

Land off Walmer Way, Coolinge Estate, Folkestone

Surface Water and Foul Drainage Strategy

EDAROTH and Southern Housing

February 2023



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This document has 22 pages including the cover.

Document history

Document title: Surface Water and Foul Drainage Strategy

Document reference: 5217038.601

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	For Planning	D Avagnano	N. Kirsopp	P Brayshaw	P. Brayshaw	23.11.22
1.1	Survey Detail Update		D Avagnano	N. Kirsopp	N. Kirsopp	17.02.23

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1. Overview

The purpose of this report is to inform the Surface Water and Foul Drainage aspects of the Planning Application for the development of eight houses and eight parking spaces within the town of Folkestone, Kent. This report presents the existing drainage conditions against the proposed drainage strategy for potential impacts on the surrounding environment.

The report is to be read in conjunction with the concept drainage design drawings which have been developed for the development site within Folkestone – see Drawing Nos. FOLK-ATK-XX-XX-PH-72-1001 to FOLK-ATK-XX-XX-PH-72-1003.

Guidance documents considered in the preparation of this drainage strategy include:

- Drainage and Planning Policy – a Local Flood Risk Management Strategy Document (December 2019, Kent County Council)
- The Kent Design Guide – making it happen – sustainability (drainage systems) (Kent County Council)
- Kent Local Flood Risk Management Strategy 2017 – 2023 (Kent County Council)
- Standing Advice Minor Development (March 2018, Kent County Council)
- Folkestone & Hythe Surface Water Management Plan – Stage 1 (November 2012, JBA Consulting)

2. Existing Conditions

2.1. Site Description

The site is located approximately 1.5km from central Folkestone, in between Walmer Way, Hythe Close and Sandwich Close (see Figure 2-1). The site is currently unoccupied greenfield land surrounded by residential development. There is a row of 10 garages flanking the south-east of the site which will be removed as part of the development to allow for vehicle access to the site via a single lane road. Part of this area will be replaced with car parking for the proposed development.



Figure 2-1 - Proposed Development Boundaries - Shown in Red (Source: Google Earth)

2.2. Existing Catchment and Runoff Assessment

A review of the wastewater plan provided by Southern Water (see Appendix C) indicates that there is a surface water and foul water public network in the vicinity of the development site.

Topographical survey data has been obtained for the proposed development site. This has been used along with imagery from Google Street View (2022) to identify existing surface water drainage of the development site – see Table 2-1.

Table 2-1: Existing Surface Water Drainage

Plot Number	Approximate Impermeable Area (m ²)	Existing Surface Water Drainage
Plots 01 - 08	784	- The site predominantly consists of unoccupied greenfield land, therefore there is no formal drainage network and it is assumed flows infiltrate to the ground. - The existing row of garages to the south of the site appear to have roofs sloping towards the road south of the site, where there is a gully located to the southwest. It appears this will take the flows from these garages. - The topographical survey confirms that the levels fall from the north-east corner to the south-west corner of the site.

3. Development Proposals

3.1. Proposed Development

The proposed development consists of eight houses and eight parking spaces to increase occupancy within the village to suit the local need. Table 3-1 provides a detailed overview for the two types of plot, whilst a site plan is available in Appendix A.

Table 3-1: Development Details

Plot Number/ hardstanding	Development Details	Approximate Impermeable Area (m ²)	Approximate Impermeable Area Change (m ²)
Plot 01 – 04	These are two bed 4 person households	356	+356
Plot 04 - 08	These are three bed 5 person households	428	+428
Footpath	Existing footpath	-80	+0
Access road	An access road will be required to the site	+80	+0
Parking spaces	The parking spaces will replace the existing garages	119	+0

3.1.1. Change in Impermeable Area

Table 3-1 indicates that the proposed development will result in a net increase of approximately 784m² of impermeable area. The access road will not increase the impermeable area as there is an existing footpath on the site to be removed, which represents a similar impermeable area.

4. Surface Water Drainage Strategy

The impermeable area associated with the site (see Table 3-1) comprises of residential roofs and paved areas surrounding the buildings. This strategy will cover the disposal of surface water runoff from such surfaces.

