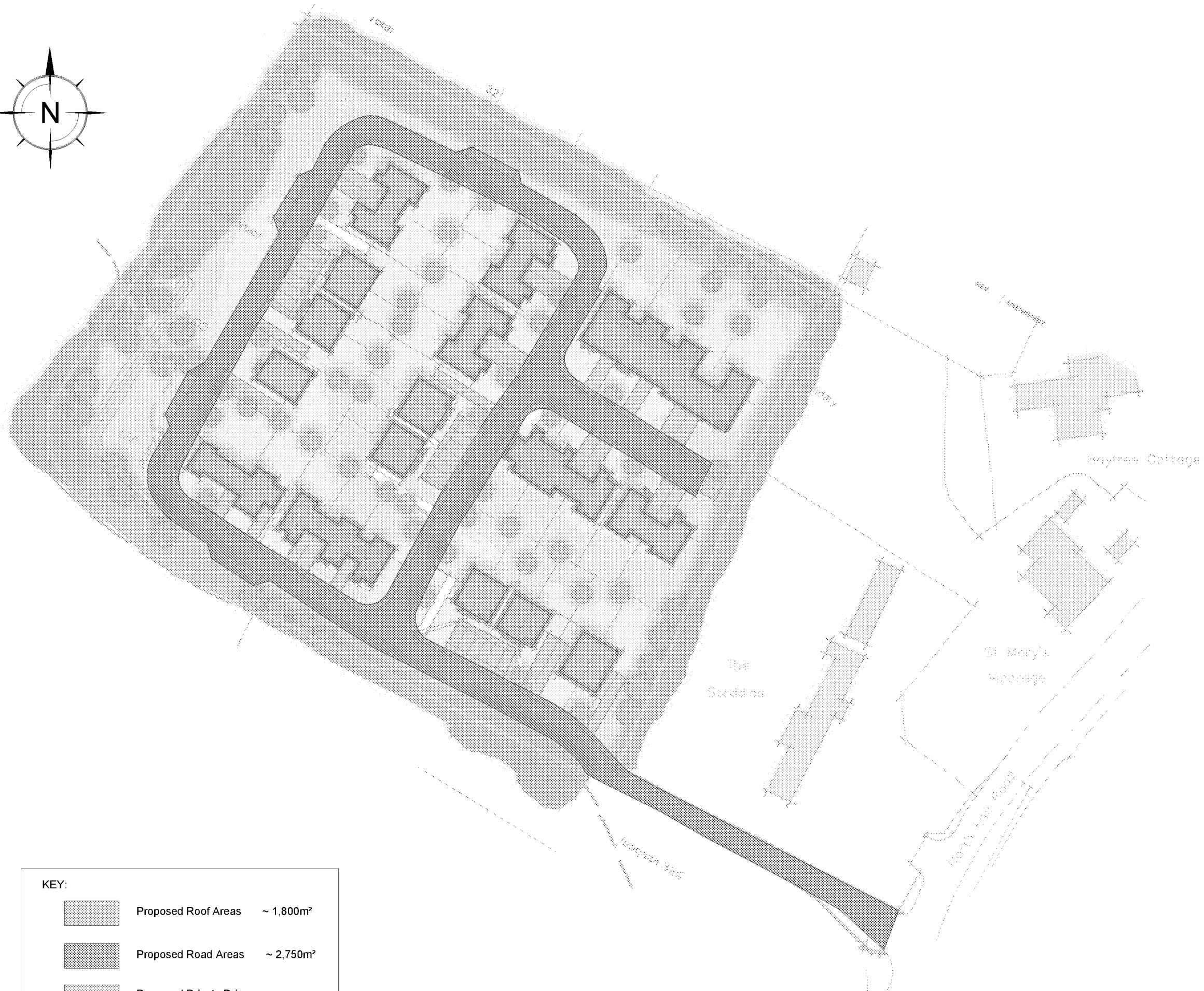
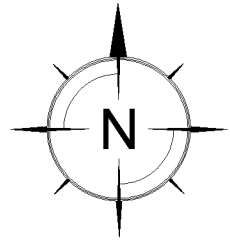


