

### Drainage (Non-adopted)

Inspection Chamber

Manhole

Rodding Eye

Rainwater Pipe

Foul Water

SVP/SS

Inspection Chamber

Combined

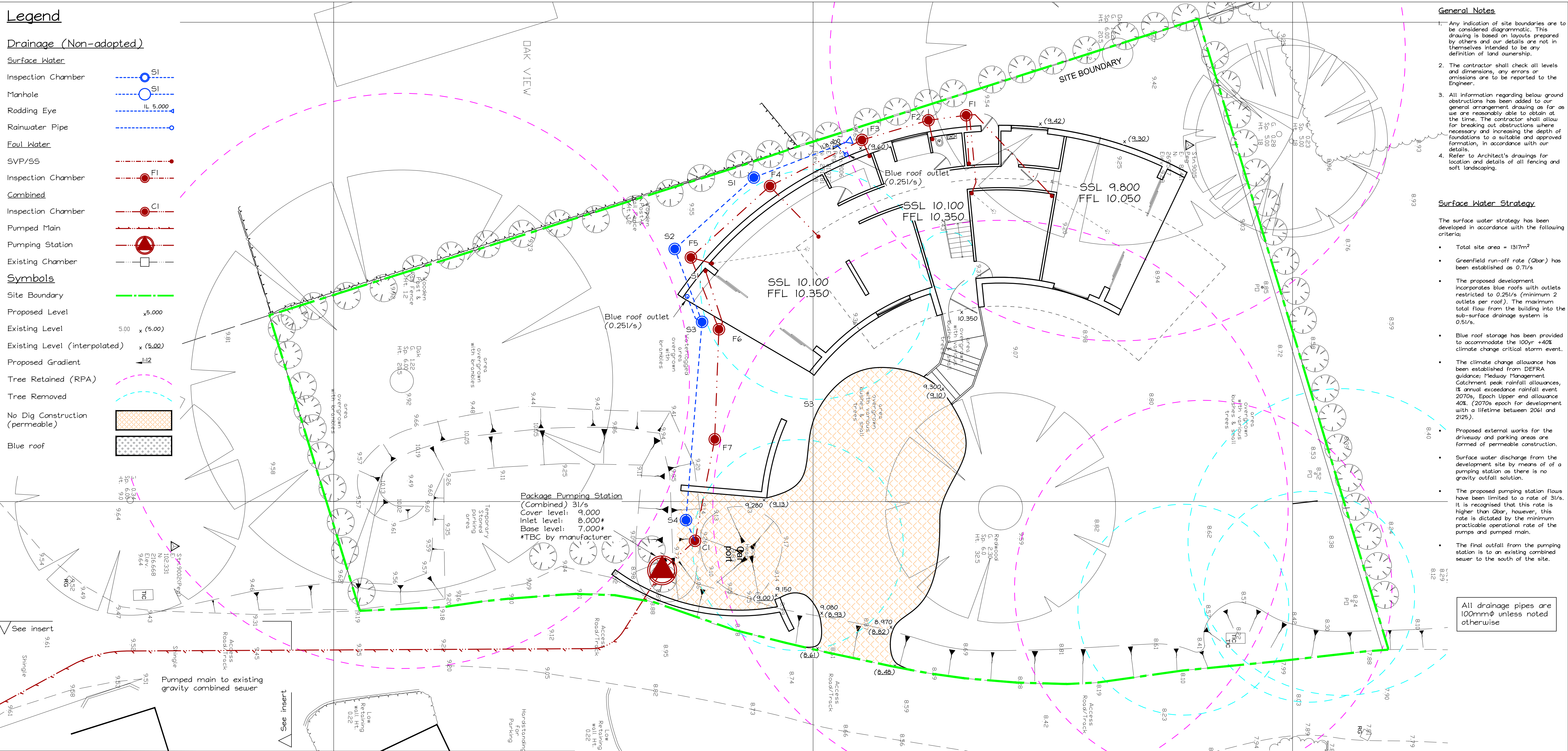
Inspection Chamber

Pumped Main

Pumping Station

Existing Chamber

|                                 |                                                                                   |          |
|---------------------------------|-----------------------------------------------------------------------------------|----------|
| Proposed Level                  |                                                                                   | x 5.00   |
| Existing Level                  | 5.00                                                                              | x (5.00) |
| Existing Level (interpolated)   |                                                                                   | x (5.00) |
| Proposed Gradient               |                                                                                   | → 1:1.2  |
| Tree Retained (RPA)             |  |          |
| Tree Removed                    |  |          |
| No Dig Construction (permeable) |  |          |
| Blue roof                       |  |          |



Existing private  
drainage system  
final connection  
point at Southern  
Water manhole  
ref 4101

| Existing | Combined |
|----------|----------|
| Chamber  |          |
| CL 9.98  |          |
| IL 8.95  |          |

Pumped main to existing gravity combined sewer

Package Pumping Station  
(Combined) 31/s  
Cover level: 9.000  
Inlet level: 8.000\*  
Base level: 7.000\*  
\*TBC by manufacturer

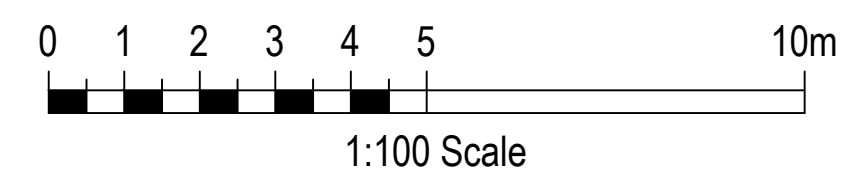
Blue roof outlet  
0.25l/s

Blue roof outlet  
0.251/s

Blue roof outlet  
0.25l/s (on to  
lower roof)

- Blue roof outlet  
0.25l/s (on to  
lower roof)

Ground Floor/First Floor Roof Level



- Any indication of site boundaries are to be considered diagrammatic. This drawing is based on layouts prepared by others and the designer is not in themselves intended to be any definition of land ownership.
- The contractor shall check all levels and dimensions, any errors or omissions are to be reported to the Engineer.
- All information regarding below ground obstructions has been added to our general arrangement drawing as far as we are reasonably able to obtain at the time. The contractor shall allow for breaking out obstructions where necessary and increasing the depth of foundations to a suitable and approved formation, in accordance with our details.
- Refer to Architect's drawings for construction details of all fencing and soil landscaping.

The surface water strategy has been developed in accordance with the following criteria:

- Total site area = 1317m<sup>2</sup>
- Greenfield run-off rate (Q<sub>0</sub>bar) has been established as 0.7/s
- The proposed development incorporates blue roofs with outlets restricted to 0.25/s (minimum 2 outlets per roof). The maximum total flow from the building into the sub-surface drainage system is 0.5/s.
- Blue roof storage has been provided to accommodate the 100yr +40% climate change critical storm event.
- The climate change allowance has been established from DEFRA guidance; Medway Management estimates peak rainfall values, 1% annual exceedance rainfall event, 2070s, Epoch Urban and allowance 40%. (2070s epoch for development with a lifetime between 2061 and 2125).
- Proposed external works for the driveway and parking areas are formed of permeable construction.
- Surface water discharge from the development site by means of a surface water station. There is no gravity outfall solution.
- The proposed pumping station flows have been limited to a rate of 31/s. It is recognised that this rate is higher than Q<sub>0</sub>bar, however, this rate is dictated by the minimum discharge operating capacity of the pumps and pumped main.
- The final outfall from the pumping station is to an existing combined sewer to the south of the site.