4.1. Basis of Design

The following sections of this report identify the design criteria that is to be applied for the proposed drainage network serving the development site within Folkestone.

4.1.1. Rainfall Return Period

The UK National Appendix of BS EN 752 gives design return periods for drainage systems as follows:

- For areas around buildings:
 - 1 year in normal situation where ponding can be tolerated during heavy rainfall and for a few minutes afterwards.
 - 5 years in situations where ponding cannot be tolerated.
 - Where buildings require a higher degree of protection, longer return periods may be considered.
- The pipe full criterion i.e. no surcharge is given as:
 - 1 year for sites with average ground slopes greater than 1%
 - 2 years for sites with average ground slopes less than 1%
 - 5 years where the consequences of flooding are severe.
- Sewers should be designed so that flooding does not occur in a 1 in 30 year storm.
- Consideration has to be given to the effects of the 1 in 100 year event.

The Kent County Council (referred to as KCC hereinafter) LLFA Policy for the management of surface water gives the following return periods for surface water drainage design:

- The drainage system must be designed to be consistent with pre-development flow rates and designed to operate without any flooding occurring during any rainfall event up to (and including) the critical 1 in 30 year storm (3.33% AEP). The system must also be able to accommodate the rainfall generated by events of varying durations and intensities up to (and including) the critical, climate change adjusted 1 in 100 year storm (1% AEP) without any on-site property flooding and without exacerbating the off-site flood-risk. The choice of where these volumes are accommodated may be within the drainage system itself or within other areas designated within the site for conveyance and storage.

Therefore, drainage for the Folkestone site will be designed so that:

- The drainage network serving the development will be designed to have capacity for the 1 in 30 year storm
- The drainage network and associated levels design will be designed such that on-site property flooding does not occur during a 1 in 100 year storm with an allowance for climate change and does not exacerbate off-site flood-risk for this event.

4.1.2. Climate Change Allowance

Climate change is expected to have an effect on rainfall intensities, which are likely to increase in the next 100 years. The Environment Agency (EA) recommends that when deriving peak rainfall intensities, the parameters shown in Table 4-1 and 4-2 should be used (Flood Risk Assessments: Climate Change Allowances, 2022).

Table 4-1: Climate Change Allowances – 3.3% Annual Exceedance Rainfall Event

Epoch	Central Allowance	Upper End Allowance
2050s	20%	40%
2070s	20%	40%

Table 4-2: Climate Change Allowances – 1% Annual Exceedance Rainfall Event

Epoch	Central Allowance	Upper End Allowance
2050s	20%	45%
2070s	20%	45%

The proposed drainage will be designed to ensure there is no surface level flooding for a 1 in 30 year storm event with a 40% climate change allowance and that the buildings do not flood in a 1 in 100 year event with 45% climate change allowance based on peak rainfall intensity.

4.1.3. Permissible Discharge

The KCC LLFA Policy for the management of surface water states that the total discharge from the site should aim to mimic greenfield rates. The discharge from the site should be restricted to the theoretical greenfield runoff rates for each of the 1, 30 and 100 year return period storms. The acceptable calculation methods are specified in CIRIA SuDS Manual, Report C753. When greenfield rate calculations result in a total discharge from the site of less than 5 litres/second, a rate of 2 litres/second may be used. Or alternatively discharge rates can be limited to the equivalent greenfield runoff rate as long as the long term storage is utilised for flow volumes in excess of greenfield volume for the 1 in 100 year 6 hour event.

Reference must also be made to any relevant Strategic Flood Risk Assessment, Surface Water Management Plan or other adopted flood risk document which may specify specific discharge rates or local requirements to manage flood risk within the locality. The list of documents considered is referred to above in Section 1.

An allowance for the increase of impermeable area from urban creep must be included in the design of the drainage system. The allowances set out in Table 3 of the KCC Drainage and Planning Policy document must be applied to the impermeable area within the property curtilage according to the proposed dwelling density. The correct allowance for this development is 10% based upon Table 3.

4.2. Drainage Proposals

The drainage proposals are based on the above design requirements and current understanding of the existing drainage systems as described in Section 2.

