

CIVIL ENGINEERING DESIGN CALCULATIONS

MANOR CLOSE, ICKLEFORD, HERTS

FOR TROY HOMES

CALCULATIONS REPORT REF: TH152_C_S_CR001

REVISION 2

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CONTENTS

1.	INTRODUCTION.....	1
2.	ENGINEERING SCOPE.....	2
3.	SITE DETAILS & PROPOSED DEVELOPMENT	3
4.	EXTERNAL DRAINAGE ARRANGEMENTS.....	4
5.	PROPOSED DRAINAGE STRATEGY	5
	GENERAL	5
	SURFACE WATER	5
	WATER QUALITY	6
	FOUL WATER	7
6.	MAINTENANCE AND MANAGEMENT	8
	PERMEABLE BLOCK PAVEMENT	8
	GEOCELLULAR SOAKAWAYS.....	9
7.	ENGINEERING TECHNICAL INFORMATION	11
8.	DESIGN CALCULATIONS	12
9.	SUMMARY.....	13

FIGURES

FIGURE 1 - SITE LOCATION PLAN/AERIAL PHOTO

APPENDICES

APPENDIX A – SITE LAYOUT

APPENDIX B – DRAINAGE GENERAL ARRANGEMENT

APPENDIX C - CALCULATIONS

1. INTRODUCTION

- 1.1. Structa LLP have been commissioned by Troy Homes to undertake the Civil Engineering Design for a proposed development at Manor Close, Ickleford, Herts.
- 1.2. The calculations in this report have been prepared in accordance with British Standards, Eurocodes and relevant Technical Guidance Documents, as applicable to the project and as listed in Tables 1 and 2.

TABLE 1: DESIGN CODES

Design Codes		Used
British Standards	BS 7533 Part 2: Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks	✓
	BS EN 752:2017 Drain and sewer systems outside buildings.	✓

TABLE 2: TECHNICAL DOCUMENTS

Technical Guidance Documents		Used
Technical Guidance	NHBC Standards 2024	✓
	Building Regulations Approved Document H - Drainage and Waste Disposal	✓
	Building Regulations Approved Document M - Access to and Use of Buildings	✓
	Technical Guidance to the National Planning Policy Framework	✓
	CIRIA C753 - The SUDS manual	✓
	Water UK Sewerage Secor Guidance, Appendix C – Design and Construction Guidance	✓
	Manual of Contract Documents for Highway Works, Volume 1 - Specification for Highway Works	✓

- 1.3. As part of the planning application, prior to the first occupation of the development hereby granted by the LPA, planning condition No.17 states that, *“Where a sustainable drainage scheme is to be provided, the submitted details shall:*
 - *Provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;*
 - *Include a timetable for its implementation; and,*
 - *Provide, a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.”*
- 1.4. The above planning condition is addressed at Sections 5 and 6, which details the Proposed drainage strategy and the associated SuDS Maintenance Plan respectively, for the lifetime of the development.

2. ENGINEERING SCOPE

2.1. Structa LLP have been instructed to carry out the civil engineering design of the external drainage, roads and finished levels and provide AutoCAD drawings with specification items included, suitable for construction. Calculations and drainage layout suitable to enable discharge of NHBC conditions pertaining to drainage matters are to be provided.

2.2. The design of the external drainage comprises the following:

- Design of private foul and surface water drainage networks
- Design of adoptable foul sewers (Section 104 works)
- Design of surface water infiltration devices
- Design of connections to public sewers (Section 106 works)

2.3. The design of the roads comprises the following:

- Design of private road construction
- Design of adoptable road junction construction (Section 278)
- Design of permeable paving construction

2.4. The design of the finished levels comprises the following:

- Design of finished floor levels and identifying steps in slab levels
- Design of falls for soft and hard landscaping
- Identifying retaining structures and retained heights
- Cut and fill modelling where required

2.5. The following elements are excluded from our design remit as these are to be designed, detailed and supplied by the developer's/contractor's preferred supplier.

- Street Lighting
- Utility Services

3. SITE DETAILS & PROPOSED DEVELOPMENT

- 3.1. The development site is located on wooded, overgrown undeveloped land off Turnpike Lane, Ickleford, Herts approximately 4.0km to the west of Letchworth Garden City centre.
- 3.2. The site is bounded to the north by Turnpike Lane, to the east by residential properties, to the south by industrial premises and to the west by open grassland.
- 3.3. The total area of the development site is 0.465ha
- 3.4. British Geological Survey (BGS) maps indicate this site to be underlain by superficial deposits of Glaciofluvial Deposits (sand and gravel) which is in turn indicated to be overlain by the Gault Formation bedrock (mudstone).
- 3.5. The latest site investigation (Ref: ES0073 Rev1) undertaken by The CDS Group in July 2024 identified topsoil/made ground 0.20-0.60m thick overlying Sands and Gravels with irregular gravelly/sandy clay bands to a minimum depth of 3.00m (bottom of trial pits).
- 3.6. The ground investigation report confirmed moderate groundwater strikes at depths varying between 1.60m-2.07m below existing ground level. Groundwater monitoring was not included as part of The CDS Group site investigation works.
- 3.7. Infiltration testing was carried out by The CDS Group, which indicates the soakage rate varies marginally across the site between 4.69×10^{-5} m/s to 9.45×10^{-6} m/s.
- 3.8. In addition, BRE365 compliant infiltration test results presented in the C J Emm Ltd "Drainage Report" (Ref 091D42-DR/01 April 2023) confirmed similar soakage rates varying marginally across the site between 6.61×10^{-5} m/s to 1.52×10^{-5} m/s.
- 3.9. The proposed development comprises the construction of 8No. residential dwellings with access road, parking areas and areas of soft landscaping. A site layout is provided in Appendix A.