All drainage pipes are 100mm $\phi$  unless noted otherwise

|   |                        |    |          |
|---|------------------------|----|----------|
| B | Outfall chamber added. | JT | 19.07.23 |
| A | First Issue.           | JT | 03.05.23 |

| Rev | Description | By | Date |
|-----|-------------|----|------|
|-----|-------------|----|------|

**KRYSTAL ENGINEERING LTD**  
1 STATION ROAD SOUTH,  
MERSTHAM,  
SURREY  
RH1 3EF  
01737 333139

Project

NEW BUILD HOUSE AT  
TILTWOOD EAST,  
HOPHURST LANE,  
CRAWLEY DOWN RH19 4LL

|             |          |
|-------------|----------|
| Drawing No. | Revision |
| 7107-200    | B        |

|                |             |      |            |
|----------------|-------------|------|------------|
| Scale          | 1:100 @ A1  | Date | APRIL 2023 |
| Drawing Status | PRELIMINARY |      |            |

|          |    |            |    |
|----------|----|------------|----|
| Drawn By | IT | Checked By | KH |
|----------|----|------------|----|

Client \_\_\_\_\_

TILTWOOD HOMES

sealed cover and frame assembly complying with BS EN 124 (highways D400, driveways/footways B125). refer to inspection chamber detail for A15 cover and frame support requirements

temporarily cap shaft during construction

150mm deep concrete collar (grade ST3) to support cover and frame

Selected backfill material with stones not bigger than 25mm (Class A or B) or where subject to light vehicular traffic e.g. driveway 150mm concrete (grade ST2)

joint of rocker pipe to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

100mm thick granular bedding material

class B engineering brick, 2 courses min, 4 courses max set in class I mortar.

restrictor cap with max 350mmØ or 300x300mm sq opening and sealing ring

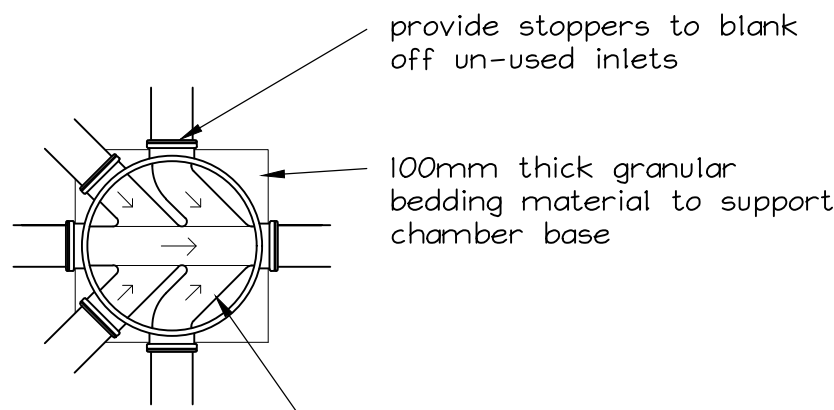
'Wavin range 450 or range 600' inspection chamber base with 450mmØ or 600mmØ compatible shaft or equal approved

clay/plastic pipe, see drainage layout for diameter and details

base unit to have all connections with soffit levels set no lower than that of the main channel

150 concrete bed (grade ST3) Chamber is to be positioned whilst concrete is wet in order that it takes the shape of the chamber base

Section



provide stoppers to blank off un-used inlets

100mm thick granular bedding material to support chamber base

number and orientation of inlets to chamber base as per drainage layout

Plan

### Deep Non-Entry Inspection Chamber Detail (Polypropylene)

(Suitable for depths ranging from 1.2m-5m deep)

temporarily cap shaft during construction

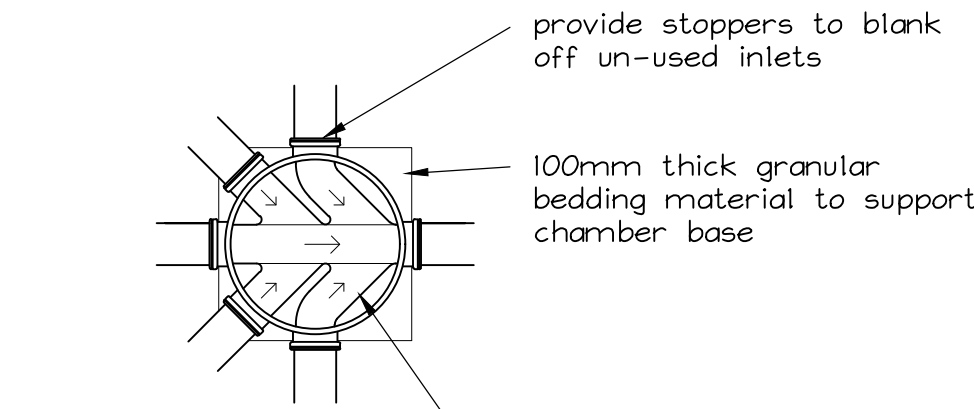
150mm deep concrete collar to support cover and frame (can be omitted when chamber is located in domestic garden)

Selected backfill material with stones not bigger than 25mm (Class A or B) or where subject to light vehicular traffic e.g. driveway 150mm concrete (grade ST2)

joint of rocker pipe to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement

100mm thick granular bedding material

Section

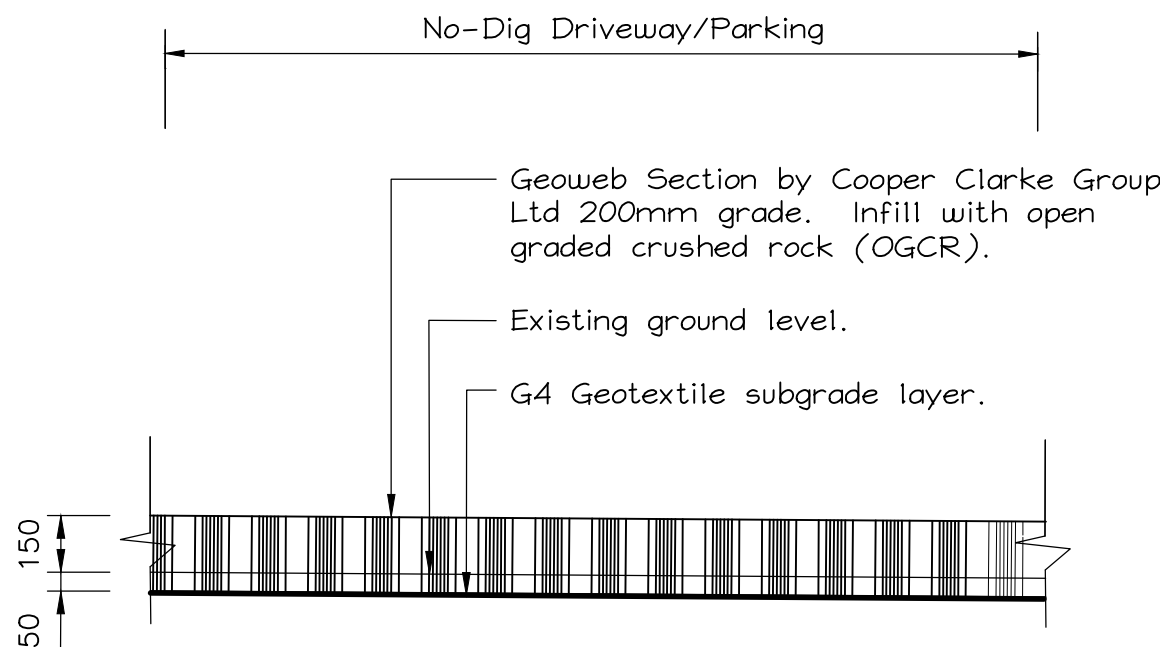


number and orientation of inlets to chamber base as per drainage layout

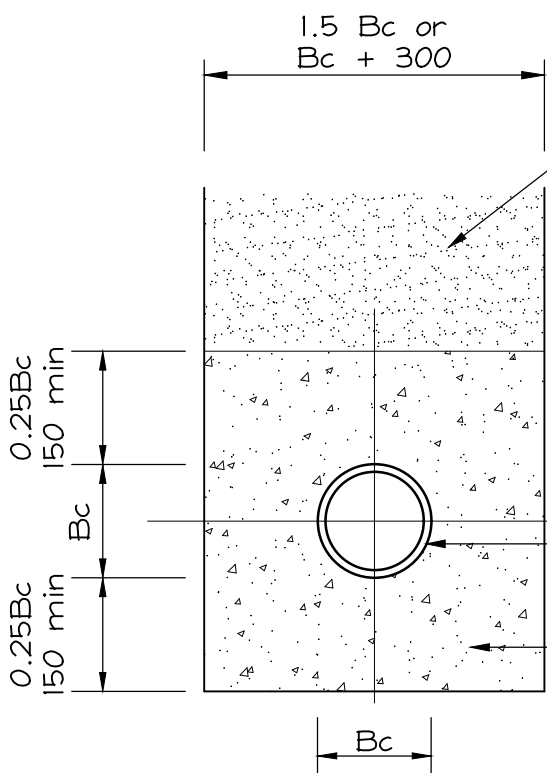
Plan

### Inspection Chamber Detail (Polypropylene)

(for depths up to 1.2m)