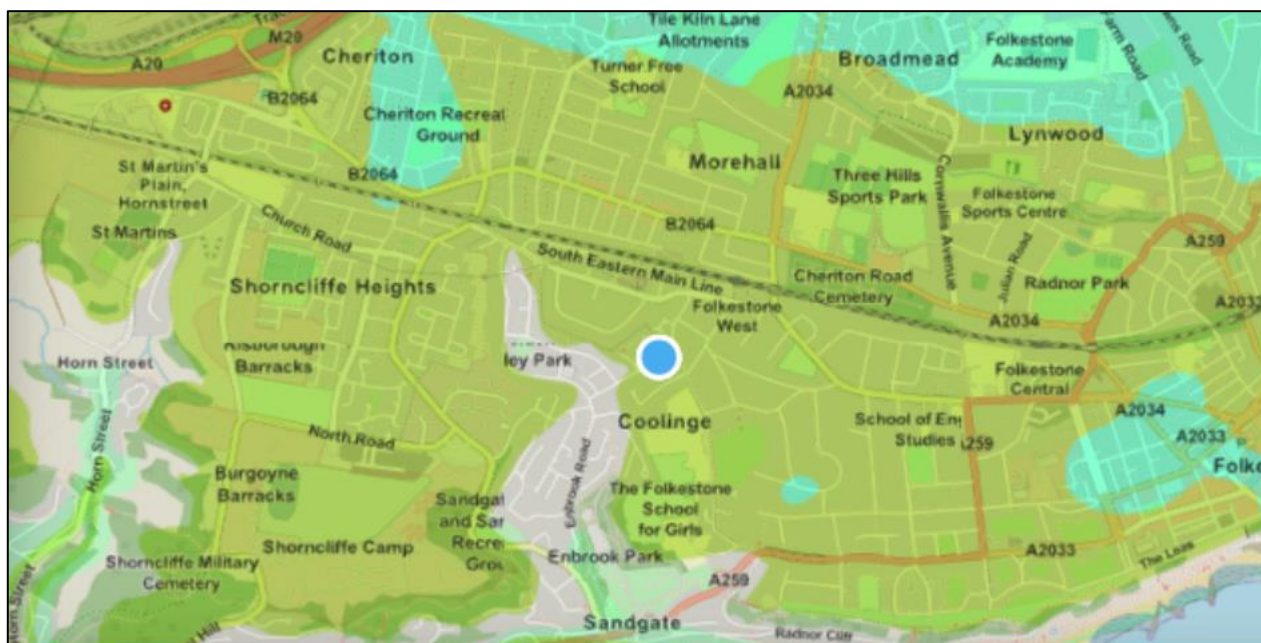
4.2.1. Point of Discharge

A hierarchy of points of discharge for surface water is given in Section 3 of Part H of the Building Regulations and the Planning Practice Guidance as follows:

- (1) Soakaway / infiltration in preference to
- (2) A watercourse, in preference to
- (3) Sewers

In the case of the proposed development, an initial desktop study indicates that ground conditions may allow for surface water flows to infiltrate to ground – satisfying both the allowable discharge rate specified in Section 4.1.3

and the Building Regulations hierarchy. Data from the British Geological Survey (©UKRI) indicates that the bedrock is comprised largely of sandstone of the Folkestone Formation (see Figure 4-1), whilst data from Soilscape (©Cranfield University) cites that soils in the area are free draining slightly acid loamy soils (see Figure 4-2).



Geology

Bedrock geology

Folkestone Formation - Sandstone. Sedimentary bedrock formed between 126.3 and 100.5 million years ago during the Cretaceous period.

