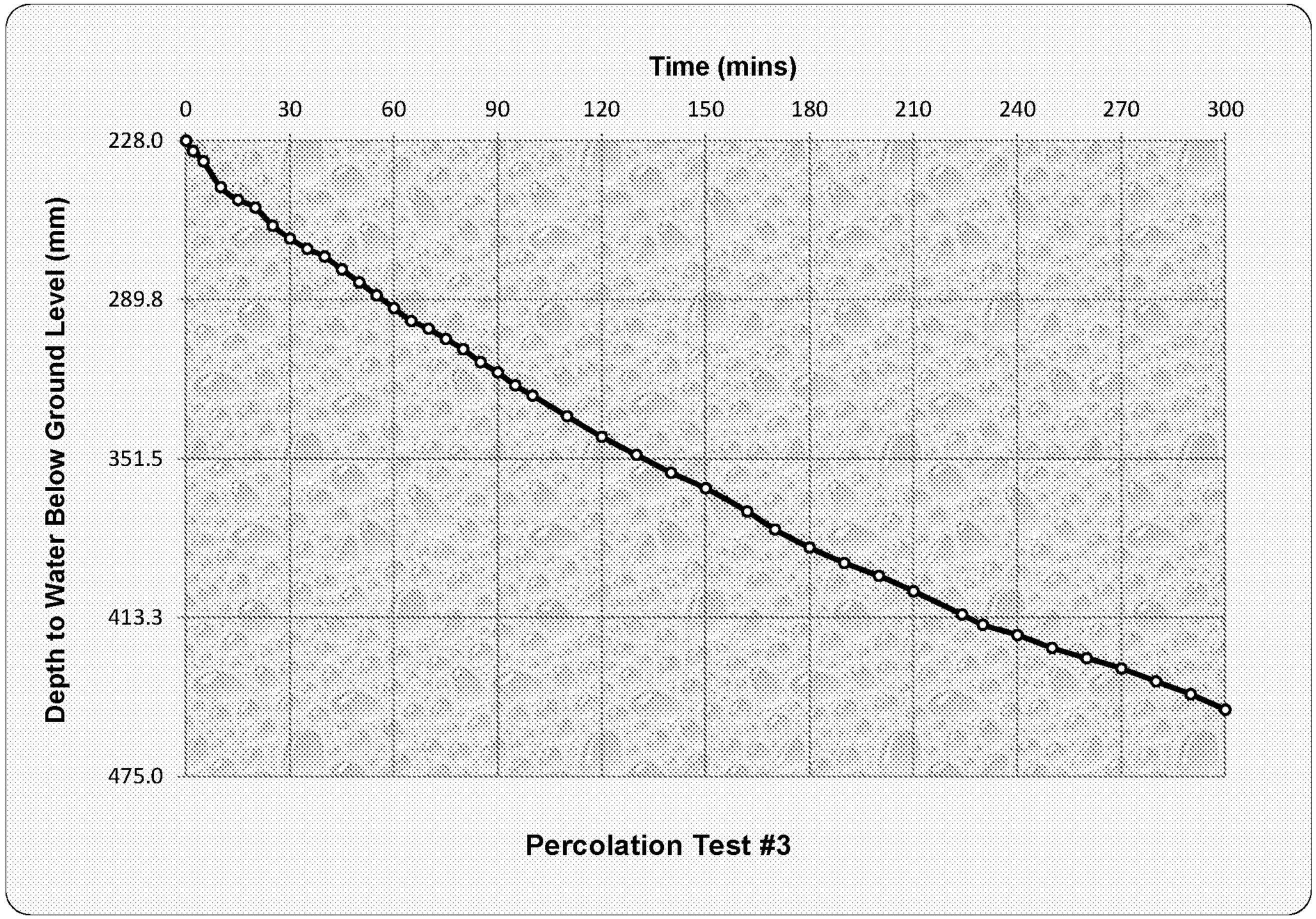
"LongAcre" the Street Walberton

Percolation Trial Pit TP#3 (south)

Percolation Test Number 3

1600mm Length x 450mm Width x 475mm Depth

	Time (mins)	Depth to Water Surface
09:30:00	0	228
	2	232
	5	236
	10	246
	15	251
	20	254
	25	261
	30	266
	35	270
	40	273
	45	278
	50	283
	55	288
10:30:00	60	293
	65	298
	70	301
	75	305
	80	309
	85	314
	90	318
	95	323
	100	327
	110	335
	120	343
	130	350
	140	357
	150	363
	162	372
	170	379
	180	386
	190	392
	200	397
	210	403
13:14:00	224	412
	230	416
	240	420
	250	425
	260	429
	270	433
	280	438
	290	443
14:30:00	300	449



Soil infiltration rate: $f = \frac{0.089}{1.226 \times 169.1 \times 60} = 7.145\text{E-}06$ m/s

SOIL INFILTRATION RATE IS

7.145E-06 metres/second

Mate GeoTechnic Services

Wednesday 17th, Thursday 18th & Sunday 21st July 2024

"LongAcre" the Street Walberton

Percolation Trial Pit TP#3 (south)

Percolation Testing Numbers #1, #2 & #3

1600mm Length x 450mm Width