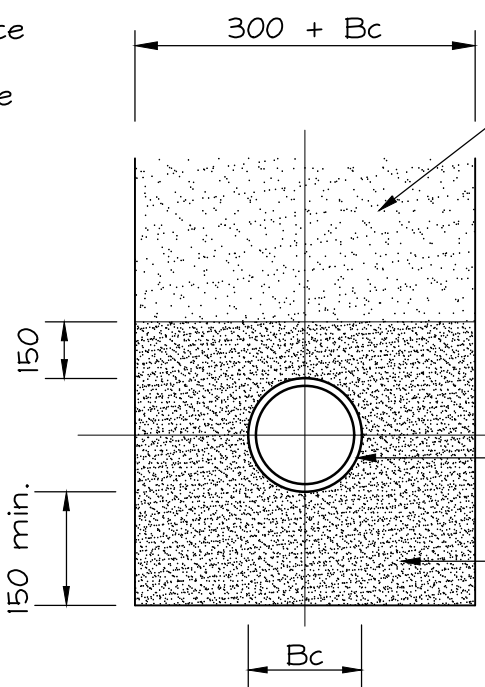


### Permeable No-Dig Driveway/Parking Bays



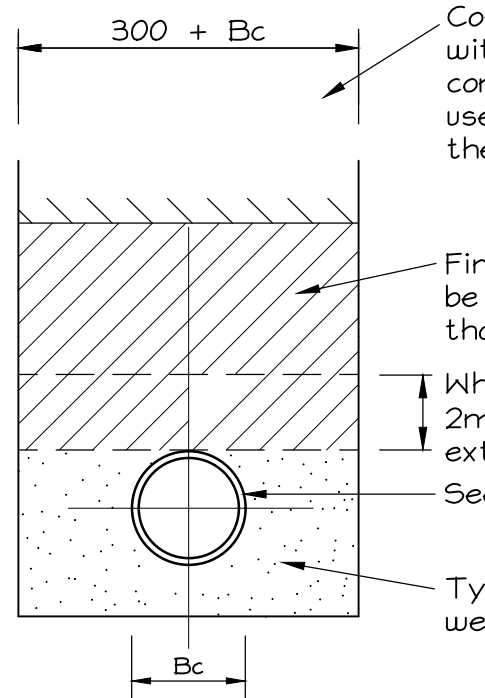
Class 'A'

Use where depth to pipe soffit <1200mm beneath adoptable highway, < 900 beneath private trafficked areas & <600mm beneath other areas



Class 'S'

Use beneath adoptable highway areas where depth to pipe soffit is >1200mm and other trafficked areas where depth to pipe soffit is > 900mm



Class 'F'

Use beneath non-trafficked areas only where depth to pipe soffit is > 600mm

### Typical Pipe Bedding Details

sealed cover and frame assembly complying with BS EN 124 (soft landscaping/footways A15). refer to deep non-entry inspection chamber detail for B125/D400 cover and frame support requirements

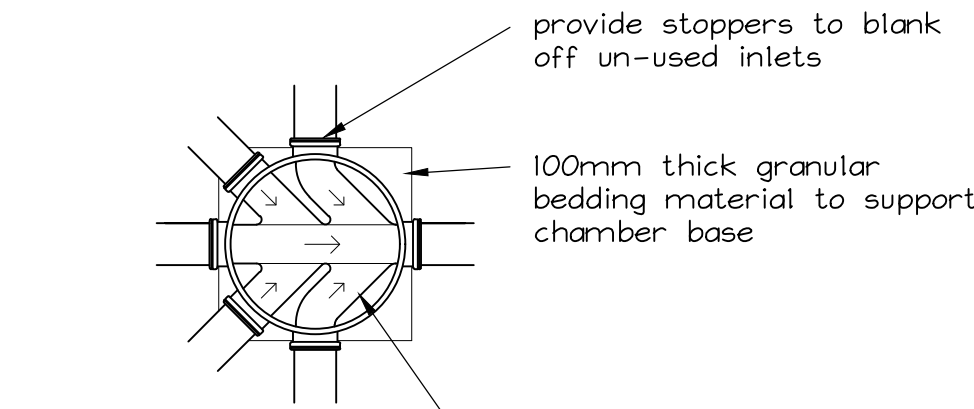
'Wavin range 450' inspection chamber base with 450mmØ shaft or similar approved

joints between base and shaft components to be fitted with watertight seals

clay/plastic pipe, see drainage layout for diameter and details

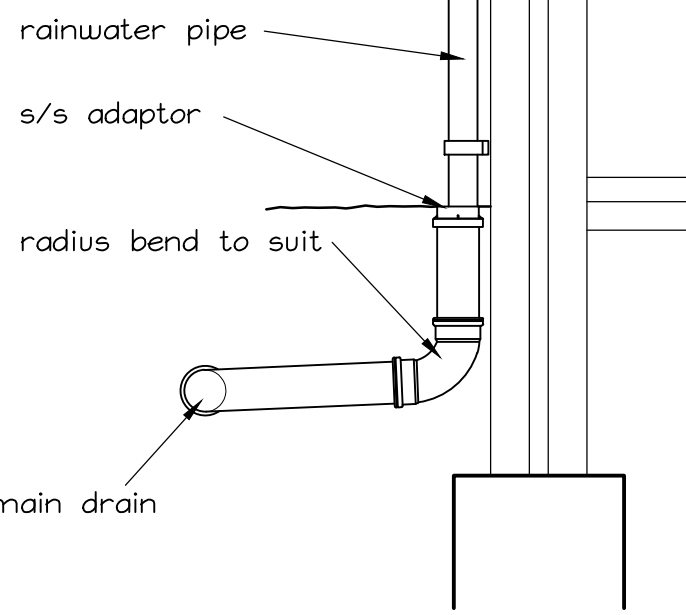
base unit to have all connections with soffit levels set no lower than that of the main channel

Section



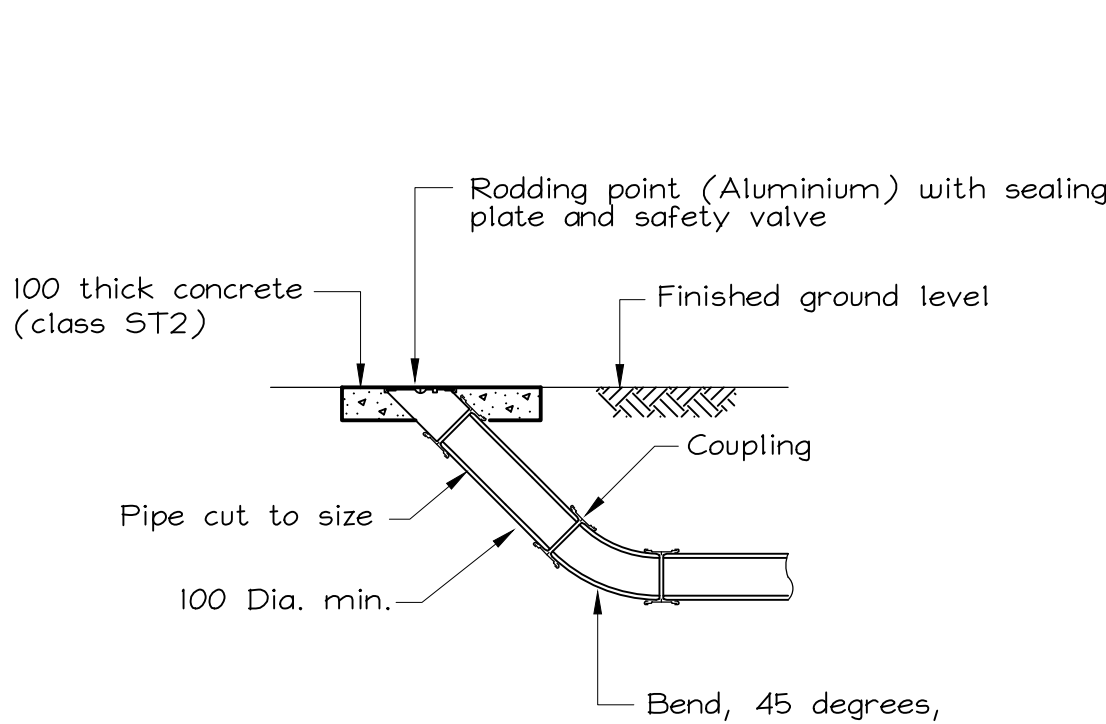
number and orientation of inlets to chamber base as per drainage layout