Figure 4-1 - Bedrock Geology Description - British Geological Survey (©UKRI)

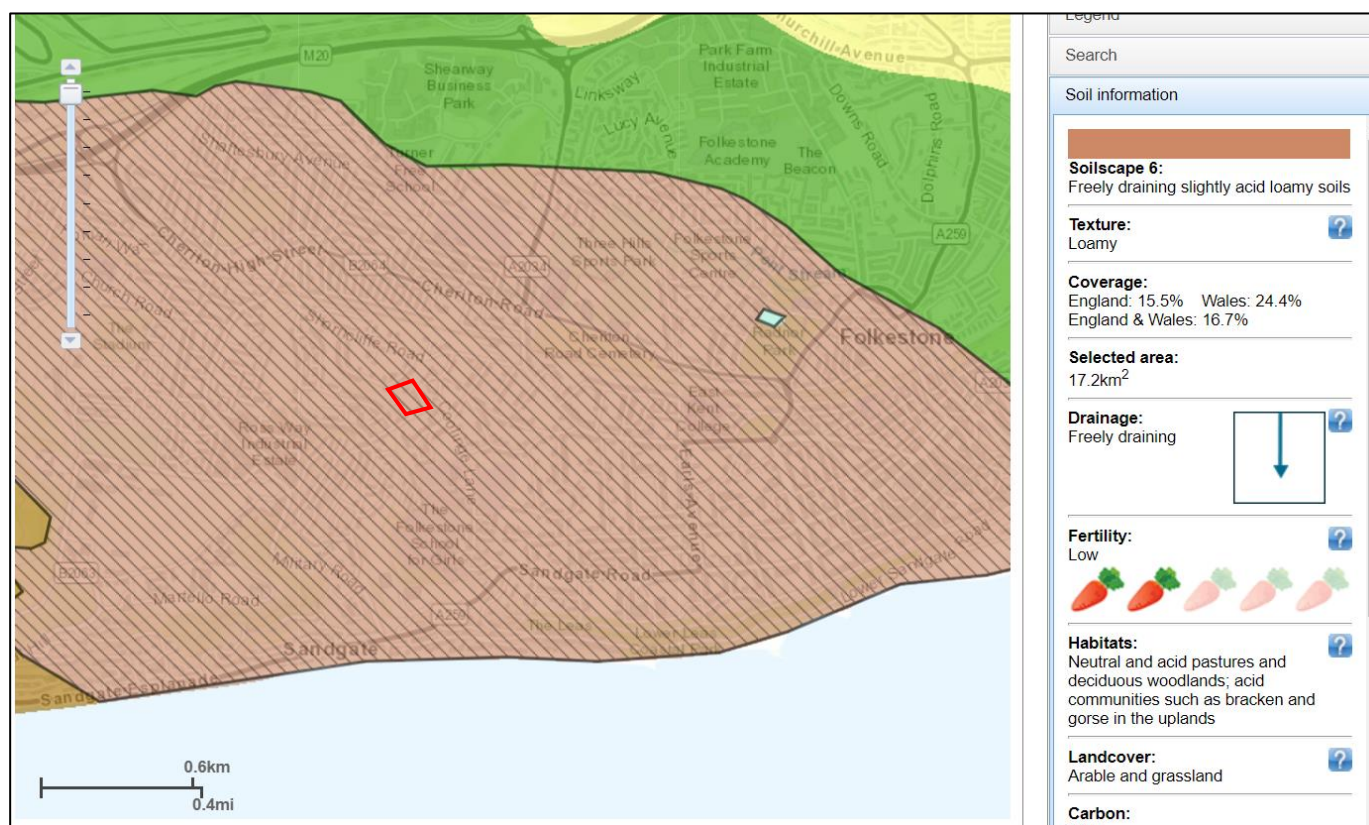


Figure 4-2 - Soil Information from Soilscape (©Cranfield University)

Disposal of water to ground is therefore considered as the preferred option across the development site. Nonetheless, during further design phases, infiltration tests in accordance with BRE 365 Soakaway Design must be undertaken to confirm that infiltration rates are appropriate. Such tests should be undertaken across the site to account for localised variations in geology. Furthermore, in accordance with guidance from KCC, any infiltration design must include adequate winter groundwater monitoring data. The site does not lie within any Source Protection Zones as shown on the DEFRA Magic Maps.