4. EXTERNAL DRAINAGE ARRANGEMENTS

- 4.1. As this is an undeveloped green field site there are currently no positive foul or surface water discharges on or off-site.
- 4.2. The majority of the site is currently permeable (0.445ha) with only a single tarmac access road being impermeable (0.02ha). The site is generally rectangular in nature and slopes gradually down in a northwest to southeast direction at a gradient of approximately 1in50.
- 4.3. Sewerage Authority (Anglian Water) records indicate that there is a public foul sewer in Turnpike running adjacent to the northern site boundary. There are no public surface water sewers in the vicinity of the site.
- 4.4. There are no open features such as ditches, watercourses, streams etc. in the vicinity of the site to accommodate an attenuated surface water discharge.

5. PROPOSED DRAINAGE STRATEGY

GENERAL

5.1. The following general principles shall be applied to the drainage design for the re-development.

- The run-off generated by the proposed development should be minimised by the use of Sustainable Drainage Systems (SUDS) techniques.
- The surface water drainage system should be designed to convey the design storm event of a 1 in 100yr storm plus 45% climate change allowance.
- The discharge from the development to the local sewer network, if necessary, shall be controlled to avoid exceeding the capacity of the sewer system, without detriment to the site use and not increasing the flood risk to the surrounding area.

5.2. By following these principals in preparing the drainage strategy it will mean that:

- The surface water drainage network will be sufficiently robust to withstand the impacts of climate change.
- The risk of flooding to surrounding areas will not be increased as a result of the development.
- Surface water run-off will be controlled on-site and the development will not increase flood risk.

5.3. The presence of suitable sand and gravel strata at shallow depth and acceptable soakage rates presented in the ground investigation report(s) indicate that conventional infiltration techniques will be suitable for disposing the surface water runoff from the development site.

SURFACE WATER

5.4. The following drainage design and layout proposals follow the principles set out in the C J Emm Ltd "Drainage Report" submitted in support of a previous 8No unit iteration of the planning layout.

5.5. The proposed drainage layout is provided on drawing **TH152_C_S_051 Drainage General Arrangement** (Refer Appendix B).

5.6. The proposals are to dispose surface water run-off from roofs, access road, drives and parking areas via infiltration techniques to accommodate all storm events up to and including 1in100year + 45% allowance for climate change.

5.7. Shallow geo-cellular soakaways are provided in rear gardens to infiltrate clean run-off from roofs only. A 10% allowance for urban creep has been added to roof areas.

5.8. Porous block paving is provided to serve the private road, drives and parking areas This will incorporate full infiltration where possible and provide storage within the granular sub-base material. Hardstanding areas within 5.0m of properties are to incorporate an impermeable liner to prevent infiltration, in accordance with Building Regulations Approved Document Part H.

- 5.9. As not all the required storage to accommodate run-off from the road/hardstanding areas can be provided in the granular sub-base alone, an adjacent shallow geo-cellular soakaway will provide additional storage and infiltration.
- 5.10. The lowest of the recorded infiltration rates of 9.45×10^{-6} m/s has been used in the design of the soakaways and permeable paving with a suitable safety factor applied.
- 5.11. Ground levels have generally been raised across the site to provide a balanced cut and fill profile resulting in all geo-cellular soakaways having their base levels set to provide a minimum 1.0m unsaturated zone above the recorded water strike levels provided in The CDS Group ground investigation report.

WATER QUALITY

- 5.12. In addition to the water quantity control measures set out above, the proposed surface water drainage network will provide treatment to run-off prior to discharge.
- 5.13. CIRIA publication C753 (The SuDS Manual) sets out the simple index approach to the assessment of surface water treatment.
- 5.14. This approach requires suitable pollution hazard indices to be allocated to the development run-off. The pollution hazard indices for the two land use classifications applicable to the proposed development are summarised in the table below.

TABLE 3: POLLUTION HAZARD INDICES

Land Use	Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads	Low	0.5	0.4	0.4

- 5.15. To deliver adequate treatment, selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

TABLE 4: POLLUTION MITIGATION INDICES: DISCHARGES TO SURFACE WATERS

SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7

- 5.16. This confirms that the proposed surface water drainage network can provide suitable treatment to run-off prior to discharge.
- 5.17. It is important to note that the mitigation indices set out above apply to SuDS components that follow the design guidance with respect to hydraulics and treatment set out in the corresponding technical

chapter of the SuDS Manual (chapter 22). During the detailed design stage the SuDS components shall be designed in accordance with the relevant guidance to ensure adequate treatment of surface water run-off.