Plan



### Rainwater Pipe Detail

(Suitable for use with separate foul and surface water drains)



### Rodding Eye Detail

#### Pipe Bedding & Sidefill Materials.

Type A bedding material shall be aggregates conforming to BS 882, or BS EN 12620, nominal single-size or graded complying with the recommendations of WIs No. 4-08-01 as follows :-

TABLE 1 :-

| Pipe dia. (minimum) | Single-size.                        | Graded.                                 |
|---------------------|-------------------------------------|-----------------------------------------|
| Over 100 to 150     | 10mm nominal single-size.           |                                         |
| Over 150 to 500     | 10 or 14mm nominal single-sized.    | 14mm to 5mm graded                      |
| Over 500            | 10,14 or 20mm nominal single-sized. | 14 or 5mm graded or 20mm to 5mm graded. |

Type B material shall be selected excavated or imported material consisting of uniform, readily compactable material, free from vegetable matter, building rubbish and frozen material, or materials susceptible to spontaneous combustion, and excluding clay of liquid limit greater than 80 and/or plastic limit greater than 55 and materials of excessive high moisture content. Clay lumps and stones retained on 75mm and 37.5mm sieves respectively shall be excluded from the fill material.

#### Pipes Laid with a Concrete Bedding Surround

Class A concrete surround to be minimum cube strength at 28 days of 20N/mm<sup>2</sup> for non-aggressive soils. For aggressive soil conditions the concrete mix shall be in accordance with the requirements of BRE Digest 250, or BRE paper CP23/77 as appropriate.

The backfill, other than the first 150mm of cover, should not be placed before the compressive strength of the site concrete has reached 14N/mm<sup>2</sup>. The concrete mix should be so designed that this is reached without unnecessary delay.

A compressible filler shall be placed throughout the concrete surround at all pipe joints. This shall consist of bitumen impregnated insulating board to BS EN 322, or other equally compressible material. The thickness of compressible filler shall be as follows :-

| Nominal diameter of pipe (mm) | Thickness of Compressible filler (mm) |
|-------------------------------|---------------------------------------|
| Less than 450                 | 18                                    |
| 450 - 1200                    | 36                                    |
| Exceeding 1200                | 54                                    |

Compressible packing for use between pipes and precast concrete setting blocks shall consist of bitumen damp proof sheeting complying with BS 743.

#### Dimension 'a'

In machine dug uniform soils :-

a = For sleeve jointed pipes, a minimum of 50mm or 1/6Bc, whichever is the greater, for socketted pipes a minimum of 100mm or 1/6Bc, whichever is the greater under barrels but not less than 50mm under sockets.

In rock or mixed soils containing rock bands, boulders, large flints or stones or other irregular hard spots these values will need to increase accordingly.

#### General Notes

1. All concrete used in drainage works shall comply with BRE Special Digest SD1 for the following aggressive conditions in the ground:

Design sulphate class DS-1 Aggressive chemical environment class AC-2t Design concrete class DC-1 (TBC) No additional protective measures (APMs).

The strength criteria for the specified standard mixes (ST4 etc.) should also be observed. Concrete mixes should meet the most onerous design criteria between strength and resistance to chemical attack.

2. Pipes and channels to be either:

Concrete to BS EN 1916 & BS 5911 Extra Strength Vitrified Clay to BS EN 298 Unplasticised PVC to BS EN 1452

3. All flexible pipes in trafficked areas with less than 400mm cover to have concrete surround.

4. All flexible pipes in gardens and planted areas with less than 600mm cover to have concrete surround.

5. Backfill material to pipe trenches beneath trafficked areas to be selected and compacted in accordance with the Highway Authorities & Utilities Committee Specification for the Reinforcement of Openings in Highways-June 1992.

Acceptable materials (HAUC Specification Appendix A1): Class A - Graded granular Class B - Granular Class C - Cohesive/granular. Compaction to be in accordance with HAUC Specification Appendix AB).

6. Beneath non-trafficked areas backfill shall be Type B

7. Manhole covers and frames are to be in accordance with BS EN124:

Class D400 for carriageways Class B125 for footways, pedestrian areas & car parks Class A15 for areas only subject to pedestrians.

8. The minimum size of any manhole serving a sewer (i.e. any drain serving more than one property) should be 1200mm x 675mm rectangular or 1200mm diameter.

9. Where drainage passes within 300mm of the underside of the floor slab, concrete protection is required. Greater than 300mm, granular bed and surround 100mm thick is to be used.

A First Issue. JT 29.04.23

Rev Description By Date

KRYSTAL ENGINEERING LTD  
1 STATION ROAD SOUTH,  
MERSTHAM,  
SURREY  
RH1 3EF  
01737 333139



Project  
NEW BUILD HOUSE AT  
TILTWOOD EAST,  
HOPHURST LANE,  
CRAWLEY DOWN RH19 4LL

Drawing Title  
DRAINAGE AND EXTERNAL  
WORKS DETAILS

Drawing No. 7107-250 Revision A

Scale 1:20 @ A1 Date APRIL 2023

Drawing Status PRELIMINARY

Drawn By JT Checked By KH

Client

TILTWOOD HOMES

Tiltwood



Date 29/04/2023 10:18

|             |
|-------------|
| Designed by |
|-------------|

File Blue roof.SRCX

Checked by

XP Solutions

Source Control 2020.1

### Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 152 minutes.

|  | Storm            | Max    | Max   | Max          | Max     | Max | Max     | Status |
|--|------------------|--------|-------|--------------|---------|-----|---------|--------|
|  | Event            | Level  | Depth | Infiltration | Control | Σ   | Outflow | Volume |
|  |                  | (m)    | (m)   | (l/s)        | (l/s)   |     | (l/s)   | (m³)   |
|  | 15 min Summer    | 13.367 | 0.017 | 0.0          | 0.5     |     | 0.5     | 3.1    |
|  | 30 min Summer    | 13.377 | 0.027 | 0.0          | 0.5     |     | 0.5     | 4.9    |
|  | 60 min Summer    | 13.387 | 0.037 | 0.0          | 0.5     |     | 0.5     | 6.9    |
|  | 120 min Summer   | 13.396 | 0.046 | 0.0          | 0.5     |     | 0.5     | 8.6    |
|  | 180 min Summer   | 13.399 | 0.049 | 0.0          | 0.5     |     | 0.5     | 9.0    |
|  | 240 min Summer   | 13.398 | 0.048 | 0.0          | 0.5     |     | 0.5     | 8.9    |
|  | 360 min Summer   | 13.396 | 0.046 | 0.0          | 0.5     |     | 0.5     | 8.5    |
|  | 480 min Summer   | 13.394 | 0.044 | 0.0          | 0.5     |     | 0.5     | 8.1    |
|  | 600 min Summer   | 13.391 | 0.041 | 0.0          | 0.5     |     | 0.5     | 7.6    |
|  | 720 min Summer   | 13.389 | 0.039 | 0.0          | 0.5     |     | 0.5     | 7.2    |
|  | 960 min Summer   | 13.384 | 0.034 | 0.0          | 0.5     |     | 0.5     | 6.2    |
|  | 1440 min Summer  | 13.374 | 0.024 | 0.0          | 0.5     |     | 0.5     | 4.5    |
|  | 2160 min Summer  | 13.363 | 0.013 | 0.0          | 0.5     |     | 0.5     | 2.4    |
|  | 2880 min Summer  | 13.356 | 0.006 | 0.0          | 0.5     |     | 0.5     | 1.0    |
|  | 4320 min Summer  | 13.351 | 0.001 | 0.0          | 0.5     |     | 0.5     | 0.2    |
|  | 5760 min Summer  | 13.351 | 0.001 | 0.0          | 0.4     |     | 0.4     | 0.2    |
|  | 7200 min Summer  | 13.351 | 0.001 | 0.0          | 0.4     |     | 0.4     | 0.1    |
|  | 8640 min Summer  | 13.351 | 0.001 | 0.0          | 0.4     |     | 0.4     | 0.1    |
|  | 10080 min Summer | 13.351 | 0.001 | 0.0          | 0.4     |     | 0.4     | 0.1    |
|  | 15 min Winter    | 13.367 | 0.017 | 0.0          | 0.5     |     | 0.5     | 3.1    |