There are no watercourses in the vicinity of the site, therefore the alternative discharge point should infiltration prove inviable, would be to the surface water sewer. Based upon a review of the Topographical data, a connection via gravity to this sewer is achievable. The greenfield runoff rates for the site area of 0.17ha are summarised in Table 4-3 below, based upon the H.R Wallingford runoff calculator tool, see Appendix D for the full output, including input parameters for the calculation:

Table 4-3 - Greenfield runoff rates (l/s)

1 in 1 year	QBAR	1 in 30 year	1 in 100 year
0.74	0.87	2.01	2.79

In line with KCC guidance, the discharge rates would be limited to 2l/s based on the rates being less than 5l/s for any proposed connection to the surface water sewer.

4.2.2. Sustainable Drainage Systems (SuDS)

SuDS are proposed as the method to treat and dispose of surface water. SuDS mimic nature and typically manage rainfall close to where it falls. SuDS can be designed to transport (convey) surface water, attenuate surface water, and provide areas to store water in natural contours that allow water to infiltrate into the ground. Such systems can also be used to 'treat' surface water prior to discharge and improve water quality.

The impermeable area (residential roofs and individual driveways) that is to be drained from the proposed development sites can generally be considered as a very low / low pollution hazard – see Table 4.3 of CIRIA Report C753 – The SuDS Manual v2.

Nonetheless SuDS offer multiple benefits as well as providing effective drainage solutions. As such, in accordance with best practice guidance, it is proposed to use SuDS as part of the surface water drainage design for the development site identified. Assuming that infiltration is feasible (see Section 4.2.1), the following infiltration-type SuDS are to be considered (not in hierarchical order):

- (1) Permeable surfacing
- (2) Rain Gardens
- (3) Infiltration trenches
- (4) Infiltration basins
- (5) Soakaways
- (6) Swales
- (7) Ponds
- (8) Tree pits

Given the relatively small size of the development, it is anticipated that infiltration trenches, infiltration basins and ponds are not likely to be feasible. Nonetheless, this will be confirmed during subsequent design phases.

4.2.3. Surface Water Drainage Strategy

The primary proposed method of drainage is via infiltration; a combination of SuDS features are proposed including permeable paving, raingardens and soakaways. Appendix A1 indicates a proposed layout should infiltration drainage be proven viable.

Permeable paving is proposed for the access road (attenuating) and car park (infiltrating) with infiltration only proposed more than 5m from any building. Lined attenuating rain gardens outside the front of each of the properties will provide additional attenuation. Soakaways are proposed for any runoff emanating from the rear of the properties.

Should infiltration be proven not viable an alternative surface water drainage option (Appendix A2) has been developed. The following attenuation-type SuDS are to be considered (not in hierarchical order):

- (1) Under-drained permeable surfacing
- (2) Raised Planters
- (3) Under-drained rain gardens
- (4) Detention basins
- (5) Swales
- (6) Tree pits

Each of the above would attenuate runoff and would be connected back to the public surface water network via a flow control device. Appendix A2 proposes the addition of lined attenuating rain gardens at the rear of the properties, ultimately discharging back to the public surface water sewer. The detail of connection will be confirmed during subsequent design phases, where appropriate. Flows will be discharged from the development sites at no greater than 2l/s. Alternatively discharge rates will be limited to the equivalent greenfield runoff rate with long term storage being utilised for flow volumes in excess of greenfield volume for the 1 in 100 year 6 hour event.

Again, given that the size of the development is relatively small, it is anticipated detention basins and ponds are not likely to be feasible at this stage. Nonetheless, this will be confirmed during subsequent design phases.

In order to progress the Sustainable Drainage strategy to design, the next steps are to include:

- Ground investigations to understand feasibility of infiltration based SuDS as discussed above
- Identification of constraints on the drainage.
- Consultation with the LLFA and/ or Southern Water as required.

4.2.4. Key Risks

Key risks for the surface water drainage strategy have been identified as the following:

- Ground investigations – infiltration testing reveals that infiltration to ground is not feasible.
- Utility clashes – utility clash assessment to be undertaken to ensure proposed drainage works do not impact any buried services.

5. Foul Drainage Strategy

Activities in the residential buildings will generate foul flows. A review of the wastewater plan provided by Southern Water (see Appendix C) indicates that Folkestone is served by a separate foul drainage network. It is recommended that each residential building is connected into the public foul sewer system via gravity where levels permit.

