RCD

Residential Development
Triggs Farm
Cranbrook Road
Goudhurst
Kent
TN17 1DP

Drainage Strategy Report

For

Mr D. Masters

6th January 2022

Rev	Date	Purpose/Status	Document Ref.	QA
A	07.01.2022	For approval	First issue	RAC/LD
B	13.01.2022	For approval	Second issue	RAC/LD
C	18.12.2023	For approval	Third issue	RAC/STC
D				
E				

Disclaimer

This report is for the use of the Client only and is not for the use of any other parties without the express permission of the Client. All calculations and related quantified assumptions are indicative for planning purposes only and are based solely on the available design proposals and must be reassessed during detailed design with the appropriate compliance methodology.

Table of Contents

Executive Summary

RCD Consultants Ltd has been appointed by Mr. D. Masters to design the surface water and foul water drainage aspects of the proposed development at Triggs Farm, Cranbrook Road, Goudhurst, Kent, TN17 1DP.

The report outlines the strategy for the surface water and foul water drainage for the proposed development.

The site area is 1.49Ha and includes a house to be demolished and an open field. To the north, west and east is residential curtilage and to the south are open fields.

The proposed development consists of the construction of twelve houses with a roof area totalling 1,364m^2. The access road and drives will be formed in impermeable materials and have a total area of 2,446m^2.

Surface water from the roofs and drives will discharge to soakaways and highway drainage will discharge to an infiltration basin.

FEH22 rainfall data has been used within the calculations and to comply with Environment Agency protocols a 40% climate change allowance has been added to the 1 in 100 year storm event calculations and 35% has been added to the 1 in 30 year calculations for the 2070s epoch as the houses will have a lifetime up to at least 2125.

For avoidance of doubt the lined soakaways will have a permeable base to allow infiltration and in accordance with researched shown in Ciria 753 silt has an infiltration rate of 1x10^{-6}m/s.

The surface water calculations confirm that no flooding occurs during the worst case 1 in 100 year storm event with a 40% climate change and the 1 in 10 year calculations confirm that the half drain time is less the 24 hours

The flooding warning information services website confirms the site is in Flood zone 1 and is not affected by surface water flooding.

The British Geological Survey website shows the site to be underlain by superficial deposits of either River Terrace Deposits or Alluvium over bedrock of the Tunbridge Wells Sand Formation.

Soakage testing completed on 11th December 2023 confirmed a worst-case result of 6.901x10^{-6}m/s for the northern half of the field.

Foul drainage will discharge to the foul sewer within the site boundaries.

Construction will commence shortly after planning has been granted and it is anticipated that the development and all SUDs components will be completed within two years.

1.0 Existing Drainage

The site area is 1.49Ha and includes a house to be demolished and an open field. To the north, west and east is residential curtilage and to the south are open fields.

A copy of the topographical survey is shown in Appendix A.

There is a public foul sewer within the site boundaries. A copy of the sewer records is shown in Appendix A.

There is a ditch approximately 200m south from the southern boundary that runs into a tributary of the River Teise.

Soakage testing completed on 11th December 2023 confirmed a worst-case result of 6.901×10^{-6}m/s for the northern half of the field. In the southern half of the field rates were not calculated and it is recommended that further testing is completed prior to construction commencing in locations where infiltration features are shown.

Soakage testing results are shown in Appendix B together with Greenfield calculations.

If infiltration testing prove to be negative then a revised drainage option will be to have a restricted outfall to the ditch along the southern boundary at rates no greater than greenfield runoff.

The pre-development surface water flow rates are shown in Appendix B.