| Storm<br>Event   | Rain<br>(mm/hr) | Flooded<br>Volume<br>(m <sup>3</sup> ) | Discharge<br>Volume<br>(m <sup>3</sup> ) | Time-Peak<br>(mins) |
|------------------|-----------------|----------------------------------------|------------------------------------------|---------------------|
| 15 min Summer    | 129.164         | 0.0                                    | 4.9                                      | 53                  |
| 30 min Summer    | 87.637          | 0.0                                    | 7.0                                      | 68                  |
| 60 min Summer    | 56.713          | 0.0                                    | 9.3                                      | 90                  |
| 120 min Summer   | 35.339          | 0.0                                    | 11.9                                     | 134                 |
| 180 min Summer   | 26.336          | 0.0                                    | 13.3                                     | 184                 |
| 240 min Summer   | 21.253          | 0.0                                    | 14.4                                     | 224                 |
| 360 min Summer   | 15.720          | 0.0                                    | 16.1                                     | 286                 |
| 480 min Summer   | 12.669          | 0.0                                    | 17.4                                     | 352                 |
| 600 min Summer   | 10.706          | 0.0                                    | 18.3                                     | 418                 |
| 720 min Summer   | 9.325           | 0.0                                    | 19.2                                     | 484                 |
| 960 min Summer   | 7.491           | 0.0                                    | 20.5                                     | 616                 |
| 1440 min Summer  | 5.490           | 0.0                                    | 22.6                                     | 868                 |
| 2160 min Summer  | 4.013           | 0.0                                    | 24.6                                     | 1220                |
| 2880 min Summer  | 3.209           | 0.0                                    | 26.1                                     | 1556                |
| 4320 min Summer  | 2.336           | 0.0                                    | 28.1                                     | 2204                |
| 5760 min Summer  | 1.866           | 0.0                                    | 29.5                                     | 2920                |
| 7200 min Summer  | 1.568           | 0.0                                    | 30.6                                     | 3656                |
| 8640 min Summer  | 1.361           | 0.0                                    | 31.4                                     | 4408                |
| 10080 min Summer | 1.207           | 0.0                                    | 32.1                                     | 5512                |
| 15 min Winter    | 129.164         | 0.0                                    | 4.9                                      | 53                  |

Tiltwood



Date 29/04/2023 10:18

|             |
|-------------|
| Designed by |
|-------------|

File Blue roof.SRCX

Checked by

XP Solutions

---

Source Control 2020.1

### Summary of Results for 100 year Return Period (+40%)

| Storm<br>Event |        | Max          | Max          | Max                   | Max              | Max                       | Max            | Status |
|----------------|--------|--------------|--------------|-----------------------|------------------|---------------------------|----------------|--------|
|                |        | Level<br>(m) | Depth<br>(m) | Infiltration<br>(l/s) | Control<br>(l/s) | $\Sigma$ Outflow<br>(l/s) | Volume<br>(m³) |        |
| 30 min         | Winter | 13.377       | 0.027        | 0.0                   | 0.5              | 0.5                       | 4.9            | O K    |
| 60 min         | Winter | 13.387       | 0.037        | 0.0                   | 0.5              | 0.5                       | 6.9            | O K    |
| 120 min        | Winter | 13.396       | 0.046        | 0.0                   | 0.5              | 0.5                       | 8.6            | O K    |
| 180 min        | Winter | 13.399       | 0.049        | 0.0                   | 0.5              | 0.5                       | 9.0            | O K    |
| 240 min        | Winter | 13.398       | 0.048        | 0.0                   | 0.5              | 0.5                       | 8.9            | O K    |
| 360 min        | Winter | 13.395       | 0.045        | 0.0                   | 0.5              | 0.5                       | 8.4            | O K    |
| 480 min        | Winter | 13.391       | 0.041        | 0.0                   | 0.5              | 0.5                       | 7.7            | O K    |
| 600 min        | Winter | 13.388       | 0.038        | 0.0                   | 0.5              | 0.5                       | 7.0            | O K    |
| 720 min        | Winter | 13.384       | 0.034        | 0.0                   | 0.5              | 0.5                       | 6.2            | O K    |
| 960 min        | Winter | 13.376       | 0.026        | 0.0                   | 0.5              | 0.5                       | 4.8            | O K    |
| 1440 min       | Winter | 13.363       | 0.013        | 0.0                   | 0.5              | 0.5                       | 2.3            | O K    |
| 2160 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.5              | 0.5                       | 0.2            | O K    |
| 2880 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.5              | 0.5                       | 0.2            | O K    |
| 4320 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.4              | 0.4                       | 0.1            | O K    |
| 5760 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.4              | 0.4                       | 0.1            | O K    |
| 7200 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.4              | 0.4                       | 0.1            | O K    |
| 8640 min       | Winter | 13.351       | 0.001        | 0.0                   | 0.4              | 0.4                       | 0.1            | O K    |
| 10080 min      | Winter | 13.351       | 0.001        | 0.0                   | 0.4              | 0.4                       | 0.1            | O K    |