It is proposed that the foul drainage from properties in the development drain via gravity and connect into the Southern Water foul network in Romney Avenue. A high level proposal is included in Appendix B.

Any foul water design will be undertaken in accordance with the following design guidance:

- BS EN 12056 – Gravity drainage systems in buildings
- BS EN 7532 – Drain and sewer systems outside buildings
- The Building Regulations 2010 Approved Document H – Drainage and waste disposal
- DEFRA – Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems – March 2015

It should be highlighted that whilst some of the recommendations for the current version of Sewers for Adoption may be taken into account as good practice, this document is not considered to be strictly relevant as it is not considered likely that the foul drains serving the sites will be adopted. In addition, the Southern Water sewer mapping plan does not show a network (foul or surface) for several properties between the site and public sewer. There is likely to be a network serving these properties that is not charted.

6. Summary

6.1. Summary of Surface Water Drainage Strategy

The initial desktop analysis undertaken as part of this report indicates that infiltration to ground may be feasible and therefore this is the proposed method of managing surface water runoff generated by the development. The data available through Soilsmap and BGS indicates that the soils are freely draining and the bedrock is Folkestone Formation – Sandstone. The infiltration techniques proposed in the drainage strategy are permeable paving for the access road and car park, along with lined attenuating raingardens outside the front of each of the properties. Soakaways are proposed for any runoff emanating from the rear of the properties.

Nonetheless, during further design phases, infiltration tests in accordance with BRE 365 Soakaway Design should be undertaken to confirm that this is a feasible option. Furthermore, in accordance with guidance from KCC, any infiltration design must include adequate winter groundwater monitoring data.

If such tests prove that infiltration to ground is not appropriate, flows will need to be discharged from the development site at a rate of 2l/s, in line with KCC guidance, to the surface water sewer network. Alternatively discharge rates will need to be limited to the equivalent greenfield runoff rate with long term storage being utilised for flow volumes in excess of greenfield volume for the 1 in 100 year 6 hour event.

The drainage system will be designed to cater for the following storm events:

- The drainage network serving the development will be designed to have capacity for the 1 in 30 year storm
- The drainage network and associated levels design will be designed such that on-site property flooding does not occur during a 1 in 100 year storm with an allowance for climate change and does not exacerbate off-site flood-risk for this event.
- For peak rainfall intensities, a climate change allowance (based on peak rainfall intensity) of 45% will be applied in the calculations.
- An allowance for urban creep of 10% for the development impermeable area will be applied to storage calculations.

6.2. Summary of Foul Drainage Strategy

Foul flows from the development sites will be served through a new on-site drainage network, which will discharge into the Southern Water foul network in Romney Avenue. Liaison with Southern Water is recommended at an early stage of design to identify if this is an acceptable connection point. The levels of the site allow for foul flows to drain via gravity into the public foul sewer system, as indicated in Appendix B.

