



## Drainage Statement

Proposed Development at

Stakers ~ Farm Barns, North End Road, Yapton

On behalf of

Mr Piers Bucknell

November 2019

## Document History and Status

Project Number 23192

| Date            | Version | Prepared By                   | Reviewed By                 | Approved By                 |
|-----------------|---------|-------------------------------|-----------------------------|-----------------------------|
| 30 Aug 2019     | 1.0     | Martin Kempshall<br>CEng MICE | Steve Doughty<br>Director   | Stuart Magowan<br>IEng MICE |
| 8 November 2019 | 1.1     | Martin Kempshall<br>CEng MICE | Stuart Magowan<br>IEng MICE | Stuart Magowan<br>IEng MICE |
|                 |         |                               |                             |                             |
|                 |         |                               |                             |                             |
|                 |         |                               |                             |                             |

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## 1 Non Technical Summary

- 1.1 This Drainage Statement has been undertaken on behalf of Mr Piers Bucknell in support of a Planning Application for the redevelopment and conversion of existing agricultural barns to three residential dwellings at Stakers ~ Farm Barns, North End Road, Yapton.
- 1.2 This report is to be read in conjunction with all planning, architectural and other reports that accompany the Planning Application for the proposed development.
- 1.3 The proposed development will incorporate a sustainable drainage system, which will discharge surface water infiltration to ground via an infiltration blanket for all storm return periods up to and including the 1:100 year rainfall event with a 40% allowance for climate change.
- 1.4 Water quality measures in accordance with CIRIA C 753 SuDS Manual Guidance will be provided to mitigate against risk to any receiving waterbody.
- 1.5 The sustainable drainage system proposed will discharge surface water to ground.
- 1.6 There is an existing combined drain located on site, which is anticipated to discharge to the Southern Water foul sewer located beneath North End Road.
- 1.7 Foul water will be discharged to the public sewers. There is no requirement for an Environmental Assessment to justify the proposed foul discharge into the public sewer network.
- 1.8 Overall loadings on the existing foul water infrastructure will be reduced as a result of the development with the existing surface water connection to the foul sewer system removed.

## 2 Planning Policy Context

### 2.1 National Planning Policy Framework

- 2.1.1 The National Planning Policy Framework was updated in February 2019.
- 2.1.2 Following the updates to The National Planning Policy Framework (J uly 2018) in relation to planning and flood risk and in accordance with the Town and Country Planning Order 2015 a SuDS system will be incorporated into the design. This will be designed in accordance with the Non-Statutory Technical Standards for SuDS, CIRIA C753 SuDS Manual Guidance and Approved Document H of the Building Regulations.
- 2.1.3 The proposed development is in Flood Zone 1 and as the main development site is less than 1ha in size a standalone Flood Risk Assessment is not required to support the Planning Application.

### 2.2 Local Planning Policy

- 2.2.1 The Arun Local Plan 2011-2031 was adopted on 18 J uly 2018.
- 2.2.2 The following policy is of specific relevance to this Drainage Statement:
- 2.2.3 Policy W DM3 Sustainable Urban Drainage Systems states that to increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design.

These features include:

- Green roofs
- Permeable driveways and parking
- Soakaways
- Water harvesting and storage features including water butts

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.

- b. Effectively manage water (including its quality)
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets
- d. Provide amenity for local residents (ensuring a safe environment)
- e. Retain the existing drainage network of the site and the wider area,
- f. Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- f. (sic) Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.
- g. Undertake up to six months groundwater monitoring within the winter period.
- h. Undertake winter percolation testing in accordance with BRE 365.
- i. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.
- j. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system.

Any excess flows must be contained within the site boundary, and within designated storage areas.~

## 2.3 Best Practice Guidance

2.3.1 CIRIA report C753 The SuDS Manual-v6 provides guidance on the redevelopment of brownfield sites. The aim for surface water runoff is to match greenfield runoff rates and volumes where reasonably achievable.

### 3 Existing Site

#### 3.1 Site Location

3.1.1 The development site is located on the land west of B2132 North End Road, Yapton at Ordnance Survey reference SU 977 035. The nearest postcode is BN18 0DU.



Image 1: Site Location

3.1.2 The site is bounded to the north by residential properties, the east by B2132 North End Road, the south by open fields and to the west by agricultural buildings.

3.1.3 A copy of the site location plan is located in Appendix 1 at the rear of this report.

#### 3.2 Site Description

3.2.1 The site is approximately 2,900m<sup>2</sup> in area and comprises two single storey outbuildings and a single two storey agricultural barn with associated hardstanding of which approximately 2,000m<sup>2</sup> is impermeable.

3.2.2 Existing ground levels are highest at the northwest corner of the site at approximately 6.6m AOD. The site falls towards its southeast boundary to a level of approximately 5.4m AOD.

3.2.3 A copy of the existing site layout plan is located in Appendix 2 at the rear of this report.

### 3.3 Existing Drainage

- 3.3.1 There is a combined drain on site, which is at least 100mm in diameter at a gradient of 1 in 80, with a full-bore capacity of 7.3l/s. All foul and surface water is believed to discharge via this existing drain.
- 3.3.2 There are public foul sewers located beneath the B2132 North End Road to the southeast of the site.
- 3.3.3 Surface and foul water from the existing properties are currently discharged in an unrestricted manner via the existing onsite combined drain to the foul water sewer beneath North End Road.
- 3.3.4 There are no watercourses adjoining the site boundaries.
- 3.3.5 The site is within the Lidsey Foul Water Treatment Catchment Area.
- 3.3.6 A copy of the sewer records is located in Appendix 3 at the rear of this report.
- 3.3.7 A copy of the existing pipe capacity calculations is located in Appendix 4 at the rear of this report.

### 3.4 Geology and Groundwater

- 3.4.1 British Geological Survey maps and borehole information identify the site as being located within an area underlain by Superficial River Terrace Deposits (a clayey sand layer) overlying Lewes Nodular Chalk.
- 3.4.2 River Terrace Deposits have been recorded beneath the topsoil layer of the adjacent sites to the northwest and southwest of the site consisting of stiff orange brown clay with varying sand and gravel content. Trial holes identified bands of clayey gravelly fine to coarse sand were encountered at shallow depths of up to 0.8m.
- 3.4.3 Infiltration testing of adjacent sites identified moderate to low infiltration rates within this area with infiltration rates consistently in the order of  $2 \times 10^{-6}$ m/s.
- 3.4.4 Trial holes of adjacent sites to the northwest identified groundwater at between 3.8m and 5.2m below ground level within the chalk underlaying River Terrace Gravels.
- 3.4.5 Winter groundwater monitoring from the adjacent site to the southwest identifies a maximum groundwater level of approximately 2m below existing ground levels.
- 3.4.6 The online 'Magic Map' available from Defra confirms that the site is located above a major aquifer classified as having an intermediate vulnerability.

3.4.7 A copy of the geological borehole data is located in Appendix 5 at the rear of this report.

## 4 Development Proposals

### 4.1 Description

4.1.1 The development proposals are for the redevelopment and conversion of existing agricultural barns and two outbuildings to three residential dwellings at Stakers Farm Barns.

4.1.2 A copy of the proposed site layout plan is located in Appendix 6 at the rear of this report.

### 4.2 Drainage Strategy

4.2.1 A preliminary surface water drainage system has been designed in accordance with the National Planning Policy Framework (NPPF) and the accompanying Guidance and Technical Standards for SuDS. The design also complies with the requirements under Building Regulations Part H.

4.2.2 CIRIA report C753 The SuDS Manual-v6 provides guidance on the redevelopment of brownfield sites. The aim for surface water runoff is to match greenfield runoff rates and volumes where reasonably achievable.

4.2.3 For surface water discharge, the drainage hierarchy notes the following list of drainage options in order of preference:

1. Infiltration to ground
2. Discharge to a watercourse
3. Discharge to a surface water sewer
4. Discharge to a foul water sewer

4.2.4 Based on this the preferred surface water drainage strategy should where possible be based on infiltration to ground.

4.2.5 Given the underlying ground conditions the site will be based on infiltration to ground with storage provided on site at source.

4.2.6 All storage will be designed to accommodate surface water for a 1:100 year storm including an additional 40% to account for the future effects of climate change.

4.2.7 All surface water will be stored on site and discharged to the ground via an infiltration blanket beneath a permeable car parking area.

4.2.8 The total proposed impermeable area of the site is approximately 1,800m<sup>2</sup>

4.2.9 Preliminary calculations have been prepared based on an infiltration rate of 2 x 10<sup>-6</sup>m/s as experienced by ground investigation undertaken within the area.

- 4.2.10 A minimum 420mm deep 30% voided subbase system will be required beneath the access and car parking area, which consists of approximately 1,000m<sup>2</sup> providing 110m<sup>3</sup> of storage with an estimated half drain time of 1,061 minutes (approximately 17.5 hours).
- 4.2.11 The drainage proposals will be confirmed at detailed design stage subject to further site investigations and testing which will include infiltration testing to BRE Digest 365 requirements to inform the detailed design.
- 4.2.12 If infiltration rates are found to be higher than initially identified the storage requirement will be reduced.
- 4.2.13 Removing the surface water loadings from the existing onsite connection to the public sewer will provide a significant betterment on downstream foul water sewer loadings in this area, with a peak reduction of approximately 7.3l/s (The full-bore capacity of the existing connection) during heavy rainfall events.
- 4.2.14 A copy of the existing and proposed drainage area plan is located in Appendix 7 at the rear of this report.
- 4.2.15 The preliminary drainage strategy plan together with the preliminary surface water calculations is located in Appendix 8 at the rear of this report.