| Storm<br>Event   | Rain<br>(mm/hr) | Flooded<br>Volume<br>(m <sup>3</sup> ) | Discharge<br>Volume<br>(m <sup>3</sup> ) | Time-Peak<br>(mins) |
|------------------|-----------------|----------------------------------------|------------------------------------------|---------------------|
| 30 min Winter    | 87.637          | 0.0                                    | 7.0                                      | 68                  |
| 60 min Winter    | 56.713          | 0.0                                    | 9.3                                      | 90                  |
| 120 min Winter   | 35.339          | 0.0                                    | 11.9                                     | 134                 |
| 180 min Winter   | 26.336          | 0.0                                    | 13.4                                     | 182                 |
| 240 min Winter   | 21.253          | 0.0                                    | 14.4                                     | 232                 |
| 360 min Winter   | 15.720          | 0.0                                    | 16.1                                     | 296                 |
| 480 min Winter   | 12.669          | 0.0                                    | 17.4                                     | 368                 |
| 600 min Winter   | 10.706          | 0.0                                    | 18.3                                     | 442                 |
| 720 min Winter   | 9.325           | 0.0                                    | 19.2                                     | 512                 |
| 960 min Winter   | 7.491           | 0.0                                    | 20.6                                     | 646                 |
| 1440 min Winter  | 5.490           | 0.0                                    | 22.6                                     | 888                 |
| 2160 min Winter  | 4.013           | 0.0                                    | 24.7                                     | 1144                |
| 2880 min Winter  | 3.209           | 0.0                                    | 26.2                                     | 1564                |
| 4320 min Winter  | 2.336           | 0.0                                    | 28.2                                     | 2152                |
| 5760 min Winter  | 1.866           | 0.0                                    | 29.6                                     | 3344                |
| 7200 min Winter  | 1.568           | 0.0                                    | 30.7                                     | 4464                |
| 8640 min Winter  | 1.361           | 0.0                                    | 31.5                                     | 3936                |
| 10080 min Winter | 1.207           | 0.0                                    | 32.2                                     | 5648                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                           | Page 3                                                                              |                |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------|----------------|-------------|---------------|-------------|-----------------------|-----|-------------|-------|--------|-------------------|-------------|-------|------------|--------|-----------------------|----|---------|-------|----------------------|-------|---------------|-----|------------------|-----|-----------|-----|----------------------|---|-------------------------|---|-------------------|-------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----|----------|-------|----------|-------|----------|--------|----------|-----|----------|-------|----------|-------|----------|---------|----------|------|----------|-------|----------|-------|----------|---------|----------|-------|----------|-------|----------|-------|----------|---------|----------|-------|----------|-------|----------|-------|----------|---------|----------|-------|----------|-------|----------|-------|----------|---------|----------|-------|----------|-------|----------|-------|----------|--|--|-------|----------|-------|----------|-------|----------|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Tiltwood                  |  |                |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Date 29/04/2023 10:18<br>File Blue roof.SRCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Designed by<br>Checked by |                                                                                     |                |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| XP Solutions Source Control 2020.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |                                                                                     |                |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| <p align="center"><u>Rainfall Details</u></p> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.900</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.900</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.330</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <p align="center"><u>Green Roof</u></p> <table> <tr> <td>Area (m³)</td> <td>205</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Depression Storage (mm)</td> <td>5</td> <td>Decay Coefficient</td> <td>0.050</td> </tr> </table> <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0 4</td> <td>0.003725</td> <td>32 36</td> <td>0.000752</td> <td>64 68</td> <td>0.000152</td> <td>96 100</td> <td>0.000031</td> </tr> <tr> <td>4 8</td> <td>0.003050</td> <td>36 40</td> <td>0.000616</td> <td>68 72</td> <td>0.000124</td> <td>100 104</td> <td>0.000025</td> </tr> <tr> <td>8 12</td> <td>0.002497</td> <td>40 44</td> <td>0.000504</td> <td>72 76</td> <td>0.000102</td> <td>104 108</td> <td>0.000021</td> </tr> <tr> <td>12 16</td> <td>0.002044</td> <td>44 48</td> <td>0.000413</td> <td>76 80</td> <td>0.000083</td> <td>108 112</td> <td>0.000017</td> </tr> <tr> <td>16 20</td> <td>0.001674</td> <td>48 52</td> <td>0.000338</td> <td>80 84</td> <td>0.000068</td> <td>112 116</td> <td>0.000014</td> </tr> <tr> <td>20 24</td> <td>0.001370</td> <td>52 56</td> <td>0.000277</td> <td>84 88</td> <td>0.000056</td> <td>116 120</td> <td>0.000011</td> </tr> <tr> <td>24 28</td> <td>0.001122</td> <td>56 60</td> <td>0.000227</td> <td>88 92</td> <td>0.000046</td> <td></td> <td></td> </tr> <tr> <td>28 32</td> <td>0.000919</td> <td>60 64</td> <td>0.000185</td> <td>92 96</td> <td>0.000037</td> <td></td> <td></td> </tr> </tbody> </table> |                           |                                                                                     | Rainfall Model | FSR         | Winter Storms | Yes         | Return Period (years) | 100 | Cv (Summer) | 0.900 | Region | England and Wales | Cv (Winter) | 0.900 | M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 | Ratio R | 0.330 | Longest Storm (mins) | 10080 | Summer Storms | Yes | Climate Change % | +40 | Area (m³) | 205 | Evaporation (mm/day) | 3 | Depression Storage (mm) | 5 | Decay Coefficient | 0.050 | Time (mins) | Area | Time (mins) | Area | Time (mins) | Area | Time (mins) | Area | From: To: | (ha) | From: To: | (ha) | From: To: | (ha) | From: To: | (ha) | 0 4 | 0.003725 | 32 36 | 0.000752 | 64 68 | 0.000152 | 96 100 | 0.000031 | 4 8 | 0.003050 | 36 40 | 0.000616 | 68 72 | 0.000124 | 100 104 | 0.000025 | 8 12 | 0.002497 | 40 44 | 0.000504 | 72 76 | 0.000102 | 104 108 | 0.000021 | 12 16 | 0.002044 | 44 48 | 0.000413 | 76 80 | 0.000083 | 108 112 | 0.000017 | 16 20 | 0.001674 | 48 52 | 0.000338 | 80 84 | 0.000068 | 112 116 | 0.000014 | 20 24 | 0.001370 | 52 56 | 0.000277 | 84 88 | 0.000056 | 116 120 | 0.000011 | 24 28 | 0.001122 | 56 60 | 0.000227 | 88 92 | 0.000046 |  |  | 28 32 | 0.000919 | 60 64 | 0.000185 | 92 96 | 0.000037 |  |  |
| Rainfall Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | FSR                       | Winter Storms                                                                       | Yes            |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 100                       | Cv (Summer)                                                                         | 0.900          |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | England and Wales         | Cv (Winter)                                                                         | 0.900          |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| M5-60 (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 20.000                    | Shortest Storm (mins)                                                               | 15             |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Ratio R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.330                     | Longest Storm (mins)                                                                | 10080          |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Summer Storms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes                       | Climate Change %                                                                    | +40            |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Area (m³)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 205                       | Evaporation (mm/day)                                                                | 3              |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Depression Storage (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5                         | Decay Coefficient                                                                   | 0.050          |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| Time (mins)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Area                      | Time (mins)                                                                         | Area           | Time (mins) | Area          | Time (mins) | Area                  |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| From: To:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | (ha)                      | From: To:                                                                           | (ha)           | From: To:   | (ha)          | From: To:   | (ha)                  |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 0 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.003725                  | 32 36                                                                               | 0.000752       | 64 68       | 0.000152      | 96 100      | 0.000031              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 4 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.003050                  | 36 40                                                                               | 0.000616       | 68 72       | 0.000124      | 100 104     | 0.000025              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 8 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.002497                  | 40 44                                                                               | 0.000504       | 72 76       | 0.000102      | 104 108     | 0.000021              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 12 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.002044                  | 44 48                                                                               | 0.000413       | 76 80       | 0.000083      | 108 112     | 0.000017              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 16 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.001674                  | 48 52                                                                               | 0.000338       | 80 84       | 0.000068      | 112 116     | 0.000014              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 20 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.001370                  | 52 56                                                                               | 0.000277       | 84 88       | 0.000056      | 116 120     | 0.000011              |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 24 28                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.001122                  | 56 60                                                                               | 0.000227       | 88 92       | 0.000046      |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| 28 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.000919                  | 60 64                                                                               | 0.000185       | 92 96       | 0.000037      |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |
| ©1982-2020 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                           |                                                                                     |                |             |               |             |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |           |     |                      |   |                         |   |                   |       |             |      |             |      |             |      |             |      |           |      |           |      |           |      |           |      |     |          |       |          |       |          |        |          |     |          |       |          |       |          |         |          |      |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |         |          |       |          |       |          |       |          |  |  |       |          |       |          |       |          |  |  |

|                                              |                           |                                                                                     |
|----------------------------------------------|---------------------------|-------------------------------------------------------------------------------------|
|                                              |                           | Page 4                                                                              |
|                                              | Tiltwood                  |  |
| Date 29/04/2023 10:18<br>File Blue roof.SRCX | Designed by<br>Checked by |                                                                                     |
| XP Solutions                                 | Source Control 2020.1     |                                                                                     |

Model Details

Storage is Online Cover Level (m) 14.000

Cellular Storage Structure

Invert Level (m) 13.350 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000     | 195.0                  | 195.0                       | 0.150     | 195.0                  | 195.0                       |

Depth/Flow Relationship Outflow Control

Invert Level (m) 13.350

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|
| 0.001     | 0.5000     | 0.100     | 0.5000     |

©1982-2020 Innovyze



---

# Surface Water Drainage Strategy Statement

## 18 July 2023

Land at Grid Reference 535270138258,  
Hophurst Lane, Crawley Down.

## 1.0 Introduction

The purpose of this document is to demonstrate to the Local Planning Authority that the site can be drained both safely and sustainably for the lifetime of the development.

The document has been prepared in accordance with guidance set out within the West Sussex LLFA Policy for the Management of Surface Water.

With particular reference to;