Appendix 3
Impermeable Areas Plan
Storm Water Calculations
Proposed Indicative Surface and Foul Water Drainage Layout



KEY:



Proposed Roof Areas ~ 1,800m²



Proposed Road Areas ~ 2,750m²



Proposed Private Driveway
and Car Parking Areas ~ 850m²



TITLE	Proposed Site Impermeable Areas Plan	
SCALE	NTS @ A3	DRG. No. 4

Permeable Paving / Drainage Blanket Calculation

Project Name: Clays Farm, North End Road
Project Number: 22997

Impermeable Area

Impermeable Area 100 m²
 Infiltration Rate 10 x10⁻⁶ m/s
 Base Area 100 m²
 Available Base Area 50 m²
 (Assuming base is 50% silted)
 Outflow 0.500 l/s

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

50% Additional Rainfall to account for Climate Change (Where Appropriate)

Storm Profiles

Return Period 100 years
 M5-60 30 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒

Storm Duration (mins)	Z1	R M5-D (mm)	Z2	R M(x)-D (mm)	I (cu.m)	Outflow (cu.m)	Storage Required
5	0.36	7.20	1.84	18.55	1.85	0.15	1.70 m ³
10	0.51	10.20	1.91	27.27	2.73	0.30	2.43 m ³
15	0.62	12.40	1.95	33.85	3.39	0.45	2.94 m ³
30	0.79	15.80	1.99	44.02	4.40	0.90	3.50 m ³
60	1.00	20.00	2.03	56.84	5.68	1.80	3.88 m ³
120	1.23	24.60	2.01	69.22	6.92	3.60	3.32 m ³
180	1.37	27.40	1.99	76.34	7.63	5.40	2.23 m ³
240	1.51	30.20	1.97	83.29	8.33	7.20	1.13 m ³
300	1.60	32.00	1.96	87.58	8.76	9.00	0.00 m ³
360	1.69	33.80	1.94	91.80	9.18	10.80	0.00 m ³
480	1.82	36.30	1.93	97.83	9.78	14.40	0.00 m ³
600	1.94	38.80	1.91	103.75	10.38	18.00	0.00 m ³
840	2.09	41.89	1.88	110.49	11.05	25.20	0.00 m ³
1140	2.29	45.74	1.85	118.61	11.86	34.20	0.00 m ³
1440	2.48	49.60	1.82	126.38	12.64	43.20	0.00 m ³

Peak Storage

3.9 m³

50% voided sub base
 259 mm deep

Time to Half Empty = 1.1 hours

Design of Dry Swale

Project Name: Clays Farm, North End Road
Project Number: 22997

Swale No

Top width of swale 3.000 m
 Base width of swale 0.600 m
 Depth of swale 0.400 m
 Side Slope 1: 3.0
 Depth of trench beneath swale 0.500 m
 Void ratio of trench backfill 30% (normally 30%)
 Impermeable Area 2.750 m²
 Allow Drainage Through Base? ☒ Yes

Storm Profiles

Return Period 100 years
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes

Soil Characteristics

Surface soil Infiltration Rate (normally planted topsoil)
 Soil Description Clayey Sand
 10.00 x10⁻⁶m/s
 Base / Subsoil Infiltration Rate
 Soil Description Clayey Sand
 10.00 x10⁻⁶m/s

Calculations based on Ciria C697 - The SuDS Manual Chapter 10 with

Soakage calculations based on BRE Digest 365 (draining through half effective depth)

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Design Results

Length of Swale 198.953 m
 Total Storage 161.15 m³
 ts50 4.75 hrs

Design of Aquacell Trench Soakaways - ROOF AREA 'A'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 0.110 m AOD
 Invert of pipe 0.110 m AOD
 Pipe Invert Depth 1.000 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 1.500 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 110 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes ☐ No (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes ☐ No