#### 4.3 Foul Water

- 4.3.1 Any new connection to the public sewer will be subject to an agreement with Southern Water under Section 106 of the Water Industry Act 1991.
- 4.3.2 The anticipated peak foul water discharge from the site has been calculated as 0.1 l/s in accordance with Sewers for Adoption guidance.
- 4.3.3 The existing gravity connection to the public foul sewer located beneath North End Road is to be used for the proposed development.

#### 4.4 Water Quality

- 4.4.1 The proposed development is for residential use. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is between very low and low.
- 4.4.2 The surface water scheme will include mitigation to ensure that surface water is suitably treated and any pollution risk adequately managed prior to discharge.

4.4.3 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

| Land Use                                                               | Pollution hazard level | Total suspended solids (TSS) | Metals | Hydro-carbons |
|------------------------------------------------------------------------|------------------------|------------------------------|--------|---------------|
| Residential roofs                                                      | Very Low               | 0.2                          | 0.2    | 0.05          |
| Individual property driveways, residential car park, low-traffic roads | Low                    | 0.5                          | 0.4    | 0.4           |

Table 1: Pollution Hazard Indices

4.4.4 Where multiple drainage components are used in series the individual mitigation index of secondary and tertiary components is lowered by 50% due to reduced performance associated with primary treatment.

| SuDS Type          | Total suspended solids (TSS) | Metals | Hydro-carbons |
|--------------------|------------------------------|--------|---------------|
| Permeable pavement | 0.7                          | 0.6    | 0.7           |

Table 2: Pollution Mitigation Indices

4.4.5 The proposed use of permeable paving will meet the target treatment level required for runoff with very low to low risk of pollution hazard thus demonstrating that the surface water drainage system for the site can be designed to adequately mitigate against the risk of pollution.

4.4.6 An outline drainage maintenance schedule is located in Appendix 9 at the rear of this report.

## 5 Conclusions

- 5.1 The geology of the area comprises River Terrace Deposits overlying Chalk and is anticipated to provide suitable percolation rates to accommodate an infiltration drainage system.
- 5.2 The preferred surface water drainage option will incorporate a sustainable drainage system, which will discharge surface water to ground via an infiltration blanket beneath the access road and carpark.
- 5.3 Preliminary calculations indicate that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an allowance for climate change.
- 5.4 Water quality measures will be provided to mitigate against any risk to any receiving waterbody.
- 5.5 Site investigations should be undertaken including infiltration testing to BRE Digest 365 requirements to inform the detailed design.
- 5.6 This report confirms a suitable surface water drainage system that is SuDS compliant is achievable for this development.
- 5.7 Foul water will be discharged to the Southern Water sewer located beneath North End Road.
- 5.8 Overall loadings on the existing foul water infrastructure will be reduced as a result of the development removing the existing surface water connection to the foul system.
- 5.9 The site is within the Lidsey Foul Water Treatment Catchment Area and has no requirement for an Environmental Assessment to justify the proposed foul discharge into the public sewer network.

## 6 List of Appendices, Images and Tables

|            |                                                     |
|------------|-----------------------------------------------------|
| Appendix 1 | Site Location Plan                                  |
| Appendix 2 | Existing Site Layout Plans                          |
| Appendix 3 | Southern Water Sewer Records                        |
| Appendix 4 | Existing Pipe Capacity Calculations                 |
| Appendix 5 | BGS Borehole Records                                |
| Appendix 6 | Proposed Site Layout Plan                           |
| Appendix 7 | Existing and Proposed Drainage Area Plan            |
| Appendix 8 | Preliminary Drainage Strategy Plan and Calculations |
| Appendix 9 | Drainage Maintenance Schedule                       |

|         |               |
|---------|---------------|
| Image 1 | Site Location |
|---------|---------------|

|         |                  |
|---------|------------------|
| Image 2 | Local Topography |
|---------|------------------|

|         |                          |
|---------|--------------------------|
| Table 1 | Pollution Hazard Indices |
|---------|--------------------------|

|         |                              |
|---------|------------------------------|
| Table 2 | Pollution Mitigation Indices |
|---------|------------------------------|

# Appendix 1

## Site Location Plan

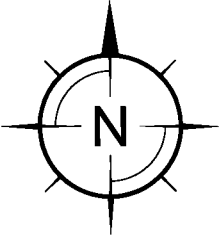


## Appendix 2

### Existing Site Layout Plans



|                               |  |                      |  |
|-------------------------------|--|----------------------|--|
| TITLE<br>Existing Site Survey |  |                      |  |
| SCALE<br>1:500 @ A3           |  | PROJECT No.<br>23192 |  |
| REPORT TYPE<br>DS             |  | DRG. No.<br>2        |  |



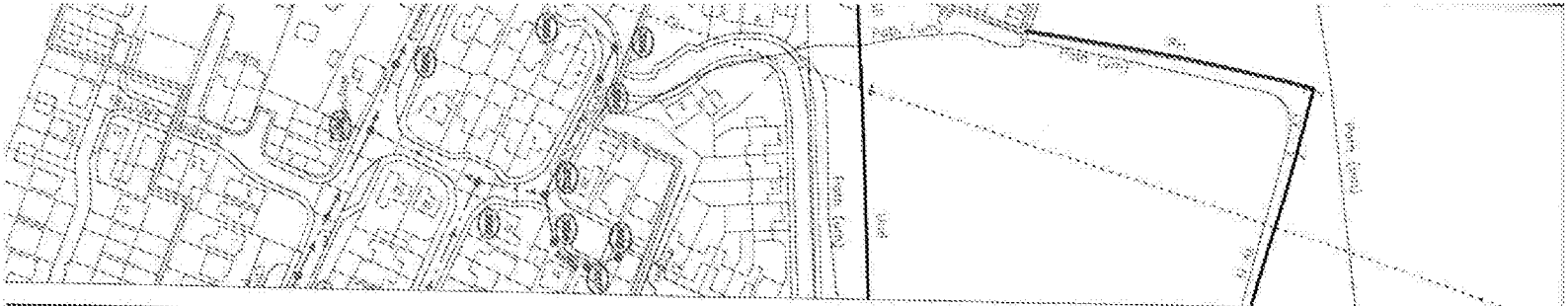
|                            |            |             |       |
|----------------------------|------------|-------------|-------|
| TITLE                      |            |             |       |
| Existing Ground Floor Plan |            |             |       |
| SCALE                      | 1:250 @ A3 | PROJECT No. | 23192 |
| REPORT TYPE                | DS         | DRG. No.    | 3     |