*SuDS Policy 1: Follow the drainage hierarchy.*

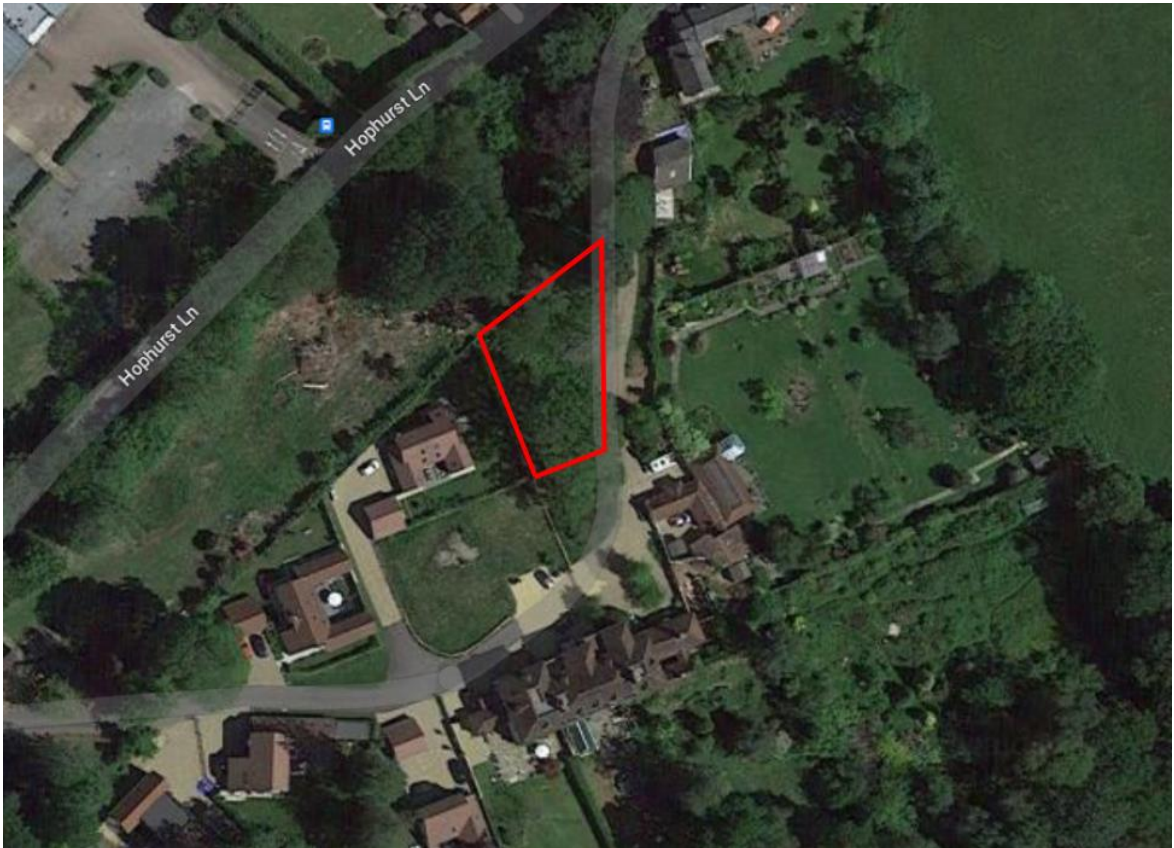
*1. Surface runoff not collected for use must be discharged according to the following discharge hierarchy:*

- to ground,*
- to a surface water body,*
- to a surface water sewer, highway drain, or another drainage system, or*
- to a combined sewer where there are absolutely no other options, and only where agreed with the relevant sewerage undertaker.*

*2. The selection of a discharge point should be clearly demonstrated and evidenced.*

## 2.0 Site Location

The site is located at at Grid Reference 535270138258, Hophurst Lane, Crawley Down.



## 3.0 Existing Conditions

### 3.1 Land Use

The site covers an area of approximately 1318m<sup>2</sup> (0.1318 hectares).

The site is currently un-developed and occupied by soft landscaping and semi-mature/mature trees along with a small area of gravel car parking.

### 3.2 Topography

The topographical survey indicates that the site has a gentle fall in a south to north direction.

Ground levels are typically within the range of 7.90m–9.80m. Levels are approximately 9.20–9.80m in the south of the site falling to 7.90-9.40m in the north of the site. Beyond the site boundary to the south the connecting combined chamber cover sits at approximately 9.98m.

### 3.3 Geology

A Geotechnical Investigation was undertaken in December 2022 by S Chick Investigations Limited.

In total, 3 boreholes were drilled with the following summary of results;

0.0m to 0.50m BGL - MADE GROUND

0.50-1.80m to 2.30m BGL – SILTY CLAY

1.80 to 2.30 (end of boreholes) – MUDSTONE/SANDSTONE

Infiltration testing was undertaken at two locations, both tests showed that there was no drop in water levels over a 60 minute period.

### 3.4 Permeable/Impermeable Area

The topographical survey shows that there is no impermeable area on the site apart from a small area (approximately 69m<sup>2</sup>) of compacted Type 1 material.

The surface run-off from the site is considered to discharge to the adjacent access road in an uncontrolled manner.

### 3.5 Drainage

There is no on-site drainage system.



---

### 3.6 Watercourses/Rivers

The nearest recorded watercourse is approximately 500m to the south of the site.

## **4.0 Development Proposals**

The existing site is to be developed to provide 1 three-bedroom house.

## 5.0 Sustainable Drainage Options

CIRIA C753 SuDS Manual explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new development. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable, and more resilient to change. This document explains the wider social context of SuDS and how SuDS can deliver high quality drainage while supporting urban areas to cope better with severe rainfall both in present and future.

There are four main categories of benefits that can be achieved by SuDS:

- Water Quantity (mitigate flood risk & protect natural water cycle)
- Water Quality (manage the quality of the runoff to prevent pollution)
- Amenity (create and sustain better places for people)
- Biodiversity (create and sustain better places for nature)

There are many site-specific factors which will influence the choice of any SuDS devices used within a development. The primary factors are:

- How the land is to be used- whether domestic, commercial, or industrial.
- Soil contamination.
- Existing soil conditions i.e. ground permeability, groundwater levels.
- Site topography e.g. steeply sloping.
- Space availability – urban or non-urban.

Most advice on the use of sustainable drainage techniques recommends the utilisation of ground infiltration, which may take the form of permeable paving, swales, infiltration basins or soakaways. However, these systems are dependent on the sub-soil suitability, unsaturated soil zone to an adequate depth and the absence of leachable contaminants in the sub-soils.

It is essential to design and install a sustainable drainage system that is appropriate for the specific development and location in question.

SuDS measures, as stated in CIRIA C753 SuDS Manual, have been considered and the potential SuDS solutions for inclusion in this development are stated in Table 1 – SuDS Feasibility Matrix.

**Table 1: SuDS Feasibility Matrix**

| Technique                     | Description                                                                                                                               | Implementation at the Site                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rainwater Harvesting          | Collection of rainwater for re-use externally for irrigation or internally within the building for toilets, washing machine etc.          | POSSIBLE - Water butts could be provided for irrigation. Internal re-use not implementable due to cost.                                  |
| Green Roofs                   | Areas of living vegetation installed on the top of buildings to reduce run-off                                                            | YES – A green roof incorporating blue roof storage will cover the entire roof of the building.                                           |
| Infiltration Systems          | Specifically, designed systems designed to promote infiltration of surface water runoff into the ground                                   | NO – The constraints of Root Protection Areas means insufficient space is available.                                                     |
| Proprietary Treatment Systems | Manufactured products that remove specified pollutants from surface water run off                                                         | NO – Pollution hazard indices class the site as VERY LOW or LOW. No specific products required before discharge to combined sewer.       |
| Filter Strips                 | Uniformly graded and gently sloping strips of grass or vegetation designed to treat surface water runoff from adjacent impermeable areas. | NO – All external areas will be permeable.                                                                                               |
| Filter Drains                 | Shallow trenches filled with stone/gravel creating temporary storage, conveyance and filtration of surface water run off.                 | NO – All external areas will be permeable.                                                                                               |
| Swales                        | Shallow, flat bottomed, vegetated open channels for conveyance and often attenuation                                                      | NO – The constraints of Root Protection Areas means insufficient space is available                                                      |
| Bioretention Systems          | Shallow landscaped depressions that can reduce run off                                                                                    | NO – The constraints of a small 'infill' site means insufficient space is available.                                                     |
| Trees                         | Protect and enhance the urban environment. Transpiration, Interception, Increased infiltration, Phytoremediation.                         | NO – Existing trees being retained leave insufficient space.                                                                             |
| Pervious Pavements            | Vehicular/pedestrian pavements allowing water to infiltrate through the surface into underlying structural layers                         | YES – All external 'hardstanding' areas will use permeable, no dig, construction methods such as a celluweb granular confinement system. |



---

|                           |                                                                                     |                                                                                      |
|---------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Attenuation Storage Tanks | Below ground void space for the temporary storage of surface water.                 | NO – The constraints of Root Protection Areas means insufficient space is available. |
| Detention Basins          | Landscaped depressions for the temporary storage of surface water.                  | NO – The constraints of a small ‘infill’ site means insufficient space is available. |
| Ponds and Wetlands        | Features with permanent water providing attenuation and treatment of surface water. | NO – The constraints of a small ‘infill’ site means insufficient space is available. |

## 6.0 Surface Water Drainage Proposals

### 6.1 Proposed Drainage Strategy

The West Sussex LLFA Policy for the Management of Surface Water requires that new developments should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so, and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

- *to ground,*
- *to a surface water body,*
- *to a surface water sewer, highway drain, or another drainage system, or*
- *to a combined sewer where there are absolutely no other options, and only where agreed with the relevant sewerage undertaker.*

*and;*

*The selection of a discharge point should be clearly demonstrated and evidenced.*

The Geotechnical Investigation report indicates ground conditions of made ground and silty clay to depths of 1.80 to 2.30m with mudstone/sandstone beyond. The two Infiltration tests (one within the clay strata and one at the top of the mudstone/sandstone strata) resulted in a zero drop of water levels over a 60 minute period. The soils conditions and infiltration results preclude infiltration.