TABLE 5: POLLUTION MITIGATION INDICES: DISCHARGES TO GROUNDWATER

Characteristics of the material overlying the proposed infiltration surface, through which the run-off percolates	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e. graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.4	0.4

- 5.18. Soakways infiltrating runoff from roofs at the rear of dwellings and connected to permeable pavement, are underlain by soil of good attenuation potential and infiltration trench with a minimum depth of 500mm.
- 5.19. This confirms that the proposed surface water drainage network can provide suitable treatment to run-off prior to discharge to the ground.

FOUL WATER

- 5.20. It is proposed to connect the gravity foul drainage network to the existing public sewer network in Turnpike Lane via a newly installed lateral connection.
- 5.21. The lateral connection is subject to Anglian Water S106 Sewer Connection and S104 Adoption consents.

6. MAINTENANCE AND MANAGEMENT

- 6.1. This section provides guidance on the maintenance of specific Sustainable Drainage Systems (SuDS) components, the management for which will be the responsibility of either:
- Anglian Water, as the sewer authority;
 - an appointed management company.
- 6.2. These sub-sections outline the maintenance requirements for the SuDS components within the proposed drainage network, however they do not set out all of the drainage that is to be maintained.
- 6.3. It is possible in the future that parts of the drainage network will automatically be transferred to the sewer authority under the Flood and Water Management Act, however this legislation is still under scrutiny and not yet fully implemented.

PERMEABLE BLOCK PAVEMENT

- 6.4. Permeable block paving allows water to infiltrate through the gaps between the blocks into a layer of open-graded aggregate, where the water is attenuated before passing into the piped drainage network.
- 6.5. Permeable pavement increases the time that surface water run-off takes to enter the main drainage system and can provide attenuation storage of run-off in the permeable sub-base.
- 6.6. Surface water run-off passing through the permeable sub-base also receives treatment through the removal/breakdown of pollutants.
- 6.7. The operation and maintenance requirements are given in the table below.

TABLE 6: PERMEABLE PAVEMENT MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Sweeping. Note: Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement.	Three times a year at the end of winter, mid-summer and after autumn leaf fall. Also as required based on site-specific observations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washed into the paving.	As required.
	Removal of weeds.	As required.
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.

Maintenance Schedule	Required Action	Recommended Frequency
	Rehabilitation of surface and underlying sand and geotextile.	As required (if infiltration performance is significantly reduced as a result of significant clogging).
Monitoring	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.

- 6.8. Maintenance of permeable pavement in public areas (e.g. shared drives and parking areas) will be the responsibility of an appointed management company.
- 6.9. Permeable pavement in areas of land conveyed during the sale of property (i.e. private driveways) will be maintained by the owners of the associated property. Householders must be informed of the maintenance requirements associated with any privately-owned permeable pavement for which they are responsible.
- 6.10. Refer to the Drainage General Arrangement Drawing for the location of the permeable block pavement.

GEOCELLULAR SOAKAWAYS

- 6.11. These soakaways utilise modular geocellular crates to convey run-off into the ground via infiltration.
- 6.12. The high void ratio of the crates allows each soakaway to provide a large volume of attenuation storage.
- 6.13. Each soakaway will be wrapped in a permeable geotextile and will be constructed in permeable strata.
- 6.14. The base of each soakaway should be at least 1.0m above the maximum likely groundwater level.
- 6.15. The operation and maintenance requirements are set out in the table below.

TABLE 7: GEOCELLULAR SOAKAWAY MAINTENANCE

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six-monthly.
	Remove sediment from geo-cellular crates via central inspection point.	Annually, or as required.
Remedial actions	Repair/rehabilitation of inlets, outlets and vents.	As required.
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required.

Maintenance Schedule	Required Action	Recommended Frequency
Monitoring	Inspect/check all inlets, outlets and vents to ensure that they are in good condition and operating as designed.	Annually and after large storms.
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.
	Check soakaway to ensure emptying is occurring.	Annually.

6.16. Refer to the Drainage General Arrangement Drawing for the location of the geocellular soakaways.

6.17. Maintenance of the geocellular soakaways will be the responsibility of an appointed management company.

7. ENGINEERING TECHNICAL INFORMATION

7.1. A technical review of the information presented has been carried out and the significant engineering elements are listed in the tables below.

TABLE 8: TECHNICAL INFORMATION

Element	Description/Report Reference	Req'd
SI Report	The CDS Group - Phase III Geoenvironmental and Geotechnical Report ES0073 Rev1	✓
Tree Report	Sharon Hosegood Associates – Arbicultural Impact Assessment SHA 1132 Rev A	✓
CCTV Drainage Survey	-	✗
Topo Survey	Terrain Surveys Ltd – Topographical Survey TS18-125 D\1	✓
Ground Conditions	The CDS Group - Phase III Geoenvironmental and Geotechnical Report ES0073 Rev1	✓
Forest Susceptible Soil	The CDS Group - Phase III Geoenvironmental and Geotechnical Report ES0073 Rev	✓
Ground water	The CDS Group - Phase III Geoenvironmental and Geotechnical Report ES0073 Rev1	✓

8. DESIGN CALCULATIONS

- 8.1. The design of the drainage elements has been carried out by hand and where appropriate utilising computer software to assist with the analysis and design elements. Table 7 below lists the software products that have been used.