## **Appendix 3**

### **Southern Water Sewer Records**







|       |      |     |     |    |      |
|-------|------|-----|-----|----|------|
| 6304X | 4.68 | 2.2 | 173 | VC | CIRC |
| 6305X |      |     | 100 | VC | CIRC |
| 6801X |      |     | 175 | VC | CIRC |
| 6802X |      |     | 150 | VC | CIRC |
| 6803X |      |     | 150 | VC | CIRC |
| 6804X |      |     | 150 | VC | CIRC |
| 6805X |      |     | 150 | VC | CIRC |
| 6806X |      |     | 150 | VC | CIRC |
| 6807X |      |     | 150 | VC | CIRC |
| 6808X |      |     | 150 | VC | CIRC |
| 6809X |      |     | 150 | VC | CIRC |
| 6810X |      |     | 150 | VC | CIRC |
| 6811X |      |     | 150 | VC | CIRC |
| 6812X |      |     | 150 | VC | CIRC |
| 6813X |      |     | 150 | VC | CIRC |
| 6814X |      |     | 150 | VC | CIRC |
| 6815X |      |     | 150 | VC | CIRC |
| 6816X |      |     | 150 | VC | CIRC |
| 6817X |      |     | 150 | VC | CIRC |
| 6818X |      |     | 150 | VC | CIRC |
| 6819X |      |     | 150 | VC | CIRC |
| 6820X |      |     | 150 | VC | CIRC |
| 6821X |      |     | 150 | VC | CIRC |
| 6822X |      |     | 150 | VC | CIRC |
| 6823X |      |     | 150 | VC | CIRC |
| 6824X |      |     | 150 | VC | CIRC |
| 6825X |      |     | 150 | VC | CIRC |
| 6826X |      |     | 150 | VC | CIRC |
| 6827X |      |     | 150 | VC | CIRC |
| 6828X |      |     | 150 | VC | CIRC |
| 6829X |      |     | 150 | VC | CIRC |
| 6830X |      |     | 150 | VC | CIRC |
| 6831X |      |     | 150 | VC | CIRC |
| 6832X |      |     | 150 | VC | CIRC |
| 6833X |      |     | 150 | VC | CIRC |
| 6834X |      |     | 150 | VC | CIRC |
| 6835X |      |     | 150 | VC | CIRC |
| 6836X |      |     | 150 | VC | CIRC |
| 6837X |      |     | 150 | VC | CIRC |
| 6838X |      |     | 150 | VC | CIRC |
| 6839X |      |     | 150 | VC | CIRC |
| 6840X |      |     | 150 | VC | CIRC |
| 6841X |      |     | 150 | VC | CIRC |
| 6842X |      |     | 150 | VC | CIRC |
| 6843X |      |     | 150 | VC | CIRC |
| 6844X |      |     | 150 | VC | CIRC |
| 6845X |      |     | 150 | VC | CIRC |
| 6846X |      |     | 150 | VC | CIRC |
| 6847X |      |     | 150 | VC | CIRC |
| 6848X |      |     | 150 | VC | CIRC |
| 6849X |      |     | 150 | VC | CIRC |
| 6850X |      |     | 150 | VC | CIRC |
| 6851X |      |     | 150 | VC | CIRC |
| 6852X |      |     | 150 | VC | CIRC |
| 6853X |      |     | 150 | VC | CIRC |
| 6854X |      |     | 150 | VC | CIRC |
| 6855X |      |     | 150 | VC | CIRC |
| 6856X |      |     | 150 | VC | CIRC |
| 6857X |      |     | 150 | VC | CIRC |
| 6858X |      |     | 150 | VC | CIRC |
| 6859X |      |     | 150 | VC | CIRC |
| 6860X |      |     | 150 | VC | CIRC |
| 6861X |      |     | 150 | VC | CIRC |
| 6862X |      |     | 150 | VC | CIRC |
| 6863X |      |     | 150 | VC | CIRC |
| 6864X |      |     | 150 | VC | CIRC |
| 6865X |      |     | 150 | VC | CIRC |
| 6866X |      |     | 150 | VC | CIRC |
| 6867X |      |     | 150 | VC | CIRC |
| 6868X |      |     | 150 | VC | CIRC |
| 6869X |      |     | 150 | VC | CIRC |
| 6870X |      |     | 150 | VC | CIRC |
| 6871X |      |     | 150 | VC | CIRC |
| 6872X |      |     | 150 | VC | CIRC |
| 6873X |      |     | 150 | VC | CIRC |
| 6874X |      |     | 150 | VC | CIRC |
| 6875X |      |     | 150 | VC | CIRC |
| 6876X |      |     | 150 | VC | CIRC |
| 6877X |      |     | 150 | VC | CIRC |
| 6878X |      |     | 150 | VC | CIRC |
| 6879X |      |     | 150 | VC | CIRC |
| 6880X |      |     | 150 | VC | CIRC |
| 6881X |      |     | 150 | VC | CIRC |
| 6882X |      |     | 150 | VC | CIRC |
| 6883X |      |     | 150 | VC | CIRC |
| 6884X |      |     | 150 | VC | CIRC |
| 6885X |      |     | 150 | VC | CIRC |
| 6886X |      |     | 150 | VC | CIRC |
| 6887X |      |     | 150 | VC | CIRC |
| 6888X |      |     | 150 | VC | CIRC |
| 6889X |      |     | 150 | VC | CIRC |
| 6890X |      |     | 150 | VC | CIRC |
| 6891X |      |     | 150 | VC | CIRC |
| 6892X |      |     | 150 | VC | CIRC |
| 6893X |      |     | 150 | VC | CIRC |
| 6894X |      |     | 150 | VC | CIRC |
| 6895X |      |     | 150 | VC | CIRC |
| 6896X |      |     | 150 | VC | CIRC |
| 6897X |      |     | 150 | VC | CIRC |
| 6898X |      |     | 150 | VC | CIRC |
| 6899X |      |     | 150 | VC | CIRC |
| 6900X |      |     | 150 | VC | CIRC |

\* \*

| LINE STYLES / COLOURS                                                                                                                               | MATERIALS     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1. Solid line                                                                                                                                       | 1. Concrete   |
| 2. Dashed line                                                                                                                                      | 2. Brick      |
| 3. Dotted line                                                                                                                                      | 3. Stone      |
| 4. Long dashed line                                                                                                                                 | 4. Mortar     |
| 5. Short dashed line                                                                                                                                | 5. Plaster    |
| 6. Dash-dot line                                                                                                                                    | 6. Paint      |
| 7. Long short dashed line                                                                                                                           | 7. Wallpaper  |
| 8. Short short dashed line                                                                                                                          | 8. Tiles      |
| 9. Dash-dot-dot line                                                                                                                                | 9. Glass      |
| 10. Long dash-short dash line                                                                                                                       | 10. Metal     |
| 11. Short dash-long dash line                                                                                                                       | 11. Wood      |
| 12. Dash-dot-dot-dot line                                                                                                                           | 12. Plastic   |
| 13. Long dash-dot-dot line                                                                                                                          | 13. Rubber    |
| 14. Short dash-dot-dot line                                                                                                                         | 14. Leather   |
| 15. Dash-dot-dot-dot-dot line                                                                                                                       | 15. Fabric    |
| 16. Long dash-dot-dot-dot line                                                                                                                      | 16. Paper     |
| 17. Short dash-dot-dot-dot line                                                                                                                     | 17. Cardboard |
| 18. Dash-dot-dot-dot-dot-dot line                                                                                                                   | 18. Glass     |
| 19. Long dash-dot-dot-dot-dot line                                                                                                                  | 19. Metal     |
| 20. Short dash-dot-dot-dot-dot line                                                                                                                 | 20. Wood      |
| 21. Dash-dot-dot-dot-dot-dot-dot line                                                                                                               | 21. Plastic   |
| 22. Long dash-dot-dot-dot-dot-dot line                                                                                                              | 22. Rubber    |
| 23. Short dash-dot-dot-dot-dot-dot line                                                                                                             | 23. Leather   |
| 24. Dash-dot-dot-dot-dot-dot-dot-dot line                                                                                                           | 24. Fabric    |
| 25. Long dash-dot-dot-dot-dot-dot-dot line                                                                                                          | 25. Paper     |
| 26. Short dash-dot-dot-dot-dot-dot-dot line                                                                                                         | 26. Cardboard |
| 27. Dash-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                                       | 27. Glass     |
| 28. Long dash-dot-dot-dot-dot-dot-dot-dot line                                                                                                      | 28. Metal     |
| 29. Short dash-dot-dot-dot-dot-dot-dot-dot line                                                                                                     | 29. Wood      |
| 30. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                                   | 30. Plastic   |
| 31. Long dash-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                                  | 31. Rubber    |
| 32. Short dash-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                                 | 32. Leather   |
| 33. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                               | 33. Fabric    |
| 34. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                              | 34. Paper     |
| 35. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                             | 35. Cardboard |
| 36. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                           | 36. Glass     |
| 37. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                          | 37. Metal     |
| 38. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                         | 38. Wood      |
| 39. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                       | 39. Plastic   |
| 40. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                      | 40. Rubber    |
| 41. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                     | 41. Leather   |
| 42. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                   | 42. Fabric    |
| 43. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                  | 43. Paper     |
| 44. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                                 | 44. Cardboard |
| 45. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                               | 45. Glass     |
| 46. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                              | 46. Metal     |
| 47. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                             | 47. Wood      |
| 48. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                           | 48. Plastic   |
| 49. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                          | 49. Rubber    |
| 50. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                         | 50. Leather   |
| 51. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                       | 51. Fabric    |
| 52. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                      | 52. Paper     |
| 53. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                     | 53. Cardboard |
| 54. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                   | 54. Glass     |
| 55. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                  | 55. Metal     |
| 56. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                                 | 56. Wood      |
| 57. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                               | 57. Plastic   |
| 58. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                              | 58. Rubber    |
| 59. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                             | 59. Leather   |
| 60. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                           | 60. Fabric    |
| 61. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                          | 61. Paper     |
| 62. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                         | 62. Cardboard |
| 63. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                       | 63. Glass     |
| 64. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                      | 64. Metal     |
| 65. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                     | 65. Wood      |
| 66. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                   | 66. Plastic   |
| 67. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                  | 67. Rubber    |
| 68. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                                 | 68. Leather   |
| 69. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                               | 69. Fabric    |
| 70. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                              | 70. Paper     |
| 71. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                             | 71. Cardboard |
| 72. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                           | 72. Glass     |
| 73. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                          | 73. Metal     |
| 74. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                         | 74. Wood      |
| 75. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                       | 75. Plastic   |
| 76. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                      | 76. Rubber    |
| 77. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                     | 77. Leather   |
| 78. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                   | 78. Fabric    |
| 79. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                  | 79. Paper     |
| 80. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                                 | 80. Cardboard |
| 81. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                               | 81. Glass     |
| 82. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                              | 82. Metal     |
| 83. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                             | 83. Wood      |
| 84. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                           | 84. Plastic   |
| 85. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                      | 85. Rubber    |
| 86. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                     | 86. Leather   |
| 87. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                       | 87. Fabric    |
| 88. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                  | 88. Paper     |
| 89. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                 | 89. Cardboard |
| 90. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line                   | 90. Glass     |
| 91. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line              | 91. Metal     |
| 92. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line             | 92. Wood      |
| 93. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line               | 93. Plastic   |
| 94. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line          | 94. Rubber    |
| 95. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line         | 95. Leather   |
| 96. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line           | 96. Fabric    |
| 97. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line      | 97. Paper     |
| 98. Short dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line     | 98. Cardboard |
| 99. Dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line       | 99. Glass     |
| 100. Long dash-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot-dot line | 100. Metal    |