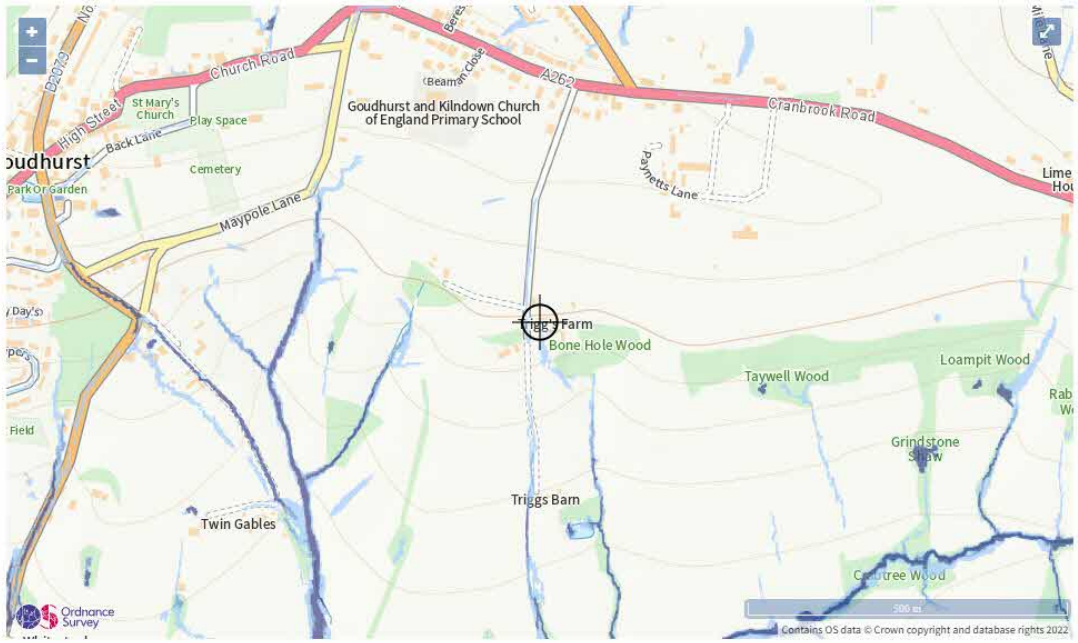
The pre-development surface water volumes are shown in Appendix C.

1.1 Fluvial and pluvial flooding

The flood warning information service website extracts below confirm that the site is in flood zone 1 with no risk of surface water flooding.

Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected



Extent of flooding from surface water

High Medium Low Very low Location you selected

2.0 Proposed Drainage Strategy

The proposed development consists of the construction of twelve houses with a roof area totalling 1,364m^2. The access road and drives will be formed in impermeable materials and have a total area of 2,446m^2.

The surface water is proposed to discharge to a balancing pond with a restricted outfall to the existing ditch. The maximum discharge rate will be 5l/s which is lower than the corresponding 1 in 1 year Greenfield rate.

The Drainage Layout is shown in Appendix D.

2.1 Surface Water Drainage

In accordance with Ciria 753, SUDS Manual, flooding is permitted above ground during the 1 in 100 year storm event + 30% climate change allowance but all flood water is to be contained within the site boundaries. No flooding is permitted during the 1 in 30 year storm event.

The impermeable area plan is shown in Appendix E.

Post development 1 in 10 year surface water flow calculations are shown in Appendix F and these confirm a half drain time of less than 24 hours.

Post development 1 in 2, 30 and 100 year surface water volume calculations are shown in Appendix G.

FEH22 rainfall data has been used within the calculations and to comply with Environment Agency protocols a 40% climate change allowance has been added to the 1 in 100 year storm event calculations and 35% has been added to the 1 in 30 year calculations for the 2070s epoch as the houses will have a lifetime up to at least 2125.

For avoidance of doubt the lined soakaways will have a permeable base to allow infiltration and in accordance with researched shown in Ciria 753 silt has an infiltration rate of 1x10^{-6}m/s.

SUDS techniques will be included where local ground conditions permit. In conjunction with the surface water management requirements, consideration of green roofs, infiltration devices, and rainwater harvesting techniques will be made. These methods are further detailed in Section 5.

The flows at the outfall will require attenuation to comply with discharge consent limits.

2.1.1 Proposed Infrastructure

It is proposed that the surface water drainage system will take the form of a network of pipes transferring surface water from the buildings and roads.

Surface water discharge will be restricted, and water will be attenuated within the development site boundaries.

2.1.2 Standards

The performance of the surface water drainage system will be designed to Sewers for Adoption current Edition, BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations. This requires the pipes to be sized so they can run full during a simulated 1 in 1 year storm of all durations, but there will be no surcharging within manholes. Additionally, the drainage system has to be tested to ensure there is no flooding during a simulated 1 in 30 year storm of any duration.

For storms in excess of this, the standard requires consideration of the route flood water will take to avoid ingress into properties. 1 in 100 year storm calculations with a 40% Climate Change allowance are shown in Appendix G.