TABLE 9: DESIGN SOFTWARE

Computational Design Packages	Used
Excel soakaway design software	✓
Causeway Flow drainage design software	✓

- 8.2. Drainage design calculations are presented in Appendix C.

9. SUMMARY

- 9.1. The proposed surface water drainage system for the development shall comprise infiltration techniques in the form of geo-cellular soakaways and permeable paving with storage provided to accommodate all storm events up to and including the 1 in 100 year storm plus a 45% allowance for climate change.
- 9.2. A 10% allowance for urban creep has been applied for roof areas.
- 9.3. The proposed surface water attenuation devices provide a SuDS approach to surface water disposal and protection of ground water quality.
- 9.4. The proposed surface water drainage design principles set out in this document will ensure that the development does not result in flooding on-site for the duration of the design storms or increase the risk of flooding to surrounding areas to the detriment of others.
- 9.5. During the post planning scheme development process, the site layout has been updated to incorporate minor changes to that shown in the C J Emm "Drainage Report" Ref: 091D42-DR-01 Rev1. The updates are very minor in nature and therefore the principles for surface water disposal remain the same.
- 9.6. A private gravity foul network serving the development will discharge to the existing public foul sewer network within Turnpike Lane to the northern site boundary with the connection subject to Anglian Water S106 Sewer Connection and S104 Adoption consent.

FIGURES

FIGURE 1

SITE LOCATION MAP/AERIAL PHOTO

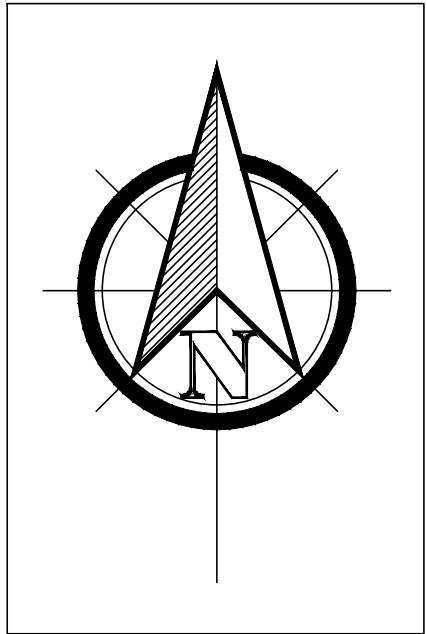


APPENDICES

APPENDIX A

SITE LAYOUT

CHBC ARCHITECTURE SITE PLAN



Rev:	Date:	Amendment:	Initial:
P1	12.06.24	PRELIMINARY ISSUE	JP
P2	14.06.24	Site boundary updated to clients comments	JP
P3	28.06.24	Updated to clients comments, additional information added	DP
P4	27.09.24	Additional information added, hard landscaping key added, plots 2-7 layouts redesigned & site layout adjusted as per S73 application	DP/JP
P5	04.10.24	Plot 8 info added, roof layout & RWP positions updated, plots 2-7 drainage updated to latest layout	JP
P6	09.10.24	600mm picket fencing added to site layout, bin storage points adjusted, 6ft x 4ft garden sheds added, parking to plots 5 & 6 updated, plot 7 parking moved and carport added, private paving hatch added to key	JP

HARD LANDSCAPING KEY

- ENTRANCE ROAD - BLACK TARMAC
- ENTRANCE PATH - BLACK TARMAC
- SITE COMMUNAL PATH - OMEGA FLOW NATURAL
- SITE ROAD - OMEGA FLOW CHARCOAL (45 deg HERRINGBONE PATTERN)
- PARKING - OMEGA FLOW CHARCOAL (90 deg HERRINGBONE PATTERN). DEMARCATION WITH NATURAL OMEGA FLOW
- PRIVATE PAVING - BRETT CHAUCER JOINTLESS PAVING SLABS

GENERAL KEY

- SITE BOUNDARY
- 1.8M HIGH 215MM WIDE BRICK WALL
- LOW BRICK RETAINING WALL WITH CLOSED BOARDED FENCE OVER
- LOW BRICK RETAINING WALL
- GRAVEL BOARD WITH CLOSED BOARDED FENCE OVER
- CLOSED BOARDED FENCE
- 600mm HIGH PICKET FENCE
- HIGH POST & RAIL FENCE
- HIGH CLOSED BOARDED FENCE WITH 0.3m TRELLIS OVER
- PLOT NUMBER
- TIMBER GARDEN GATE
- PARKING SPACES 5m x 2.5m
- VEHICLE CHARGING POINT
- BIN STORAGE POINT
- BIN COLLECTION POINT
- ELECTRIC METER
- GAS METER
- BOILER LOCATION
- PRIMARY ENTRANCE
- SECONDARY ENTRANCE OR PERSONNEL DOOR TO GARAGE
- 6ft x 4ft APEX ROOF TIMBER GARDEN SHED