As such, the surface water flows from the site will be dealt with in two ways;

1. All external areas (not forming part of the building) will be either retained grassed/soft landscaping (as existing) or in the case of the access drive and associated car parking will be formed of a granular confinement system (such as Geoweb), which will mimic the existing soft landscaped condition.
2. The roof construction will be flat to allow the use of a blue-green roof. The green roof element will help to reduce run-off, increase biodiversity and water quality. The blue roof element (incorporating restricted flow outlets to a maximum of 0.25l/s) will further reduce run-off closer to greenfield run-off rates.

Site levels and the level of the off-site connection point (an existing combined chamber approximately 30m to the south of the site) means the resulting run-off from the green-blue roof will discharge via the on-site pipe network to a package pumping station. A new pumped main will be laid along the existing access road (permission has been granted by the land owner) to the existing combined chamber. From this chamber, serving the existing houses, the waste will flow

under gravity conditions to a connection point with the southern water network at chamber ref 4101.

The proposed sewer connection will be subject to Water Authority approval via a Section 106 agreement under the terms of the Water Industry Act 1991.

## 7.0 Maintenance

Maintenance of any drainage scheme is essential to ensure that it continues to perform as designed. Within the site's, Health & Safety File a Maintenance Strategy will be developed which will give details of routine maintenance inspections for each element of the drainage system, together with details of how they should be undertaken and at what intervals or events. It should also include, where relevant, the installed manufacturer's details and maintenance recommendations.

The surface water drainage system requires regular inspection/clearing to prevent blockages due to the accumulation of silt. Table 2 sets out the maintenance requirement for each SuDS element proposed for the development, based on CIRIA C753 SuDS Manual.

The on-site foul and surface water drainage systems will be maintained and funded by the individual property owners over the lifetime of the development.

All maintenance must be carried out by suitably trained persons.

Table 2 SuDS Maintenance Schedule

| Item                             | Task                                                                                             | Frequency                                                     | Location                                          | Access                                      | Comments                                                                                        |
|----------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------|
| Main Drainage Network            |                                                                                                  |                                                               |                                                   |                                             |                                                                                                 |
| Rainwater downpipes              | Clean out at roof level and ground level                                                         | Twice yearly for the first 2 years of operation then annually | Roof level, around building perimeter .           | High level access required to roof outlets. | Works undertaken by appropriately qualified person(s).                                          |
| Chambers, silt-traps & catchpits | Clean out chamber/sump                                                                           |                                                               | Outside building to the front and rear elevations | At ground level                             | For RWP outlets at roof level follow health & safety regulations dealing with working at height |
| Pipe network & drainage channels | Pipes to be inspected and condition assessed. Pipes/channels to be cleaned (jetted) as necessary |                                                               |                                                   |                                             |                                                                                                 |

Table 2 SuDS Maintenance Schedule (cont'd)

| Item                            | Task                                                                                                                                  | Frequency                                                        | Location         | Access                    | Comments                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Blue & Green (Biodiverse) Roofs |                                                                                                                                       |                                                                  |                  |                           |                                                                                                                            |
| Generally                       | Inspect all components including soil substrate, underside of roof for structural integrity & signs of leakage. Remove litter/debris. | Monthly for first 12 months then annually or after severe storms | Roof of building | High level access to roof | Works undertaken by appropriately qualified person(s) following health & safety regulations dealing with working at height |
| Roof Outlets                    | Clean out, inspect, remove plant growth                                                                                               |                                                                  |                  |                           |                                                                                                                            |

|                           |                                                                   |                                                                     |                   |                            |                                                       |
|---------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|-------------------|----------------------------|-------------------------------------------------------|
| Permeable Hardstandings   |                                                                   |                                                                     |                   |                            |                                                       |
| Gravel Confinement System | Remove organic matter from surface. Replenish gravel if required. | Monthly for first 3 months then twice yearly (in spring and autumn) | Front of building | Access drive/ parking area | Works undertaken by appropriately qualified person(s) |

|                 |                                            |                                                                               |              |                                |                                                                                                                                                       |
|-----------------|--------------------------------------------|-------------------------------------------------------------------------------|--------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pumping Station |                                            |                                                                               |              |                                |                                                                                                                                                       |
| Pumps           | As pump manufacture’s maintenance schedule | Annually (or as otherwise defined by pump manufacture’s maintenance schedule) | Front garden | Access drive/ Soft landscaping | Works undertaken by appropriately qualified person(s)<br><br>It is recommended that an annual maintenance contract is arranged with the pump supplier |

## 8.0 Conclusions

The Geotechnical Investigation report indicates ground conditions of made ground, silty clay and mudstone/sandstone.

The two Infiltration tests resulted in a zero drop of water levels over a 60 minute period.

The soils conditions and infiltration results preclude infiltration.

All external areas (not forming part of the building) will be either retained grassed/soft landscaping (as existing) or in the case of the access drive and associated car parking will be formed of a granular confinement system, which will mimic the existing soft landscaped condition.

The roof construction will provide a blue-green roof. The green roof element will help to reduce run-off, increase biodiversity, and water quality. The blue roof element (incorporating restricted flow outlets to a maximum of 0.25l/s) will further reduce run-off closer to greenfield run-off rates.

The nearest recorded watercourse is approximately 500m to the south of the site. Third party land ownership between the site and the watercourse precludes a connection.

There are no surface water sewers, highway drains or other surface water drainage systems in the vicinity of the site.

The on-site drainage system will discharge via a pumped main running along the existing access road with a final discharge point of the existing combined chamber to the south of the site.

Approval has been granted by the landowner to lay the pumped main in the access road and connect to the existing combined chamber.

The on-site foul and surface water drainage systems will be maintained and funded by the individual property owners over the lifetime of the development. The Maintenance Strategy gives details of routine maintenance inspections for each element of the drainage system.

This document has been prepared in accordance with guidance set out within the West Sussex LLFA Policy for the Management of Surface Water and demonstrates that the surface water drainage proposals follow the requirements of the drainage hierarchy.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|-----------------------|---|------|-------|-----------|-------|-------|-------|-----------|-----|---------------|----------|------------|-----|------------|-----|----------|-----|---------|-----|-----------|-----|------------|-----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       | Page 1                                                                              |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Tiltwood              |  |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Date 01/05/2023 07:40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Designed by .         |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| File Blue roof.SRCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Checked by            |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| XP Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Source Control 2020.1 |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| <p style="text-align: center;"><u>ICP SUDS Mean Annual Flood</u></p> <p style="text-align: center;">Input</p> <table><tr><td>Return Period (years)</td><td>2</td><td>Soil</td><td>0.450</td></tr><tr><td>Area (ha)</td><td>0.132</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>800</td><td>Region Number</td><td>Region 7</td></tr></table> <p style="text-align: center;"><b>Results 1/s</b></p> <table><tr><td>QBAR Rural</td><td>0.7</td></tr><tr><td>QBAR Urban</td><td>0.7</td></tr><tr><td>Q2 years</td><td>0.6</td></tr><tr><td>Q1 year</td><td>0.6</td></tr><tr><td>Q30 years</td><td>1.5</td></tr><tr><td>Q100 years</td><td>2.2</td></tr></table> |                       |                                                                                     | Return Period (years) | 2 | Soil | 0.450 | Area (ha) | 0.132 | Urban | 0.000 | SAAR (mm) | 800 | Region Number | Region 7 | QBAR Rural | 0.7 | QBAR Urban | 0.7 | Q2 years | 0.6 | Q1 year | 0.6 | Q30 years | 1.5 | Q100 years | 2.2 |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2                     | Soil                                                                                | 0.450                 |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.132                 | Urban                                                                               | 0.000                 |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 800                   | Region Number                                                                       | Region 7              |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| QBAR Rural                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.7                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| QBAR Urban                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.7                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Q2 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.6                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Q1 year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.6                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Q30 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1.5                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| Q100 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2.2                   |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |
| <p style="text-align: center;">©1982-2020 Innovyze</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                                                                                     |                       |   |      |       |           |       |       |       |           |     |               |          |            |     |            |     |          |     |         |     |           |     |            |     |