In accordance with the Local Water Authority guidance a flood exceedance plan shown in Appendix H indicates the routes water will take in the unlikely event of SUDS failure.

The materials specification for the scheme will be in accordance with the Highways Agency Specification for Highway Works. For the purposes of the indicative design, the following material types have been assumed:

- Drainage pipes up to 300mm diameter –plastic pipes.
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in higher quality paved areas.
- Class D400 standard type in all other road / park areas
- Class C250 standard type in all footpath areas
- Pipe bedding - Imported granular material.
- Pipe Trench backfill - Selected as dug or imported material.
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at every junction of a public sewer.

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 1.0m/s for self-cleansing
- Standard pipe roughness “Ks” of 0.6.

2.2 Foul Water Drainage

2.2.1 Proposed Infrastructure

Foul drainage from the buildings will be collected via pipes and discharge to the existing public foul sewer in the site access road via a pumping station.

Average Water flows will be 0.55l/s in accordance with Sewers for Adoption current Edition.

2.2.2 Standards

The performance of the foul drainage system has been designed to Sewers for Adoption current Edition, BS EN 752 Parts 3 and 4, and the most current issue of Part H of the Building Regulations. The main criteria used are as follows.

- Drainage pipes up to 100mm diameter – plastic pipes.
- Manholes and chambers - Precast concrete with concrete surround or PPIC
- Chamber covers – Class D400 infill type in higher quality paved areas.
- Class D400 standard type in all other road / parking areas
- Class C250 standard type in all footpath areas
- Pipe bedding - Imported granular material.
- Pipe Trench backfill - Selected as dug or imported material.
- Manholes should be located at every change of alignment or gradient; at the head of all sewers; at every junction of a public sewer

The drainage shall be designed utilizing the following criteria:

- Minimum flow velocity 0.75m/s for self-cleansing
- Standard pipe roughness “Ks” of 1.5.

3.0 Surface Water Flows

3.1 Existing and proposed site run-off flows

A summary of the existing and proposed peak flows are detailed in Table 1 below and include the 20% and 40% climate change allowances for the worst case 1 in 100 year storm event.

Return Period	Pre-development l/s	Post-development l/s
1 in 1 year	6.66	n/a
1 in 30 years	18.02	n/a
1 in 100 years	24.99	n/a
1 in 100 years +40% CC	-	n/a

Table 1: Summary of Existing and Proposed Surface Water Flows

The pre-development surface water flow calculations are shown in Appendix B and the post-development calculations are shown in Appendix F, G and I.

3.2 Existing and proposed site run-off volumes

A summary of the existing and proposed peak volumes are detailed in Table 2 below and include the 20% and 40% climate change allowances for the worst case 1 in 100 year storm event. The volumes are based upon a pond design with zero outflow during the 360 minute storm event.

Return Period	Pre-development m^3	Post-development m^3
1 in 1 year	148.61	n/a
1 in 30 years	341.68	n/a
1 in 100 years	461.61	n/a
1 in 100 years +40% CC	-	n/a

Table 2: Summary of Existing and Proposed Surface Water Volumes

The pre-development surface water volume calculations are shown in Appendix C and the post-development surface water calculations are shown in Appendix H.

4.0 Attenuation

It is proposed that Sustainable Urban Drainage Systems (SUDS) will be the primary consideration for surface water management. There are several different methods that may be used to provide sufficient attenuation of the surface water described in Section 5 below.

Hydraulically the attenuation should be positioned as close to the outfall as possible where it would control the surface water discharge from the site. Implementation of one or all of the SUDS methods outlined in Section 5 of this report is highly recommended to reduce the requirement for below ground storage.

The proposed drainage design includes soakaways for the roof and drive drainage and an infiltration basin for the highway drainage.

5.0 Sustainable Urban Drainage Systems (SUDS)

The objective of SUDS is to minimise the impacts of the development on the quantity and quality of site runoff and maximise amenity and biodiversity opportunities. Surface water SUDS will be designed and installed in accordance with NPPF and associated technical guidance March 2012 and associated CIRIA documents.