KEY CDM RESIDUAL DESIGN RISKS

- Notes:
- Site verify all dimensions prior to construction
 - Report all discrepancies to the Drawing Originator immediately
 - This drawing is to be read in conjunction with all relevant documents and drawings
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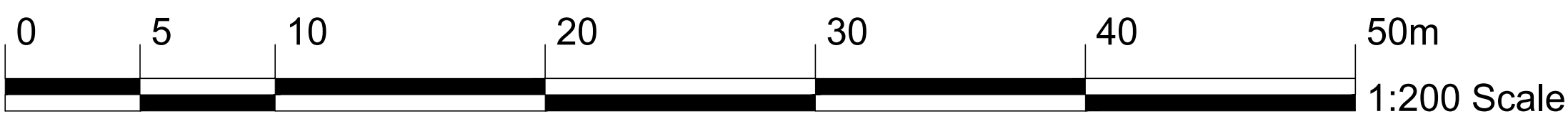
Client: TROY HOMES

Project: LODGE COURT
TURNPIKE LANE, ICKLEFORD
HITCHIN, SG5 3UZ

Drawing: SITE PLAN

Scale: 1:200 @ A1 Date: JUNE 2024
Drawn By: Checked By: Drawing No: JP DP TH152_A_S_XX_001 Rev: P6

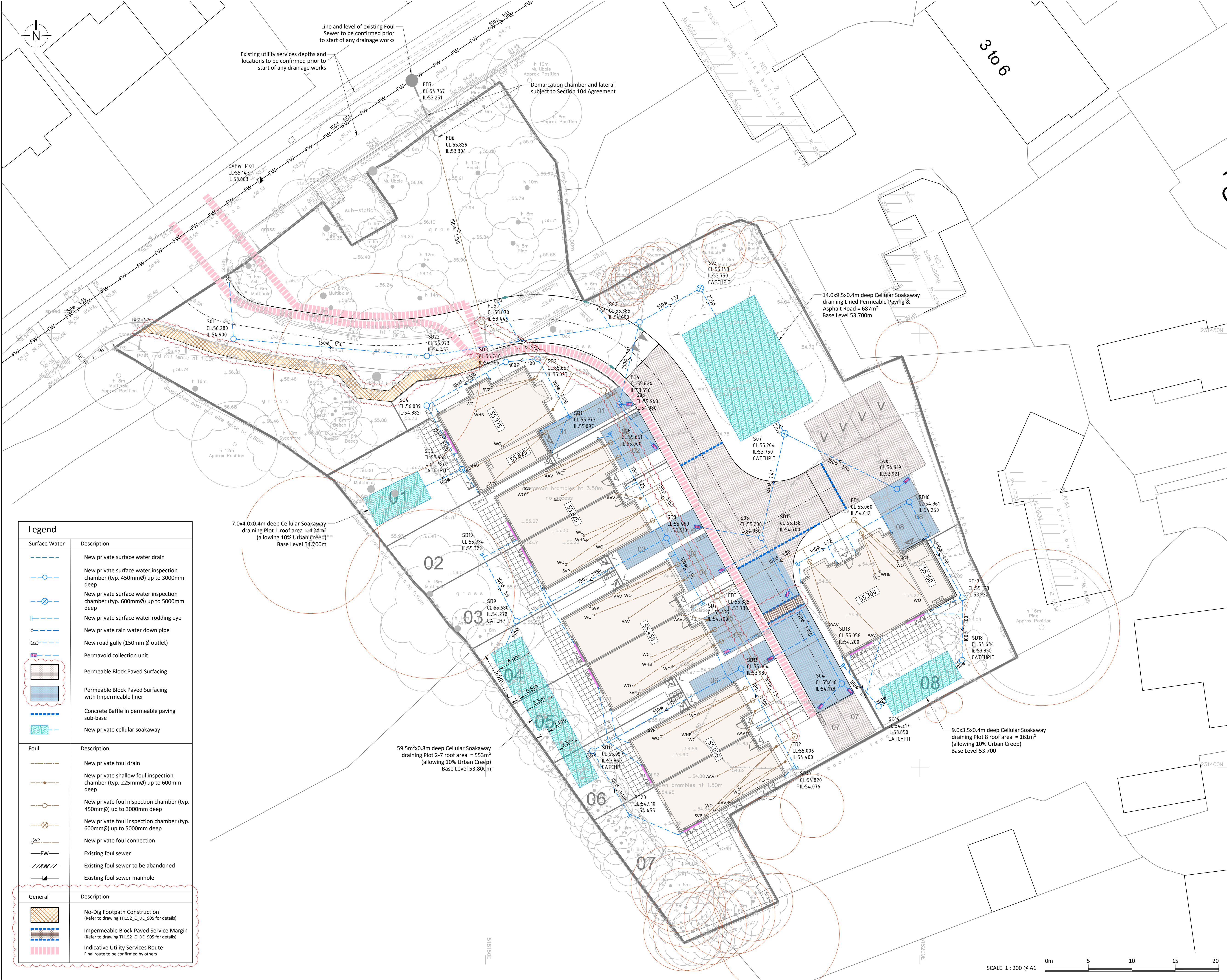
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Only figured dimensions to be worked to. Any discrepancies to be reported to the drawing originator.