| LEGEND - SEWERS       |
|-----------------------|
| 1. Sewer line         |
| 2. Manhole            |
| 3. Catchment          |
| 4. Inlet              |
| 5. Outlet             |
| 6. Valve              |
| 7. Check valve        |
| 8. Air valve          |
| 9. Cleanout           |
| 10. Manhole cover     |
| 11. Catchment cover   |
| 12. Inlet cover       |
| 13. Outlet cover      |
| 14. Valve cover       |
| 15. Check valve cover |
| 16. Air valve cover   |
| 17. Cleanout cover    |
| 18. Manhole cover     |
| 19. Catchment cover   |
| 20. Inlet cover       |
| 21. Outlet cover      |
| 22. Valve cover       |
| 23. Check valve cover |
| 24. Air valve cover   |
| 25. Cleanout cover    |
| 26. Manhole cover     |
| 27. Catchment cover   |
| 28. Inlet cover       |
| 29. Outlet cover      |
| 30. Valve cover       |
| 31. Check valve cover |
| 32. Air valve cover   |
| 33. Cleanout cover    |
| 34. Manhole cover     |
| 35. Catchment cover   |
| 36. Inlet cover       |
| 37. Outlet cover      |
| 38. Valve cover       |
| 39. Check valve cover |
| 40. Air valve cover   |
| 41. Cleanout cover    |
| 42. Manhole cover     |
| 43. Catchment cover   |
| 44. Inlet cover       |
| 45. Outlet cover      |
| 46. Valve cover       |
| 47. Check valve cover |
| 48. Air valve cover   |
| 49. Cleanout cover    |
| 50. Manhole cover     |
| 51. Catchment cover   |
| 52. Inlet cover       |
| 53. Outlet cover      |
| 54. Valve cover       |
| 55. Check valve cover |
| 56. Air valve cover   |
| 57. Cleanout cover    |
| 58. Manhole cover     |
| 59. Catchment cover   |
| 60. Inlet cover       |
| 61. Outlet cover      |
| 62. Valve cover       |
| 63. Check valve cover |
| 64. Air valve cover   |
| 65. Cleanout cover    |
| 66. Manhole cover     |
| 67. Catchment cover   |
| 68. Inlet cover       |
| 69. Outlet cover      |
| 70. Valve cover       |
| 71. Check valve cover |
| 72. Air valve cover   |
| 73. Cleanout cover    |
| 74. Manhole cover     |
| 75. Catchment cover   |
| 76. Inlet cover       |
| 77. Outlet cover      |
| 78. Valve cover       |
| 79. Check valve cover |
| 80. Air valve cover   |
| 81. Cleanout cover    |
| 82. Manhole cover     |
| 83. Catchment cover   |
| 84. Inlet cover       |
| 85. Outlet cover      |
| 86. Valve cover       |
| 87. Check valve cover |
| 88. Air valve cover   |
| 89. Cleanout cover    |
| 90. Manhole cover     |
| 91. Catchment cover   |
| 92. Inlet cover       |
| 93. Outlet cover      |
| 94. Valve cover       |
| 95. Check valve cover |
| 96. Air valve cover   |
| 97. Cleanout cover    |
| 98. Manhole cover     |
| 99. Catchment cover   |
| 100. Inlet cover      |

| SHAPES (S)                                                            |
|-----------------------------------------------------------------------|
| 1. Circle                                                             |
| 2. Square                                                             |
| 3. Rectangle                                                          |
| 4. Triangle                                                           |
| 5. Diamond                                                            |
| 6. Star                                                               |
| 7. Cross                                                              |
| 8. Circle with cross                                                  |
| 9. Square with cross                                                  |
| 10. Rectangle with cross                                              |
| 11. Triangle with cross                                               |
| 12. Diamond with cross                                                |
| 13. Star with cross                                                   |
| 14. Cross with cross                                                  |
| 15. Circle with cross and dot                                         |
| 16. Square with cross and dot                                         |
| 17. Rectangle with cross and dot                                      |
| 18. Triangle with cross and dot                                       |
| 19. Diamond with cross and dot                                        |
| 20. Star with cross and dot                                           |
| 21. Cross with cross and dot                                          |
| 22. Circle with cross and dot and dot                                 |
| 23. Square with cross and dot and dot                                 |
| 24. Rectangle with cross and dot and dot                              |
| 25. Triangle with cross and dot and dot                               |
| 26. Diamond with cross and dot and dot                                |
| 27. Star with cross and dot and dot                                   |
| 28. Cross with cross and dot and dot                                  |
| 29. Circle with cross and dot and dot and dot                         |
| 30. Square with cross and dot and dot and dot                         |
| 31. Rectangle with cross and dot and dot and dot                      |
| 32. Triangle with cross and dot and dot and dot                       |
| 33. Diamond with cross and dot and dot and dot                        |
| 34. Star with cross and dot and dot and dot                           |
| 35. Cross with cross and dot and dot and dot                          |
| 36. Circle with cross and dot and dot and dot and dot                 |
| 37. Square with cross and dot and dot and dot and dot                 |
| 38. Rectangle with cross and dot and dot and dot and dot              |
| 39. Triangle with cross and dot and dot and dot and dot               |
| 40. Diamond with cross and dot and dot and dot and dot                |
| 41. Star with cross and dot and dot and dot and dot                   |
| 42. Cross with cross and dot and dot and dot and dot                  |
| 43. Circle with cross and dot and dot and dot and dot and dot         |
| 44. Square with cross and dot and dot and dot and dot and dot         |
| 45. Rectangle with cross and dot and dot and dot and dot and dot      |
| 46. Triangle with cross and dot and dot and dot and dot and dot       |
| 47. Diamond with cross and dot and dot and dot and dot and dot        |
| 48. Star with cross and dot and dot and dot and dot and dot           |
| 49. Cross with cross and dot and dot and dot and dot and dot          |
| 50. Circle with cross and dot and dot and dot and dot and dot and dot |

| MODE REFERENCE SYSTEM |
|-----------------------|
| 1. Mode 1             |
| 2. Mode 2             |
| 3. Mode 3             |
| 4. Mode 4             |
| 5. Mode 5             |
| 6. Mode 6             |
| 7. Mode 7             |
| 8. Mode 8             |
| 9. Mode 9             |
| 10. Mode 10           |
| 11. Mode 11           |
| 12. Mode 12           |
| 13. Mode 13           |
| 14. Mode 14           |
| 15. Mode 15           |
| 16. Mode 16           |
| 17. Mode 17           |
| 18. Mode 18           |
| 19. Mode 19           |
| 20. Mode 20           |
| 21. Mode 21           |
| 22. Mode 22           |
| 23. Mode 23           |
| 24. Mode 24           |
| 25. Mode 25           |
| 26. Mode 26           |
| 27. Mode 27           |
| 28. Mode 28           |
| 29. Mode 29           |
| 30. Mode 30           |
| 31. Mode 31           |
| 32. Mode 32           |
| 33. Mode 33           |
| 34. Mode 34           |
| 35. Mode 35           |
| 36. Mode 36           |
| 37. Mode 37           |
| 38. Mode 38           |
| 39. Mode 39           |
| 40. Mode 40           |
| 41. Mode 41           |
| 42. Mode 42           |

## Appendix 4

### Existing Pipe Capacity Calculations

/IX<sub>8</sub>г↑IXX<sup>o</sup> D<sub>8</sub>т 9←L<sub>1</sub>IX<sub>12</sub>III<sub>5</sub> L<sub>1</sub>д<sub>1</sub>≈ т<sub>1</sub>г L<sub>1</sub>д<sub>1</sub>р<sub>1</sub>CIX<sub>1</sub> I<sub>1</sub> X<sub>1</sub>  
 ыX<sub>1</sub>/ L<sub>1</sub>д<sub>1</sub>X<sub>1</sub>↑ t<sub>1</sub> X<sub>1</sub>↓ X<sub>1</sub>т<sub>1</sub>↑ t<sub>1</sub> L<sub>1</sub>↑ C<sub>1</sub>X<sub>1</sub>/ IX<sub>1</sub>т<sub>1</sub>IX<sub>1</sub>  
 ↓ t<sub>1</sub>↑ t<sub>1</sub>р<sub>1</sub>X<sub>1</sub> IX<sub>1</sub> о<sub>1</sub>L<sub>1</sub>т<sub>1</sub>↑ t<sub>1</sub>≈ т<sub>1</sub>р<sub>1</sub>д<sub>1</sub>≈ L<sub>1</sub>т<sub>1</sub>↓ t<sub>1</sub>р<sub>1</sub>д<sub>1</sub>

$$V = -\sqrt{(32gRS)} \log \frac{\check{\check{u}}_s}{\check{\check{u}}_{14.8R}} + \frac{1.255v''}{R\sqrt{32gRS}} \frac{A}{B}$$