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 1.500 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 10.76 m
 ts50 4.05 hrs
 Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'B'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 0.110 m AOD
 Invert of pipe 0.110 m AOD
 Pipe Invert Depth 1.000 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 1.500 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 115 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 1.500 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 11.25 m
 ts50 4.05 hrs
 Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'C'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 0.110 m AOD
 Invert of pipe 0.110 m AOD
 Pipe Invert Depth 1.000 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 1.500 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 75 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes ☐ No (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes ☐ No

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 1.500 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 7.30 m
 ts50 3.99 hrs

Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'D'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 6.420 m AOD
 Invert of pipe 6.700 m AOD
 Pipe Invert Depth 0.720 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 2.000 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 350 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes ☐ No (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes ☐ No

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 2.000 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 26.26 m
 ts50 4.34 hrs
 Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'E'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 6.420 m AOD
 Invert of pipe 6.700 m AOD
 Pipe Invert Depth 0.720 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 2.000 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 170 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes ☐ No (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes ☐ No

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 2.000 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 12.70 m
 ts50 4.29 hrs
 Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'F'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 6.310 m AOD
 Invert of pipe 6.500 m AOD
 Pipe Invert Depth 0.810 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 2.000 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 170 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes ☐ No (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes ☐ No

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 2.000 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 12.70 m
 ts50 4.29 hrs
 Design OK

Design of Aquacell Trench Soakaways - ROOF AREA 'G'

Project Name: Clays Farm, North End Road
Project Number: 22997

Soakaway No

Cover Level 6.000 m AOD
 Invert of pipe 5.250 m AOD
 Pipe Invert Depth 0.750 m
 Depth to top of Soakaway 0.500 m
 Depth to Permeable Strata 0.500 m
 Soakaway Width 2.000 m (Crate Size 1m x 0.5m)
 Depth to Base 0.900 m 1 crates
 Impermeable Area 120 m²
 Void Ratio 95 %

Allow Drainage Through Base? ☒ Yes (Default No)

Storm Profiles

Return Period 100 years (10years-BRE 365)
 M5-60 20 mm
 Ratio r1 0.35

Consider Storms Beyond 6 hour duration? ☒ Yes

Soil Characteristics

Soil Infiltration Rate 10.00 x10⁻⁶m/s
 Soil Description

Calculations based on BRE Digest 365 - September 1991.

Return Storm Period Assessments available are: 1, 2, 5, 10, 20, 25, 50, 100 years.

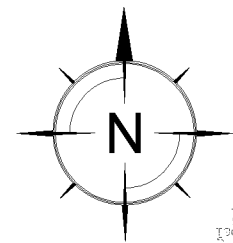
Ratio r1 in the range 0.12, 0.15, 0.18, 0.21, 0.24, 0.27, 0.30-0.45

40% Additional Rainfall to account for Climate Change (Where Appropriate)

Crate Depth 400 mm each

Soakaway Results

Width 2.000 m
 Excavation Depth 0.900 m
 Storage Depth 0.400 m
 Effective Outflow Depth 0.400 m
 Length of Soakaway 8.94 m
 ts50 4.24 hrs
 Design OK



DRAINAGE KEY:

Existing Public Sewers

● Existing Foul

Storm Drainage

Proposed Cellular Crates Soakaway

Permeable Sub Base
minimum 300mm Voided Subbase Required

Highway Drainage

● Precast Concrete Manhole

Drainage Swale

Private Foul Drainage

● Foul Inspection Chambers

Proposed Rising Main

Proposed Pumping Station

Proposed Pumping Station Type
Subject to Detailed Design

B Roof Areas Reference Number

Proposed Dry Swale
Total Length: 150m
Top width of swale: 3m
Base width: 0.8m
Depth of swale: 0.4m

Proposed Dry Swale
Total Length: 150m
Top width of swale: 3m
Base width: 0.8m
Depth of swale: 0.4m

**Proposed Indicative Storm Water
and Foul Drainage Plan**

SCALE
NTS @ A3

DRG. No.
5