The mix of SUDS to be used is determined by the conditions on site, in this case a development with areas of external space which can be utilised for SUDS. The methodology of surface water control is to slow the entry of the surface water into the system by using flow control devices (in this instance infiltration), then retain the runoff by using below ground storage (soakaway chamber and an infiltration basin) which will release surface water at an agreed rate to limit the impact of the development on drainage infrastructure and therefore reduce the potential for flooding.

5.1 Infiltration Devices

Infiltration devices drain water directly into the ground. Infiltration trenches and soakaways are more practicable for urban sites with limited space available. Infiltration devices can be integrated into and form part of the landscaped areas.

Infiltration trenches are completely below ground, and water should not occur on the surface.

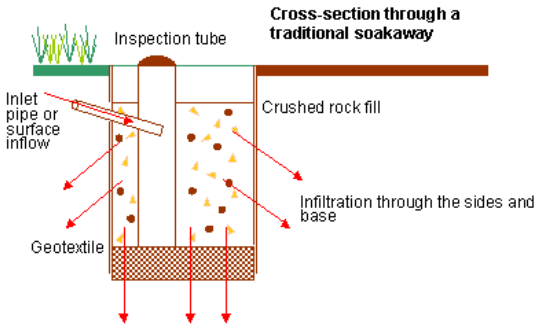


Figure 1 – Typical cross section through infiltration trench

Advantages – Reduces the volume of runoff, effective at pollutant removal, contributes to ground water recharge, simple and cost effective.

Disadvantages – Potentially high failure rates, comprehensive ground investigations required, offset from foundations (min. 5m away), risk of ground water pollution, reduced performance during prolonged wet periods.

Suitable for use – **Yes**, the soakage testing results confirmed that infiltration rates will be suitable for the design of soakaways.

5.2 Brown/Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/landscaping over a drainage layer. They are designed to intercept and retain precipitation, increasing the time of concentration and reducing the volume of runoff and attenuation peak flows. Green roofs can be anything from a thin growing layer of sedums and mosses to plants, shrubs and large trees.

These roofs vary in specification and can be designed to attract bird and invertebrate species. Referring to CIRIA document C644, green and brown roofs also participate in attenuating rainwater. This would reduce the requirement for below ground storage attenuation on the site.

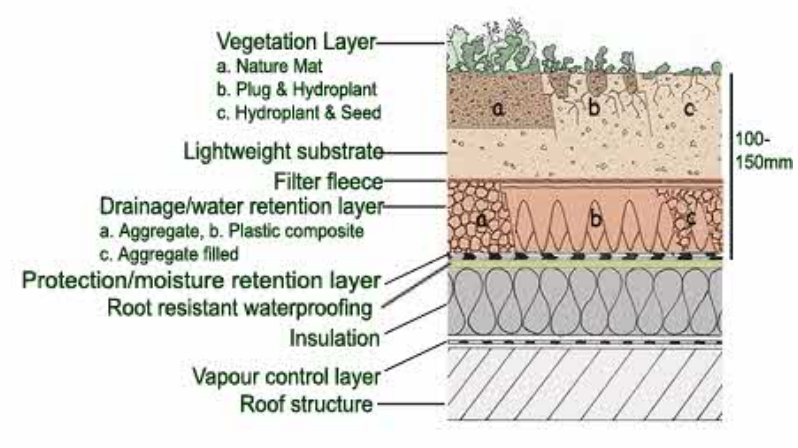


Figure 2 – Typical section through green roof build up

Advantages – Mimic greenfield state of building footprint, good removal of pollutants, ecological and amenity benefits, improve air quality, insulates building.

Disadvantages – Costs, increased structural loading, roof height, design, maintenance and exposure may preclude use.

Suitable for use – **No**, the style of development will not include the use of Green roof construction.

5.3 Rainwater Harvesting

These tanks act as mini-storage chambers for surface water, reducing the extent of underground storage required. They provide a source of water for plant irrigation, washing machines and for flushing wc's

Harvested rainwater is stored below ground and pumped to provide a substitute for potable mains water reducing both the site discharge and water consumption.

Figure 4 – Rainwater Harvesting

Advantages – Provided source control of storm water runoff, reduces demand on mains water.

Disadvantages – Costs, Risk to public health, use dependant on demand requirements and seasonal rainfall characteristics, maintenance of pumps & control systems.

Suitable for use – **No,** the cost of installing is not viable for a project of this type.