 $\circ D_{\beta} \uparrow \tau$ 

53 I  $\updownarrow$ <sup>w</sup>

3 50

349 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 1230 1235 1240 1245 1250 1255 1260 1265 1270 1275 1280 1285 1290 1295 1300 1305 1310 1315 1320 1325 1330 1335 1340 1345 1350 1355 1360 1365 1370 1375 1380 1385 1390 1395 1400 1405 1410 1415 1420 1425 1430 1435 1440 1445 1450 1455 1460 1465 1470 1475 1480 1485 1490 1495 1500 1505 1510 1515 1520 1525 1530 1535 1540 1545 1550 1555 1560 1565 1570 1575 1580 1585 1590 1595 1600 1605 1610 1615 1620 1625 1630 1635 1640 1645 1650 1655 1660 1665 1670 1675 1680 1685 1690 1695 1700 1705 1710 1715 1720 1725 1730 1735 1740 1745 1750 1755 1760 1765 1770 1775 1780 1785 1790 1795 1800 1805 1810 1815 1820 1825 1830 1835 1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050 2055 2060 2065 2070 2075 2080 2085 2090 2095 2100 2105 2110 2115 2120 2125 2130 2135 2140 2145 2150 2155 2160 2165 2170 2175 2180 2185 2190 2195 2200 2205 2210 2215 2220 2225 2230 2235 2240 2245 2250 2255 2260 2265 2270 2275 2280 2285 2290 2295 2300 2305 2310 2315 2320 2325 2330 2335 2340 2345 2350 2355 2360 2365 2370 2375 2380 2385 2390 2395 2400 2405 2410 2415 2420 2425 2430 2435 2440 2445 2450 2455 2460 2465 2470 2475 2480 2485 2490 2495 2500 2505 2510 2515 2520 2525 2530 2535 2540 2545 2550 2555 2560 2565 2570 2575 2580 2585 2590 2595 2600 2605 2610 2615 2620 2625 2630 2635 2640 2645 2650 2655 2660 2665 2670 2675 2680 2685 2690 2695 2700 2705 2710 2715 2720 2725 2730 2735 2740 2745 2750 2755 2760 2765 2770 2775 2780 2785 2790 2795 2800 2805 2810 2815 2820 2825 2830 2835 2840 2845 2850 2855 2860 2865 2870 2875 2880 2885 2890 2895 2900 2905 2910 2915 2920 2925 2930 2935 2940 2945 2950 2955 2960 2965 2970 2975 2980 2985 2990 2995 3000 3005 3010 3015 3020 3025 3030 3035 3040 3045 3050 3055 3060 3065 3070 3075 3080 3085 3090 3095 3100 3105 3110 3115 3120 3125 3130 3135 3140 3145 3150 3155 3160 3165 3170 3175 3180 3185 3190 3195 3200 3205 3210 3215 3220 3225 3230 3235 3240 3245 3250 3255 3260 3265 3270 3275 3280 3285 3290 3295 3300 3305 3310 3315 3320 3325 3330 3335 3340 3345 3350 3355 3360 3365 3370 3375 3380 3385 3390 3395 3400 3405 3410 3415 3420 3425 3430 3435 3440 3445 3450 3455 3460 3465 3470 3475 3480 3485 3490 3495 3500 3505 3510 3515 3520 3525 3530 3535 3540 3545 3550 3555 3560 3565 3570 3575 3580 3585 3590 3595 3600 3605 3610 3615 3620 3625 3630 3635 3640 3645 3650 3655 3660 3665 3670 3675 3680 3685 3690 3695 3700 3705 3710 3715 3720 3725 3730 3735 3740 3745 3750 3755 3760 3765 3770 3775 3780 3785 3790 3795 3800 3805 3810 3815 3820 3825 3830 3835 3840 3845 3850 3855 3860 3865 3870 3875 3880 3885 3890 3895 3900 3905 3910 3915 3920 3925 3930 3935 3940 3945 3950 3955 3960 3965 3970 3975 3980 3985 3990 3995 4000 4005 4010 4015 4020 4025 4030 4035 4040 4045 4050 4055 4060 4065 4070 4075 4080 4085 4090 4095 4100 4105 4110 4115 4120 4125 4130 4135 4140 4145 4150 4155 4160 4165 4170 4175 4180 4185 4190 4195 4200 4205 4210 4215 4220 4225 4230 4235 4240 4245 4250 4255 4260 4265 4270 4275 4280 4285 4290 4295 4300 4305 4310

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## Appendix 5

### BGS Borehole Records





**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 434407 : BGS Reference: SU90SE29

British National Grid (27700) : 497380,103350

Report an issue with this borehole

<<

< Prev

Page 1 of 1

Next >

>>

**SU 90 SE 29**

**9738 8335**

**North-east end of Drove Lane, Yapton**

Surface level +6.6 m

Water struck at +1.9 m

October 1981

**Block H**

Overburden 2.9 m

Mineral 1.0 m

Bedrock 2.3 m+

## LOG

Geological classification

Lithology

Thickness Depth

m

m

|                                 | Soil                                                                           | 0.5  | 0.5 |
|---------------------------------|--------------------------------------------------------------------------------|------|-----|
| Brickearth                      | Clay, brown, silty                                                             | 1.4  | 1.9 |
| Raised Beach Deposits (younger) | Silt, chalky, with chalk pebbles                                               | 1.0  | 2.9 |
|                                 | 'Very clayey' sandy gravel                                                     | 1.0  | 3.9 |
|                                 | Gravel: coarse with flint dominant, and fine with chalk dominant; some cobbles |      |     |
|                                 | Sand: fine with some medium and coarse; coarse mostly chalk                    |      |     |
|                                 | Fines: silt and clay, chalky                                                   |      |     |
| Upper Chalk                     | Chalk, rubbly, soft, silty and sandy to 6.0 m                                  | 2.3+ | 6.2 |

## GRADING

Mean for deposit percentages

Depth below surface (m)

Percentages

Fines Sand Gravel

Fines

Sand

Gravel

Gravel

0-4

4-16

16-64

64 mm

35

38

27

2.9-3.9

35

28

4

6

10

14

3

96



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 434410 : BGS Reference: SU90SE32  
British National Grid (27700) : 498220,104300  
[Report an issue with this borehole](#)

<<

< Prev

Page 1 of 1

Next >

>>

**SU 90 SE 32**

**9822 0430**

**North End, Yapton**

Surface level +6.0 m  
Water not stuck  
August 1981

**Block H**

**Waste 3.3 m**  
**Bedrock 1.2 m+**

**LOG**

| Geological classification       | Lithology                                                                                                        | Thickness<br>m | Depth<br>m |
|---------------------------------|------------------------------------------------------------------------------------------------------------------|----------------|------------|
|                                 | Soil                                                                                                             | 0.3            | 0.3        |
| Brickearth                      | Clay, brown, silty, with a few subangular flint pebbles. Very sandy near base                                    | 2.7            | 3.0        |
| Raised Beach Deposits (younger) | Sand, mid to dark brown; fine to coarse; quartz with flint; silty and with angular to well rounded flint pebbles | 0.3            | 3.3        |
| Upper Chalk                     | Chalk, soft, rubbly                                                                                              | 1.2+           | 4.5        |



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

BGS ID: 434411 : BGS Reference: SU90SE33  
British National Grid (27700) : 498270,103490  
[Report an issue with this borehole](#)

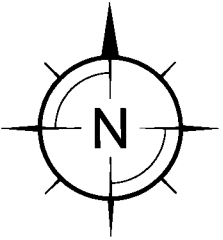
<< < Prev Page 1 of 1 Next > >>

|                       |  |               |         |        |
|-----------------------|--|---------------|---------|--------|
| SU 90 SE 33 9827 0349 |  | Yapton Church | Block   | H      |
| Surface level +6.4 m  |  |               | Waste   | 1.4 m  |
| Water not struck      |  |               | Bedrock | 1.6 m+ |
| September 1981        |  |               |         |        |

| LOG                       |                                                                          |  | Thickness | Depth |
|---------------------------|--------------------------------------------------------------------------|--|-----------|-------|
| Geological classification | Lithology                                                                |  | m         | m     |
|                           | Soil and made ground                                                     |  | 0.3       | 0.3   |
| Brickearth                | Clay, very sandy, mottled brown and grey-brown; some small flint pebbles |  | 1.1       | 1.4   |
| Upper Chalk               | Chalk, soft, weathered, pale yellowish brown; nodular flints             |  | 1.6+      | 3.0   |