APPENDIX B

DRAINAGE GENERAL ARRANGEMENT

TH152_C_S_051



HEALTH, SAFETY & ENVIRONMENT

It is the responsibility of the client to ensure that those undertaking the works are competent and experienced in the type of work to be undertaken.

In addition to the hazards usually associated with the types of work detailed on this drawing, the following specific hazards have been identified through design risk assessment. The planning and execution of the works should take into account all usual and specific hazards.

Hazards should also be taken into account in the maintenance, operation, decommissioning and demolition of the works.

None Identified

- NOTES
- All dimensions are in millimetres (mm) and levels in metres Above Ordnance Datum (mAOD) unless noted otherwise.
 - The copyright in this drawing belongs to Structa LLP; the designs and details may not be used on any project other than that indicated in the titleblock.
 - Where CAD or BIM files of the drawing are issued, they are provided for the convenience of others, and shall not be used for construction purposes or relied upon for accuracy or completeness.
 - Soakaway designs have been based on an Infiltration Rate of 9.45x10⁻⁴m/s as provided in The CDS Group report ref. "ES0073rev1".

C1	29.01.25	UPDATED AS CLOUDED. SERVICES ROUTE ADDED. ISSUED FOR CONSTRUCTION	MR	TL	MDI
P3	28.11.24	SOAKAWAY TO REAR OF PLOTS 4&5 UPDATED	MPG	TL	MDI
P2	04.11.24	DRAINAGE UPDATED TO SUIT LATEST LEVELS	JL	TL	MDI
P1	22.10.24	FIRST ISSUE	MPG	TL	MDI
Rev.	Date	Description	Drawn	Checked	Approved

FOR CONSTRUCTION

MANOR CLOSE, ICKLEFORD

DRAINAGE GENERAL ARRANGEMENT

Structural

Civil

Geo-environmental

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Drawing No: TH152_C_S_051

Revision: C1

APPENDIX C

DRAINAGE CALCULATIONS

SOAKAWAYS AND PERMEABLE PAVING

Soakaway designed in accordance with CIRIA 156

Project & Site Details

Project Number	6786	Produced by	MG
Client	Troy Homes	Checked by	TL
Site Name	Manor Road, Ickleford		
Location	Ickleford, Herts	Date	28/11/2024

Drainage Details

Area	134 m ²	Climate Change	45 %
Catchment Type	Roof	Effective Area	214 m ²
Area Reduction Factor	1.1	Additional Inflow	0.00 l/s

Discharge Parameters

Infiltration Rate	9.45E-06	Soil Type	Clayey Sand
Factor of Safety	3	Source	S.I.R
Effective Infiltration Rate	3.15E-06		
Additional Outflow*	0.00 l/s	Depth to Groundwater (m)	1.0m min

*flat rate from pump only

Rainfall Data

R value					0.45		Storm Return Period			1 in 100 years	
M5-60					20		Country			England and Wales	
								Storage		Time To	
Time	Z1 Value	y mm	Z2 Value	p mm	Value i	a	b	Height		Half -Empty	
5min	0.39	7.80	1.84	14.35	0.17	-146.27	0.009	0.114		4.49	
10min	0.55	11.00	1.91	21.01	0.13	-106.72	0.009	0.167		6.36	
15min	0.64	12.80	1.91	24.45	0.10	-82.51	0.009	0.193		7.27	
30min	0.82	16.40	1.99	32.64	0.07	-54.65	0.009	0.256		9.31	
1hr	1.00	20.00	2.03	40.60	0.04	-33.51	0.009	0.313		11.07	
2hr	1.18	23.60	2.03	47.91	0.02	-19.25	0.009	0.358		12.39	
4hr	1.38	27.60	2.01	55.48	0.01	-10.61	0.009	0.391		13.32	
6hr	1.50	30.00	1.97	59.10	0.01	-7.17	0.009	0.392		13.36	
10hr	1.70	34.00	1.97	66.98	0.01	-4.47	0.009	0.400		13.57	
24hr	2.05	41.00	1.89	77.49	0.00	-1.49	0.009	0.301		10.72	
48hr	2.30	46.00	1.89	86.94	0.00	-0.28	0.009	0.101		4.00	

Soakaway Parameters

Length	7.0 m	Width	4.0 m
Depth	0.4 m	Void	95 %

Results

Critical storm duration (hrs)	10hr	
Required Storage Height	0.400	PASS
Half Time Empty	13.57	PASS

AquaCell Modular Units

No. Units Long	7	No. Units Wide	8
No. Units Deep	1		
Total Number of Units	56	Unit Type	AquaCell Prime

Soakaway designed in accordance with CIRIA 156

Project & Site Details

Project Number	6786	Produced by	MG
Client	Troy Homes	Checked by	TL
Site Name	Manor Road, Ickleford		
Location	Ickleford, Herts	Date	28/11/2024

Drainage Details

Area	503 m ²	Climate Change	45 %
Catchment Type	Roof	Effective Area	802 m ²
Area Reduction Factor	1.1	Additional Inflow	0.00 l/s