5.4 Porous Paving

Porous pavement is an alternative to conventional paving in which water permeates through the paved structure rather than draining off it. The surface water will be held in a reservoir structure (high void content sub-base) under the pavement for subsequent delayed discharge or infiltration into the sub-strata below.

The porous paving can be materials such as gravel, grasscrete, porous (no fines) concrete, concrete blocks or porous asphalt. Pollutant removal rates have been shown to be high, as the majority of the removal occurs as a result of the filtration of the water through the aggregate sub-base.

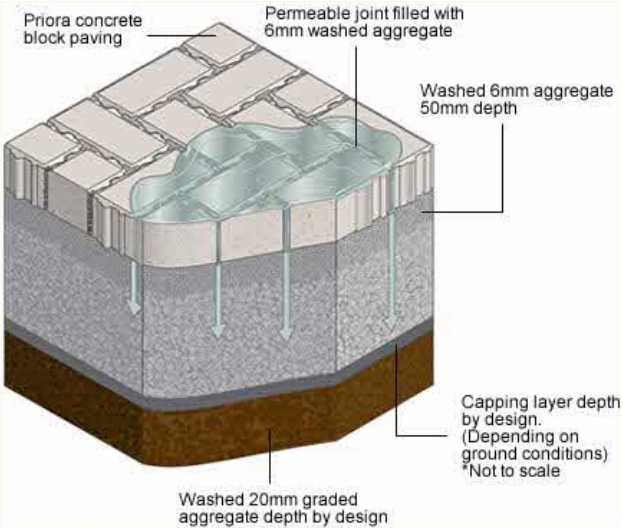


Figure 3 – Typical section through porous paving

Advantages – Effective in removing pollutants, lined systems can be used to avoid infiltration, reduces volume and rate of surface water runoff, suitable for high density developments. Mimics existing Greenfield conditions by filtering into the surrounding soft landscaped areas.

Disadvantages – Costs, used for low traffic volumes, low axel loads and speeds, risk of long term clogging due to poor maintenance.

Suitable for use – **Yes**, however soakaways and an infiltration basin are the preferred SUDS options.

5.5 Below Ground Attenuation

Attenuation involves the storing of surface water within pipework or underground tanks prior to controlled discharge into the public system. Attenuation tanks can also provide off-line storage.

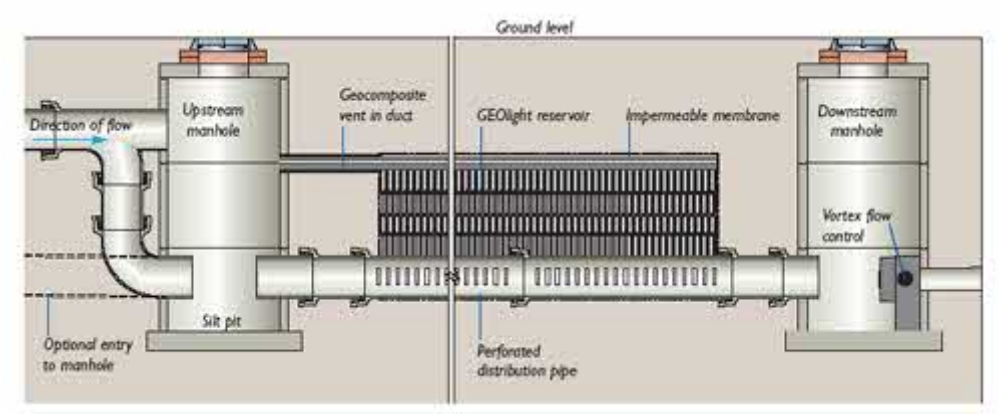


Figure 5 – Typical section through below ground attenuation chamber (cellular storage)

Advantages – Effective storage of surface water, can be used below trafficked areas, can be used below public open areas, minimum maintenance.

Disadvantages – No water quality treatment.

Suitable for use – **Yes,** however soakaways and an infiltration basin are the preferred SUDS options.

5.6 Wetlands

Wetlands provide both stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands provide settlement of sediment and remove contaminants.

Advantages – Effective storage of surface water, good pollutant removal, ecological and amenity benefits.

Disadvantages – Requires large surface area. Health & Safety issues associated with large bodies of water.

Suitable for use – **No,** there is no space available as the site is steeply sloping.