## Appendix 6

### Proposed Site Layout Plan



**Proposed Site Layout Plan**

SCALE 1:500 @ A3

PROJECT No. 23192

REPORT TYPE DS

DRG. No. 4

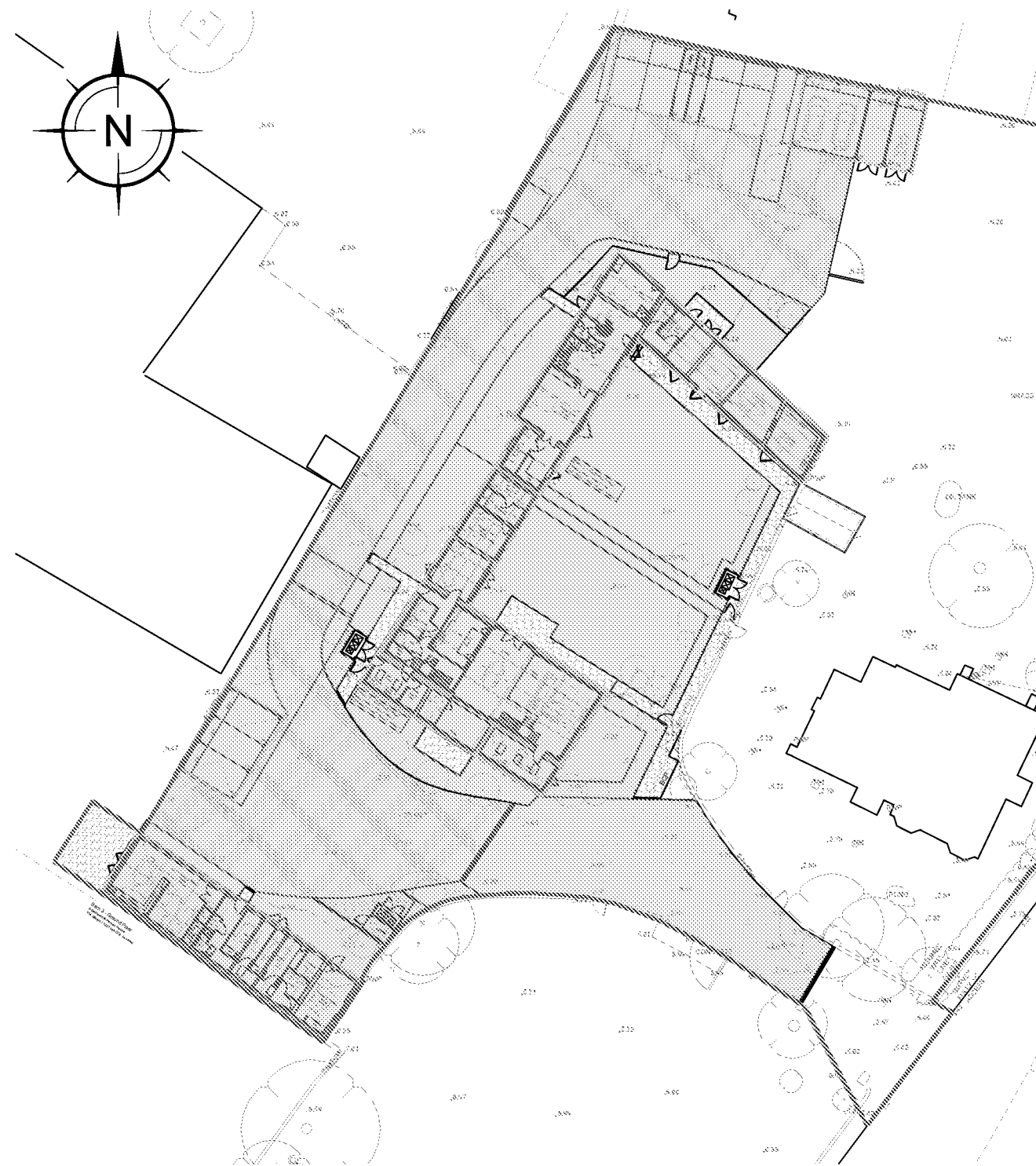
## Appendix 7

### Existing and Proposed Drainage Area Plan



**EXISTING SITE PLAN**  
(Scale 1:500)

| Key |                                                |
|-----|------------------------------------------------|
|     | Roofs 713m <sup>2</sup>                        |
|     | Existing Impermeable paving 1264m <sup>2</sup> |



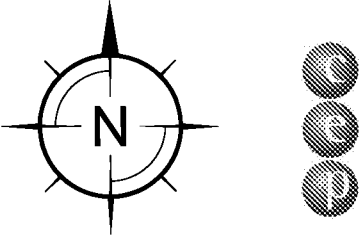
**PROPOSED SITE PLAN**  
(Scale 1:500)

| Key |                                                        |
|-----|--------------------------------------------------------|
|     | Roofs 770m <sup>2</sup>                                |
|     | Proposed permeable paving 1021m <sup>2</sup>           |
|     | Proposed permeable landscaping areas 865m <sup>2</sup> |

|                                     |                      |
|-------------------------------------|----------------------|
| TITLE<br><b>Drainage Areas Plan</b> |                      |
| SCALE<br>1:500 @ A3                 | PROJECT No.<br>23192 |
| REPORT TYPE<br>DS                   | DRG. No.<br>6        |

Appendix 8

Preliminary Drainage Strategy Plan  
and Calculations



Legend:

Private Type 3 / 4 Foul Water Inspection Chamber  
To discharge via existing connection

Existing Southern Water Sewer

1021m² Permeable surface Voided subbase  
Approx 420mm thick to accommodate  
stormwater from roofs and hard paved areas.  
Based on an assumed infiltration rate of 2x10<sup>-6</sup>m/s

Proposed roof area of 770m²

Assumed existing combined connection  
to public foul sewer in North End Road.  
To be confirmed by drainage survey  
prior to detailed design

|                                             |  |                      |  |
|---------------------------------------------|--|----------------------|--|
| TITLE<br>Preliminary Drainage Strategy Plan |  |                      |  |
| SCALE<br>1:500 @ A3                         |  | PROJECT No.<br>23192 |  |
| REPORT TYPE<br>DS                           |  | DRG. No.<br>5        |  |