Discharge Parameters

Infiltration Rate	9.45E-06	Soil Type	Clayey Sand
Factor of Safety	3	Source	S.I.R
Effective Infiltration Rate	3.15E-06		
Additional Outflow*	0.00 l/s	Depth to Groundwater (m)	1.0m min

*flat rate from pump only

Rainfall Data

R value					0.45		Storm Return Period			1 in 100 years	
M5-60					20		Country			England and Wales	
								Storage		Time To	
Time	Z1 Value	y mm	Z2 Value	p mm	Value i	a	b	Height		Half -Empty	
5min	0.39	7.80	1.84	14.35	0.17	-269.45	0.009	0.203		7.62	
10min	0.55	11.00	1.91	21.01	0.13	-196.87	0.009	0.296		10.62	
15min	0.64	12.80	1.91	24.45	0.10	-152.42	0.009	0.344		12.06	
30min	0.82	16.40	1.99	32.64	0.07	-101.30	0.009	0.456		15.20	
1hr	1.00	20.00	2.03	40.60	0.04	-62.51	0.009	0.562		17.88	
2hr	1.18	23.60	2.03	47.91	0.02	-36.34	0.009	0.650		19.95	
4hr	1.38	27.60	2.01	55.48	0.01	-20.48	0.009	0.726		21.62	
6hr	1.50	30.00	1.97	59.10	0.01	-14.16	0.009	0.747		22.05	
10hr	1.70	34.00	1.97	66.98	0.01	-9.21	0.009	0.795		23.03	
24hr	2.05	41.00	1.89	77.49	0.00	-3.75	0.009	0.731		21.72	
48hr	2.30	46.00	1.89	86.94	0.00	-1.53	0.009	0.536		17.26	

Soakaway Parameters

Base Area	59.5 m ²	Perimeter	45.0 m
Depth	0.8 m	Void	95 %

Results

Critical storm duration (hrs)	10hr	
Required Storage Height	0.795	PASS
Half Time Empty	23.03	PASS

AquaCell Modular Units

No. Units on Plan (2 per m ²)	119	
No. Units Deep	2	
Total Number of Units	238	Unit Type AquaCell Prime

Soakaway designed in accordance with CIRIA 156

Project & Site Details

Project Number	6786	Produced by	MG
Client	Troy Homes	Checked by	TL
Site Name	Manor Road, Ickleford		
Location	Ickleford, Herts	Date	28/11/2024

Drainage Details

Area	146 m ²	Climate Change	45 %
Catchment Type	Roof	Effective Area	233 m ²
Area Reduction Factor	1.1	Additional Inflow	0.00 l/s

Discharge Parameters

Infiltration Rate	9.45E-06	Soil Type	Clayey Sand
Factor of Safety	3	Source	S.I.R
Effective Infiltration Rate	3.15E-06		
Additional Outflow*	0.00 l/s	Depth to Groundwater (m)	1.0m min

*flat rate from pump only

Rainfall Data

R value					0.45		Storm Return Period			1 in 100 years	
M5-60					20		Country			England and Wales	
	<u>Time</u>	<u>Z1 Value</u>	<u>y mm</u>	<u>Z2 Value</u>	<u>p mm</u>	<u>Value i</u>	<u>a</u>	<u>b</u>	<u>Storage Height</u>	<u>Time To Half -Empty</u>	
	5min	0.39	7.80	1.84	14.35	0.17	-140.21	0.009	0.111	4.35	
	10min	0.55	11.00	1.91	21.01	0.13	-102.29	0.009	0.161	6.17	
	15min	0.64	12.80	1.91	24.45	0.10	-79.07	0.009	0.187	7.05	
	30min	0.82	16.40	1.99	32.64	0.07	-52.36	0.009	0.247	9.04	
	1hr	1.00	20.00	2.03	40.60	0.04	-32.09	0.009	0.303	10.75	
	2hr	1.18	23.60	2.03	47.91	0.02	-18.42	0.009	0.346	12.02	
	4hr	1.38	27.60	2.01	55.48	0.01	-10.13	0.009	0.377	12.91	
	6hr	1.50	30.00	1.97	59.10	0.01	-6.83	0.009	0.377	12.93	
	10hr	1.70	34.00	1.97	66.98	0.01	-4.24	0.009	0.383	13.09	
	24hr	2.05	41.00	1.89	77.49	0.00	-1.39	0.009	0.283	10.16	
	48hr	2.30	46.00	1.89	86.94	0.00	-0.23	0.009	0.083	3.32	

Soakaway Parameters

Length	9.0 m	Width	3.5 m
Depth	0.4 m	Void	95 %

Results

Critical storm duration (hrs)	10hr	
Required Storage Height	0.383	PASS
Half Time Empty	13.09	PASS

AquaCell Modular Units

No. Units Long	9	No. Units Wide	7
No. Units Deep	1		
Total Number of Units	63	Unit Type	AquaCell Prime

Soakaway designed in accordance with CIRIA 156

Project & Site Details

Project Number	6786	Produced by	MG
Client	Troy Homes	Checked by	TL
Site Name	Manor road, Ickleford		
Location	Ickleford, Herts	Date	28/11/2024