5.7 Swales

Swales are vegetated drainage structures up to 500mm deep and used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits extent of trees used in landscaping. Health & Safety issues associated with large bodies of water following heavy rainfall.

Suitable for use – **Yes,** however a balancing pond is proposed that will act in a similar way to the swales in removing contaminants.

5.8 Ponds/Rain gardens

Ponds or rain gardens are irregular shaped vegetated drainage structures used to provide flow control through attenuation. They can be used for infiltration, where possible.

Advantages – Can be incorporated into landscaping, good removal of contaminants, reduces discharge rates. Low costs.

Disadvantages – Requires large surface area. Limits extent of trees used in landscaping. Health & Safety issues associated with large bodies of water following heavy rainfall.

Suitable for use – **Yes,** an infiltration basin is proposed.

6.0 Proposed SUDS solution

It is advised that a combination of Sustainable Drainage Systems (SUDS) is used to increase the time of concentration of the water before it discharges to the ditch.

This can be achieved by using soakaways and an infiltration basin.

7.0 Management and Maintenance of SUDS

A management company will be appointed to complete routine maintenance of the development including all SUDs elements not within private ownership.

The homeowners will be responsible for maintenance of their own soakaways.

The infiltration basin and soakaways shall be inspected and cleaned out on an annual basin.

The grass in the infiltration basin is to be cut every two weeks during the growing season and all cuttings are to be removed.

8.0 Implementation of SUDS

Construction will commence shortly after planning has been granted and it is anticipated that the development, all SUDs components will be completed within two years.

9.0 Contamination mitigation

The British Geological Survey website shows the site to be underlain by superficial deposits of either River Terrace Deposits or Alluvium over bedrock of the Tunbridge Wells Sand Formation.

Soakage testing completed on 11th December 2023 confirmed a worst-case result of 6.901×10^{-6}m/s for the northern half of the field. In the southern half of the field rates were not calculated and it is recommended that further testing is completed prior to construction commencing in locations where infiltration features are shown.

The low infiltration rates confirm that the soils have low leaching characteristics

The site lies above a secondary aquifer and the Groundwater vulnerability is high.

Ciria 753 Chapter 26 Mitigation indices:

Pre-development pollution indices:

Based upon the former agricultural development use the Table 26.2 indices will apply and confirm a low pollution hazard level.

Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore MI = 0.2 + 0.5x0.2 + 0.5x0.05 = 0.325

Post-development

Residential use is identified in Table 26.2 as low pollution hazard level;

Roofs: Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore MI = 0.2 + 0.5x0.2 + 0.5x0.05 = 0.325

Access Roads: Total Solids = 0.5, Metals = 0.4 and Hydrocarbons = 0.4

The mitigation index is therefore MI = 0.5 + 0.5x0.4 + 0.5x0.4 = 0.9

The post-development mitigation indices are equal or less than the pre-development indices therefore no further mitigation is required based upon the fact that the access road are constructed in permeable materials.

Table 26.5 Risk matrix

Element Number	Description	Risk Score	Weighting Factor	Score
1	Pollution Hazard Traffic Density	1	15	15
2	Average annual rainfall	1	15	15
3	Type of SUDS	2	15	30
4	Unsaturated zone depth	1	20	20
5	Flow through sub-soils	3	20	60
6	Unsaturated zone material	2	10	20
7	Soil organic matter	1	5	5
8	Unsaturated zone ph	1	5	5
Total				**155**

Based upon the above table the risk to groundwater is low as the total value is less than 180.

Appendix A

Topographical Survey and sewer records

This drawing is confidential and must not be copied or disclosed without written consent ©ACAD MAPPING

Do Not Scale

GARAGE

KESTREL

CLIEFDEN

GOUDHURST INN

HOLLY VILLAS

TRANQUIL VILLAS

HOLLY COTTAGE

MERRIEDENE

DAINTREE

SCOTNEY

FOOTBALL HUT

Electric Sub Station

Dense Scrub & Bramble

Community Orchard

N

1m 2m 4m 6m 8m 10m

Scale 1:250 printed on A0

CLIENT

DAVID MASTERS

PROJECT

TRIGGS FARM
CRANBROOK ROAD
GOUDHURST

TITLE

SITE SURVEY

SCALE	DATE	BY
1:250	30/08/16	M.R.G.