Appendices



Appendix A. Site Details

A.1. Primary Surface Water Drainage

Drawing FOLK-ATK-XX-XX-PH-72-1001

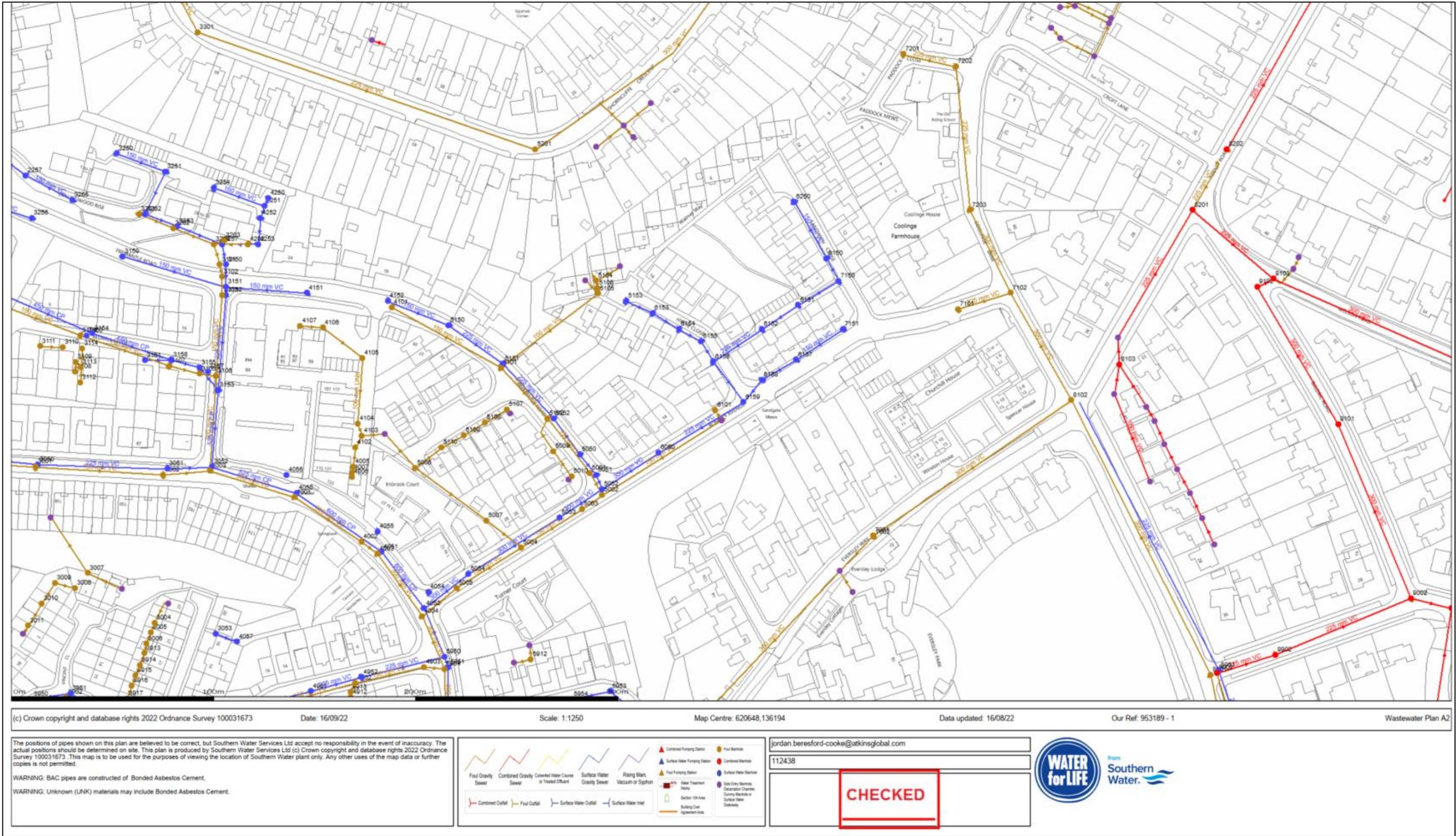
A.2. Alternative Surface Water Drainage

Drawing FOLK-ATK-XX-XX-PH-72-1002

Appendix B. Foul Drainage

Drawing FOLK-ATK-XX-XX-PH-72-1003

Appendix C. Public Sewer Network



Appendix D. Greenfield runoff rate calculations output



HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Domenico Avagnano

Site name: Folkestone

Site location: Folkestone

Site Details

Latitude: 51.08245° N

Longitude: 1.14908° E

Reference: 4005807829

Date: Sep 30 2022 15:48

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

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):

0.17

Methodology

Q_{BAR} estimation method:

Calculate from SPR and SAAR

SPR estimation method:

Calculate from SOIL type

Soil characteristics

Default

Edited

SOIL type:

4

4

HOST class:

N/A

N/A

SPR/SPRHOST:

0.47

0.47

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Hydrological characteristics

Default

Edited

SAAR (mm):

738

738

Hydrological region:

7

7

Growth curve factor 1 year:

0.85

0.85

Growth curve factor 30 years:

2.3

2.3

Growth curve factor 100 years:

3.19

3.19

Growth curve factor 200 years:

3.74

3.74

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.87	0.87
1 in 1 year (l/s):	0.74	0.74
1 in 30 years (l/s):	2.01	2.01
1 in 100 year (l/s):	2.79	2.79
1 in 200 years (l/s):	3.27	3.27

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.