Drainage Details

Area	687 m ²	Climate Change	45 %
Catchment Type	Roof	Effective Area	996 m ²
Area Reduction Factor	1	Additional Inflow	0.00 l/s

Discharge Parameters

Infiltration Rate	9.45E-06	Soil Type	Clayey Sand
Factor of Safety	3	Source	S.I.R
Effective Infiltration Rate	3.15E-06		
Additional Outflow*	0.00 l/s	Depth to Groundwater (m)	1.0m min

*flat rate from pump only

Rainfall Data

R value					0.45		Storm Return Period			1 in 100 years	
M5-60					20		Country			England and Wales	
	<u>Time</u>	<u>Z1 Value</u>	<u>y mm</u>	<u>Z2 Value</u>	<u>p mm</u>	<u>Value i</u>	<u>a</u>	<u>b</u>	<u>Storage Height</u>	<u>Time To Half -Empty</u>	
	5min	0.39	7.80	1.84	14.35	0.17	-312.27	0.004	0.106	4.34	
	10min	0.55	11.00	1.91	21.01	0.13	-227.78	0.004	0.155	6.26	
	15min	0.64	12.80	1.91	24.45	0.10	-176.05	0.004	0.180	7.21	
	30min	0.82	16.40	1.99	32.64	0.07	-116.54	0.004	0.238	9.40	
	1hr	1.00	20.00	2.03	40.60	0.04	-71.38	0.004	0.292	11.36	
	2hr	1.18	23.60	2.03	47.91	0.02	-40.92	0.004	0.334	12.87	
	4hr	1.38	27.60	2.01	55.48	0.01	-22.46	0.004	0.365	13.97	
	6hr	1.50	30.00	1.97	59.10	0.01	-15.11	0.004	0.367	14.03	
	10hr	1.70	34.00	1.97	66.98	0.01	-9.34	0.004	0.375	14.32	
	24hr	2.05	41.00	1.89	77.49	0.00	-2.99	0.004	0.280	10.94	
	48hr	2.30	46.00	1.89	86.94	0.00	-0.40	0.004	0.071	2.92	

Soakaway Parameters

Length	14.0 m	Width	10.0 m
Depth	0.4 m	Void	95 %

Results

Critical storm duration (hrs)	10hr	
Required Storage Height	0.375	PASS
Half Time Empty	14.32	PASS

AquaCell Modular Units

No. Units Long	14	No. Units Wide	20
No. Units Deep	1		
Total Number of Units	280	Unit Type	AquaCell Prime

Soakaway designed in accordance with CIRIA 156

Project & Site Details

Project Number	6786	Produced by	MG
Client	Troy Homes	Checked by	TL
Site Name	Manor Road, Ickleford		
Location	Ickleford, Herts	Date	28/11/2024

Drainage Details

Area	326 m ²	Climate Change	45 %
Catchment Type	Roof	Effective Area	473 m ²
Area Reduction Factor	1	Additional Inflow	0.00 l/s

Discharge Parameters

Infiltration Rate	9.45E-06	Soil Type	Clayey Sand
Factor of Safety	3	Source	S.I.R
Effective Infiltration Rate	3.15E-06		
Additional Outflow*	0.00 l/s	Depth to Groundwater (m)	1.0m min

*flat rate from pump only

Rainfall Data

R value					0.45	Storm Return Period			1 in 100 years
M5-60					20	Country			England and Wales
<u>Time</u>	<u>Z1 Value</u>	<u>y mm</u>	<u>Z2 Value</u>	<u>p mm</u>	<u>Value i</u>	<u>a</u>	<u>b</u>	<u>Storage Height</u>	<u>Time To Half -Empty</u>
5min	0.39	7.80	1.84	14.35	0.17	-58.75	0.015	0.071	0.92
10min	0.55	11.00	1.91	21.01	0.13	-42.31	0.015	0.102	1.31
15min	0.64	12.80	1.91	24.45	0.10	-32.23	0.015	0.117	1.49
30min	0.82	16.40	1.99	32.64	0.07	-20.65	0.015	0.149	1.89
1hr	1.00	20.00	2.03	40.60	0.04	-11.86	0.015	0.171	2.15
2hr	1.18	23.60	2.03	47.91	0.02	-5.93	0.015	0.169	2.14
4hr	1.38	27.60	2.01	55.48	0.01	-2.33	0.015	0.132	1.68
6hr	1.50	30.00	1.97	59.10	0.01	-0.90	0.015	0.075	0.97
10hr	1.70	34.00	1.97	66.98	0.01	0.22	0.015	-0.030	-0.40
24hr	2.05	41.00	1.89	77.49	0.00	1.46	0.015	-0.428	-6.46
48hr	2.30	46.00	1.89	86.94	0.00	1.96	0.015	-0.984	-18.25

Soakaway Parameters

Base Area	305.0 m ²	Perimeter	117.0 m
Depth	0.2 m	Void	30 %

Results

Critical storm duration (hrs)	1hr	
Required Storage Height	0.171	PASS
Half Time Empty	2.15	PASS

AquaCell Modular Units

No. Units on Plan (2 per m ²)	610	
No. Units Deep	0.475	
Total Number of Units	289.75	Unit Type AquaCell Prime