NUMBER	SHEET	REV'N
M1089	1	

Acad Mapping Ltd
Land Surveyors

Frenches Farm House
Mark Cross
East Sussex TN6 3NS
Telephone (01892) 853663
Fax (01892) 853828
e-mail info@acadmapping.com

ACAD MAPPING

Survey carried out using GPS to establish control stations combined with Total Station methods for detail & levels
Grid relates to Ordnance Survey National Grid

Species of trees must be confirmed by a qualified arboriculturist before any design work takes place

Spreads of trees shown as average

AutoCAD AVAILABLE IN DIGITAL FORMAT

Do Not Scale

CLIENT
DAVID MASTERS

PROJECT
TRIGGS FARM
CRANBROOK ROAD
GOUDHURST

TITLE
SITE SURVEY

SCALE	DATE	BY
1:250	30/08/16	M.R.G.

NUMBER	SHEET	REV'N
M1089	2	

Acad Mapping Ltd
Land Surveyors
Frenches Farm House
Mark Cross
East Sussex TN6 3NS
Telephone (01892) 853663
Fax (01892) 853828
e-mail info@acadmapping.com

ACAB MAPPING

1m 2m 4m 6m 8m 10m
Scale 1:250 printed on A0

Survey carried out using GPS to establish control stations combined with Total Station methods for detail & levels
Grid relates to Ordnance Survey National Grid

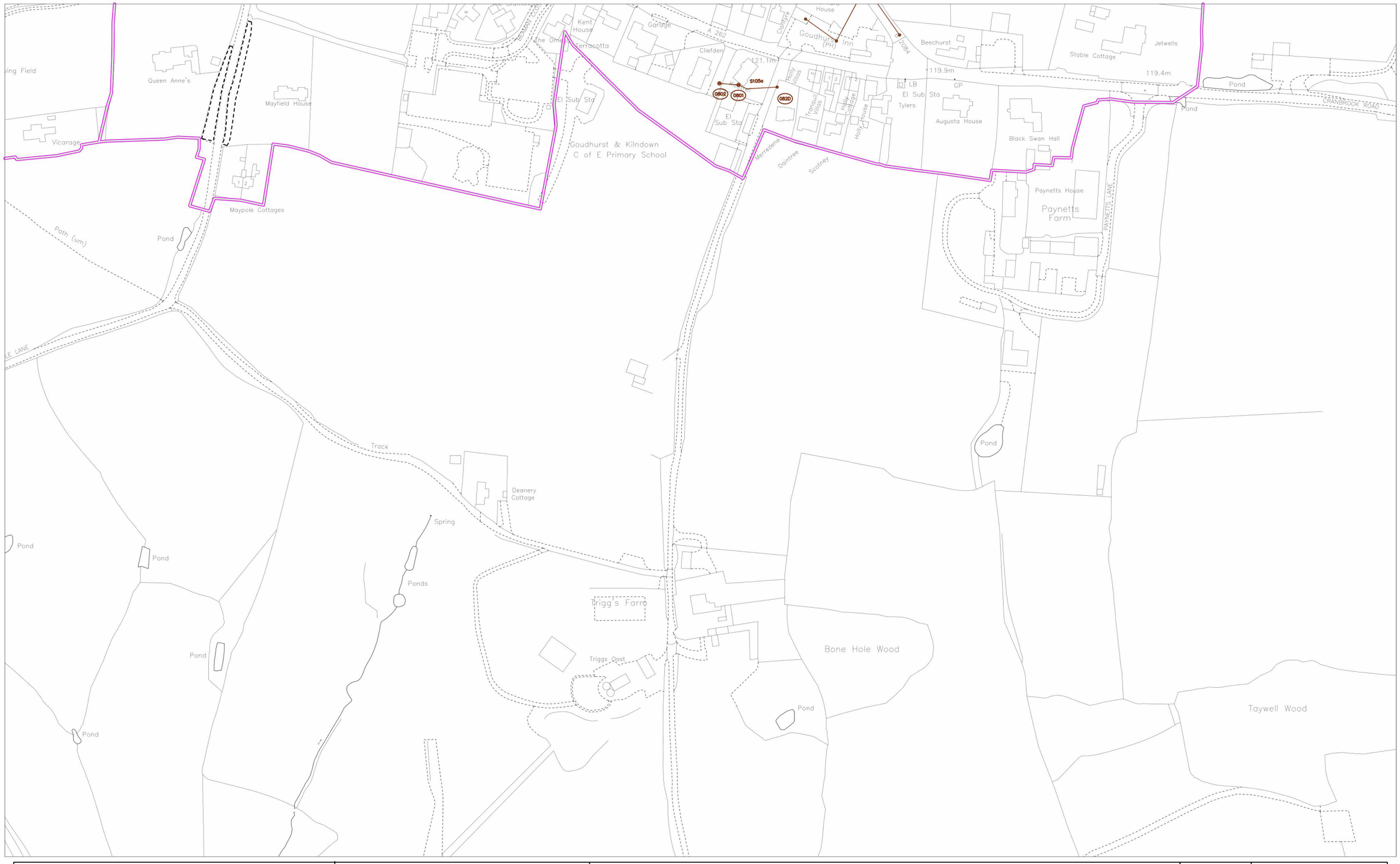
Species of trees must be confirmed by a qualified arboriculturist before any design work takes place