| The Civil Engineering Practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| 11 Tungsten Building<br>George Street<br>Fishersgate BN41 1RA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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        |  |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |  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| Date 07/11/2019<br>File 1 IN 100 PLUS 40.SRCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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 |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| <p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 1061 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (mE)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>5.588</td><td>0.138</td><td>1.0</td><td>41.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>5.635</td><td>0.185</td><td>1.0</td><td>55.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>5.685</td><td>0.235</td><td>1.0</td><td>70.0</td><td>O K</td></tr><tr><td>120 min Summer</td><td>5.735</td><td>0.285</td><td>1.0</td><td>85.0</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>5.762</td><td>0.312</td><td>1.0</td><td>92.8</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>5.777</td><td>0.327</td><td>1.0</td><td>97.5</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>5.796</td><td>0.346</td><td>1.0</td><td>103.1</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>5.806</td><td>0.356</td><td>1.0</td><td>105.9</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>5.810</td><td>0.360</td><td>1.0</td><td>107.2</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>5.811</td><td>0.361</td><td>1.0</td><td>107.3</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>5.806</td><td>0.356</td><td>1.0</td><td>106.1</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>5.795</td><td>0.345</td><td>1.0</td><td>102.6</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>5.774</td><td>0.324</td><td>1.0</td><td>96.5</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>5.753</td><td>0.303</td><td>1.0</td><td>90.1</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>5.710</td><td>0.260</td><td>1.0</td><td>77.5</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>5.671</td><td>0.221</td><td>1.0</td><td>65.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>5.636</td><td>0.186</td><td>1.0</td><td>55.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>5.605</td><td>0.155</td><td>1.0</td><td>46.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>5.578</td><td>0.128</td><td>1.0</td><td>38.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>5.605</td><td>0.155</td><td>1.0</td><td>46.1</td><td>O K</td></tr></tbody></table><br><table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (mE)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>124.343</td><td>0.0</td><td>22</td></tr><tr><td>30 min Summer</td><td>83.917</td><td>0.0</td><td>37</td></tr><tr><td>60 min Summer</td><td>54.074</td><td>0.0</td><td>66</td></tr><tr><td>120 min Summer</td><td>33.635</td><td>0.0</td><td>126</td></tr><tr><td>180 min Summer</td><td>25.091</td><td>0.0</td><td>186</td></tr><tr><td>240 min Summer</td><td>20.228</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>14.907</td><td>0.0</td><td>364</td></tr><tr><td>480 min Summer</td><td>11.995</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>10.125</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.810</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>7.068</td><td>0.0</td><td>858</td></tr><tr><td>1440 min Summer</td><td>5.171</td><td>0.0</td><td>1102</td></tr><tr><td>2160 min Summer</td><td>3.774</td><td>0.0</td><td>1496</td></tr><tr><td>2880 min Summer</td><td>3.015</td><td>0.0</td><td>1904</td></tr><tr><td>4320 min Summer</td><td>2.192</td><td>0.0</td><td>2724</td></tr><tr><td>5760 min Summer</td><td>1.746</td><td>0.0</td><td>3512</td></tr><tr><td>7200 min Summer</td><td>1.464</td><td>0.0</td><td>4248</td></tr><tr><td>8640 min Summer</td><td>1.268</td><td>0.0</td><td>4936</td></tr><tr><td>10080 min Summer</td><td>1.124</td><td>0.0</td><td>5648</td></tr><tr><td>15 min Winter</td><td>124.343</td><td>0.0</td><td>22</td></tr></tbody></table> |               |                                                      |                        |                 |                                                                                     | Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Volume (mE) | Status | 15 min Summer | 5.588 | 0.138 | 1.0 | 41.1 | O K | 30 min Summer | 5.635 | 0.185 | 1.0 | 55.1 | O K | 60 min Summer | 5.685 | 0.235 | 1.0 | 70.0 | O K | 120 min Summer | 5.735 | 0.285 | 1.0 | 85.0 | Flood Risk | 180 min Summer | 5.762 | 0.312 | 1.0 | 92.8 | Flood Risk | 240 min Summer | 5.777 | 0.327 | 1.0 | 97.5 | Flood Risk | 360 min Summer | 5.796 | 0.346 | 1.0 | 103.1 | Flood Risk | 480 min Summer | 5.806 | 0.356 | 1.0 | 105.9 | Flood Risk | 600 min Summer | 5.810 | 0.360 | 1.0 | 107.2 | Flood Risk | 720 min Summer | 5.811 | 0.361 | 1.0 | 107.3 | Flood Risk | 960 min Summer | 5.806 | 0.356 | 1.0 | 106.1 | Flood Risk | 1440 min Summer | 5.795 | 0.345 | 1.0 | 102.6 | Flood Risk | 2160 min Summer | 5.774 | 0.324 | 1.0 | 96.5 | Flood Risk | 2880 min Summer | 5.753 | 0.303 | 1.0 | 90.1 | Flood Risk | 4320 min Summer | 5.710 | 0.260 | 1.0 | 77.5 | Flood Risk | 5760 min Summer | 5.671 | 0.221 | 1.0 | 65.8 | O K | 7200 min Summer | 5.636 | 0.186 | 1.0 | 55.4 | O K | 8640 min Summer | 5.605 | 0.155 | 1.0 | 46.1 | O K | 10080 min Summer | 5.578 | 0.128 | 1.0 | 38.2 | O K | 15 min Winter | 5.605 | 0.155 | 1.0 | 46.1 | O K | Storm Event | Rain (mm/hr) | Flooded Volume (mE) | Time-Peak (mins) | 15 min Summer | 124.343 | 0.0 | 22 | 30 min Summer | 83.917 | 0.0 | 37 | 60 min Summer | 54.074 | 0.0 | 66 | 120 min Summer | 33.635 | 0.0 | 126 | 180 min Summer | 25.091 | 0.0 | 186 | 240 min Summer | 20.228 | 0.0 | 244 | 360 min Summer | 14.907 | 0.0 | 364 | 480 min Summer | 11.995 | 0.0 | 482 | 600 min Summer | 10.125 | 0.0 | 602 | 720 min Summer | 8.810 | 0.0 | 720 | 960 min Summer | 7.068 | 0.0 | 858 | 1440 min Summer | 5.171 | 0.0 | 1102 | 2160 min Summer | 3.774 | 0.0 | 1496 | 2880 min Summer | 3.015 | 0.0 | 1904 | 4320 min Summer | 2.192 | 0.0 | 2724 | 5760 min Summer | 1.746 | 0.0 | 3512 | 7200 min Summer | 1.464 | 0.0 | 4248 | 8640 min Summer | 1.268 | 0.0 | 4936 | 10080 min Summer | 1.124 | 0.0 | 5648 | 15 min Winter | 124.343 | 0.0 | 22 |
| Storm Event                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Max Level (m) | Max Depth (m)                                        | Max Infiltration (l/s) | Max Volume (mE) | Status                                                                              |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 15 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.588         | 0.138                                                | 1.0                    | 41.1            | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 30 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.635         | 0.185                                                | 1.0                    | 55.1            | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 60 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.685         | 0.235                                                | 1.0                    | 70.0            | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 120 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 180 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 240 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 360 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5.796         | 0.346                                                | 1.0                    | 103.1           | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 480 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 600 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5.810         | 0.360                                                | 1.0                    | 107.2           | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 720 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 960 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 1440 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5.795         | 0.345                                                | 1.0                    | 102.6           | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 2160 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5.774         | 0.324                                                | 1.0                    | 96.5            | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 2880 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 4320 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        | Flood Risk                                                                          |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 5760 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 7200 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 8640 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 10080 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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        | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 15 min Winter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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        | O K                                                                                 |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| Storm Event                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 15 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 30 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 60 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 120 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 180 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 240 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 360 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |          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 |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 480 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 600 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| 720 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |     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| 960 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |          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 |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 1440 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 2160 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 2880 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 4320 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 5760 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 7200 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 8640 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1.268         | 0.0                                                  | 4936                   |                 |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 10080 min Summer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1.124         | 0.0                                                  | 5648                   |                 |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| 15 min Winter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 124.343       | 0.0                                                  | 22                     |                 |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |
| ø1982- 2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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        |                                                                                     |             |               |               |                        |                 |        |               |       |       |     |      |     |               |       |       |     |      |     |               |       |       |     |      |     |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |      |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                |       |       |     |       |            |                 |       |       |     |       |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |            |                 |       |       |     |      |     |                 |       |       |     |      |     |                 |       |       |     |      |     |                  |       |       |     |      |     |               |       |       |     |      |     |             |              |                     |                  |               |         |     |    |               |        |     |    |               |        |     |    |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |        |     |     |                |       |     |     |                |       |     |     |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                 |       |     |      |                  |       |     |      |               |         |     |    |

|                                                               |               |                                                      |                        |                 |                                                                                     |
|---------------------------------------------------------------|---------------|------------------------------------------------------|------------------------|-----------------|-------------------------------------------------------------------------------------|
| The Civil Engineering Practice                                |               |                                                      |                        |                 | Page 2                                                                              |
| 11 Tungsten Building<br>George Street<br>Fishersgate BN41 1RA |               | Stakers Farm Barns<br>Yapton<br>Storage Calculations |                        |                 |  |
| Date 07/11/2019<br>File 1 IN 100 PLUS 40.SRCX                 |               | Designed by MK<br>Checked by                         |                        |                 |                                                                                     |
| Innovyze                                                      |               | Source Control 2019.1                                |                        |                 |                                                                                     |
| <u>Summary of Results for 100 year Return Period (+40%)</u>   |               |                                                      |                        |                 |                                                                                     |
| Storm Event                                                   | Max Level (m) | Max Depth (m)                                        | Max Infiltration (l/s) | Max Volume (mE) | Status                                                                              |
| 30 min Winter                                                 | 5.658         | 0.208                                                |                        | 61.9            | O K                                                                                 |
| 60 min Winter                                                 | 5.715         | 0.265                                                | 1.0                    | 78.8            | Flood Risk                                                                          |
| 120 min Winter                                                | 5.772         | 0.322                                                | 1.0                    | 95.8            | Flood Risk                                                                          |
| 180 min Winter                                                | 5.803         | 0.353                                                | 1.0                    | 105.0           | Flood Risk                                                                          |
| 240 min Winter                                                | 5.821         | 0.371                                                | 1.0                    | 110.6           | Flood Risk                                                                          |
| 360 min Winter                                                | 5.845         | 0.395                                                | 1.0                    | 117.5           | Flood Risk                                                                          |
| 480 min Winter                                                | 5.858         | 0.408                                                | 1.0                    | 121.5           | Flood Risk                                                                          |
| 600 min Winter                                                | 5.865         | 0.415                                                | 1.0                    | 123.6           | Flood Risk                                                                          |
| 720 min Winter                                                | 5.868         | 0.418                                                | 1.0                    | 124.5           | Flood Risk                                                                          |
| 960 min Winter                                                | 5.867         | 0.417                                                | 1.0                    | 124.1           | Flood Risk                                                                          |
| 1440 min Winter                                               | 5.850         | 0.400                                                | 1.0                    | 119.1           | Flood Risk                                                                          |
| 2160 min Winter                                               | 5.822         | 0.372                                                | 1.0                    | 110.8           | Flood Risk                                                                          |
| 2880 min Winter                                               | 5.791         | 0.341                                                | 1.0                    | 101.4           | Flood Risk                                                                          |
| 4320 min Winter                                               | 5.726         | 0.276                                                | 1.0                    | 82.2            | Flood Risk                                                                          |
| 5760 min Winter                                               | 5.666         | 0.216                                                | 1.0                    | 64.2            | O K                                                                                 |
| 7200 min Winter                                               | 5.613         | 0.163                                                | 1.0                    | 48.4            | O K                                                                                 |
| 8640 min Winter                                               | 5.568         | 0.118                                                | 1.0                    | 35.2            | O K                                                                                 |
| 10080 min Winter                                              | 5.533         | 0.083                                                | 1.0                    | 24.7            | O K                                                                                 |
| Storm Event                                                   | Rain (mm/hr)  | Flooded Volume (mE)                                  | Time-Peak (mins)       |                 |                                                                                     |
| 30 min Winter                                                 | 83.917        | 0.0                                                  | 37                     |                 |                                                                                     |
| 60 min Winter                                                 | 54.074        | 0.0                                                  | 66                     |                 |                                                                                     |
| 120 min Winter                                                | 33.635        | 0.0                                                  | 124                    |                 |                                                                                     |
| 180 min Winter                                                | 25.091        | 0.0                                                  | 182                    |                 |                                                                                     |
| 240 min Winter                                                | 20.228        | 0.0                                                  | 240                    |                 |                                                                                     |
| 360 min Winter                                                | 14.907        | 0.0                                                  | 358                    |                 |                                                                                     |
| 480 min Winter                                                | 11.995        | 0.0                                                  | 472                    |                 |                                                                                     |
| 600 min Winter                                                | 10.125        | 0.0                                                  | 586                    |                 |                                                                                     |
| 720 min Winter                                                | 8.810         | 0.0                                                  | 700                    |                 |                                                                                     |
| 960 min Winter                                                | 7.068         | 0.0                                                  | 918                    |                 |                                                                                     |
| 1440 min Winter                                               | 5.171         | 0.0                                                  | 1184                   |                 |                                                                                     |
| 2160 min Winter                                               | 3.774         | 0.0                                                  | 1624                   |                 |                                                                                     |
| 2880 min Winter                                               | 3.015         | 0.0                                                  | 2076                   |                 |                                                                                     |
| 4320 min Winter                                               | 2.192         | 0.0                                                  | 2940                   |                 |                                                                                     |
| 5760 min Winter                                               | 1.746         | 0.0                                                  | 3744                   |                 |                                                                                     |
| 7200 min Winter                                               | 1.464         | 0.0                                                  | 4472                   |                 |                                                                                     |
| 8640 min Winter                                               | 1.268         | 0.0                                                  | 5184                   |                 |                                                                                     |
| 10080 min Winter                                              | 1.124         | 0.0                                                  | 5752                   |                 |                                                                                     |
| ø1982- 2019 Innovyze                                          |               |                                                      |                        |                 |                                                                                     |

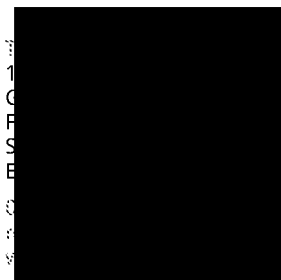
| The Civil Engineering Practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      | Page 3                                                                              |                |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|----------------|-----|---------------|-----|-----------------------|-----|-------------|-------|--------|-------------------|-------------|-------|------------|--------|-----------------------|----|---------|-------|----------------------|-------|---------------|-----|------------------|-----|-------------|-----------|-------------|-----------|------|-----|------|-----|---|---|-------|---|---|-------|
| 11 Tungsten Building<br>George Street<br>Fishersgate BN41 1RA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Stakers Farm Barns<br>Yapton<br>Storage Calculations |  |                |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Date 07/11/2019<br>File 1 IN 100 PLUS 40.SRCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Designed by MK<br>Checked by                         |                                                                                     |                |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      | Source Control 2019.1                                                               |                |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| <p style="text-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>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.100</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.342</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 style="text-align: center;"><u>Time Area Diagram</u></p> <p style="text-align: center;">Total Area (ha) 0.180</p> <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From</th> <th>To:</th> <th>From</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>0.090</td> <td>4</td> <td>8</td> <td>0.090</td> </tr> </tbody> </table> |                                                      |                                                                                     | Rainfall Model | FSR | Winter Storms | Yes | Return Period (years) | 100 | Cv (Summer) | 0.750 | Region | England and Wales | Cv (Winter) | 0.840 | M5-60 (mm) | 19.100 | Shortest Storm (mins) | 15 | Ratio R | 0.342 | Longest Storm (mins) | 10080 | Summer Storms | Yes | Climate Change % | +40 | Time (mins) | Area (ha) | Time (mins) | Area (ha) | From | To: | From | To: | 0 | 4 | 0.090 | 4 | 8 | 0.090 |
| Rainfall Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | FSR                                                  | Winter Storms                                                                       | Yes            |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Return Period (years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 100                                                  | Cv (Summer)                                                                         | 0.750          |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | England and Wales                                    | Cv (Winter)                                                                         | 0.840          |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| M5-60 (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.100                                               | Shortest Storm (mins)                                                               | 15             |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Ratio R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.342                                                | Longest Storm (mins)                                                                | 10080          |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Summer Storms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes                                                  | Climate Change %                                                                    | +40            |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| Time (mins)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Area (ha)                                            | Time (mins)                                                                         | Area (ha)      |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| From                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To:                                                  | From                                                                                | To:            |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 4                                                    | 0.090                                                                               | 4              | 8   | 0.090         |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |
| ø1982- 2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |                                                                                     |                |     |               |     |                       |     |             |       |        |                   |             |       |            |        |                       |    |         |       |                      |       |               |     |                  |     |             |           |             |           |      |     |      |     |   |   |       |   |   |       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                      |                                                                                     |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------|---------|--------------------|------|---------------|-----|------------|------|----------|------|------------|-----------------|------------------|-------|--|--|
| The Civil Engineering Practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                      | Page 4                                                                              |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| 11 Tungsten Building<br>George Street<br>Fishersgate BN41 1RA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Stakers Farm Barns<br>Yapton<br>Storage Calculations |  |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| Date 07/11/2019<br>File 1 IN 100 PLUS 40.SRCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Designed by MK<br>Checked by                         |                                                                                     |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                      | Source Control 2019.1                                                               |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| <p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 6.000</p> <p style="text-align: center;"><u>Infiltration Blanket Structure</u></p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00720</td> <td>Diameter/Width (m)</td> <td>31.5</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Length (m)</td> <td>31.5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Cap Volume</td> <td>Depth (m) 0.460</td> </tr> <tr> <td>Invert Level (m)</td> <td>5.450</td> <td></td> <td></td> </tr> </table> |                                                      |                                                                                     | Infiltration Coefficient Base (m/hr) | 0.00720 | Diameter/Width (m) | 31.5 | Safety Factor | 2.0 | Length (m) | 31.5 | Porosity | 0.30 | Cap Volume | Depth (m) 0.460 | Invert Level (m) | 5.450 |  |  |
| Infiltration Coefficient Base (m/hr)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.00720                                              | Diameter/Width (m)                                                                  | 31.5                                 |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| Safety Factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2.0                                                  | Length (m)                                                                          | 31.5                                 |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| Porosity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.30                                                 | Cap Volume                                                                          | Depth (m) 0.460                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| Invert Level (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5.450                                                |                                                                                     |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |
| ø1982- 2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |                                                                                     |                                      |         |                    |      |               |     |            |      |          |      |            |                 |                  |       |  |  |

## Appendix 9

### Drainage Maintenance Schedule

# Drainage Maintenance Schedule



|                |                    |
|----------------|--------------------|
| Project        | Stakers Farm Barns |
| Project Number | 23192              |

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Date 07 November 2019

## 1 Schedule of Maintenance

- 1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of water pollution from construction sites, provides further guidance on this.
- 1.2 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site.
- 1.3 Upon completion management of the shared drainage facilities (where not adopted) will be passed on to a Management Company appointed by the developer on behalf of the new residents.
- 1.4 In the event that the Management Company becomes unable to discharge its duties within two years of first appointment the developer will endeavour to appoint an alternative on behalf of the residents.
- 1.5 Maintenance of individual property drainage connections is the responsibility of the individual property owners.
- 1.6 The following maintenance schedule details the typical tasks to be undertaken at different intervals.

| Maintenance Schedule | Required Action                                                                       | Frequency                    |
|----------------------|---------------------------------------------------------------------------------------|------------------------------|
| Regular Maintenance  | Remove sediment and debris from silt trap chambers, channel drains and inlet chambers | 6 monthly                    |
|                      | Surface and foul water pipework - jetting / rodding                                   | Every 2 years or as required |
|                      | Manage other vegetation and remove nuisance plants - aesthetics                       | As required                  |
|                      | Visual inspection of permeable paving for defects and settlement                      | Annually                     |
|                      | Sweeping / brushing of permeable paving                                               | Every 2 years                |



| Maintenance Schedule   | Required Action                                                                             | Frequency   |
|------------------------|---------------------------------------------------------------------------------------------|-------------|
| Corrective Maintenance | Remove debris / blockages to silt traps / channel drains                                    | As required |
|                        | Repairs to access chambers / manhole covers                                                 | As required |
|                        | Replace any broken permeable blocks / surface, remedial works to any depressions or rutting | As required |
|                        | Inspect inlet, outlet from downpipe and gullies for blockages, standing water and clear     | As required |

#### Indicative Schedule of Maintenance for the Proposed Drainage System

## 2 Financing

- 2.1 The regular maintenance of all private drainage, channels, gutters, rainwater pipes and connections will be the responsibility of the individual homeowner.
- 2.2 The regular and corrective maintenance of all shared elements of the drainage system will be managed and funded through the Management Company on behalf of the Residents.

| Inspection / Action Required | Gullies, Channels and Gutters | Permeable Surface | Surface Water Pipework |
|------------------------------|-------------------------------|-------------------|------------------------|
| After leaf fall in Autumn    | V                             |                   |                        |
| 6 Months                     | V                             | V                 |                        |
| 1 Year                       |                               | V                 |                        |
| 2 Years                      |                               |                   | V                      |

#### Drainage System Maintenance Summary