Spreads of trees shown as average

AutoCAD AVAILABLE IN DIGITAL FORMAT

SEWER RECORDS PAGE 1 OF 2

137887



137309

572532

572532

572472

O.S. REF. TQ7337NW	Drawn by: kumaria	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement
	Scale: 1:2500	
Title: 228897_Triggs Farm, Goudhurst	Date: 02/12/2016	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

N

Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0801X			UNK	UNK	CIRC																		
080DX			UNK	UNK	CIRC																		
081DX			UNK	UNK	CIRC																		
082DX			UNK	UNK	CIRC																		
181DX			UNK	UNK	CIRC																		

LINE STYLES / COLOURS

- Brown — Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main
- Red — Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain
- Orange — Building Over Agreement Area
- Dark Blue — Treated Effluent
- Purple — Sludge
- Sewer Catchment
- Section 104 Area
- Light Blue — Surface Water
- Surface Water Rising Main
- Yellow — Private
- Green — Access Shaft
- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

LEGEND - SEWERS

- Manhole (SW)
- Manhole (F&C)
- Lamp hole (SW)
- Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- Blind shaft (SW)
- Blind shaft (F&C)
- Ejector station (SW)
- Ejector station (F&C)
- Watertight door (SW)
- Watertight door (F&C)
- Flushing ch. Mn-e (SW)
- Flushing ch. Mn-e (F&C)
- Flushing ch. No-e (SW)
- Flushing ch. No-e (F&C)
- Demarcation Chamber
- Washout (SW)
- Washout (F&C)
- Rodding Eye (SW)
- Rodding Eye (F&C)
- Gauging point (SW)
- Gauging point (F&C)
- Intercept chamber (SW)
- Intercept chamber (F&C)
- Storm Tank (SW)
- Storm Tank (F&C)
- Vortex chamber (SW)
- Vortex chamber (F&C)
- Label ellipse
- Dummy/S24 manhole
- Outfall
- Penstock chamber
- Damboards
- Storm Overflow
- Backdrop manhole
- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- Anode
- Valve
- Closed Valve
- Air Valve
- Hatch box (SW)
- Hatch box (F&C)
- Direction arrow
- Emptying valve
- Catchpit
- Soakaway
- Inlet
- Balancing Pond
- Wastewater treatment works
- Marine treatment works
- Outfall headworks
- Vent
- Vent column
- Tidal storage tank
- Blank end
- Head of Public Sewer
- Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

- 1st digit: hundred metre easting identifier
- 2nd digit: hundred metre northing identifier
- 3rd digit: sewer type identifier
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- 4th digit: next sequential node

Drawn by:	kumaria
Title:	228897_Triggs Farm, Goudhurst
Date:	02/12/2016

Southern Water

Appendix B

Pre-development surface water flow calculations

Infiltration testing results

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ray Clark
Site name:	Triggs Farm
Site location:	Goudhurst

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.

Site Details

Latitude:	51.11264° N
Longitude:	0.47134° E
Reference:	1549869264
Date:	Jan 05 2022 08:27

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.49

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

Hydrological characteristics	Default	Edited
SAAR (mm):	753	753
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

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.

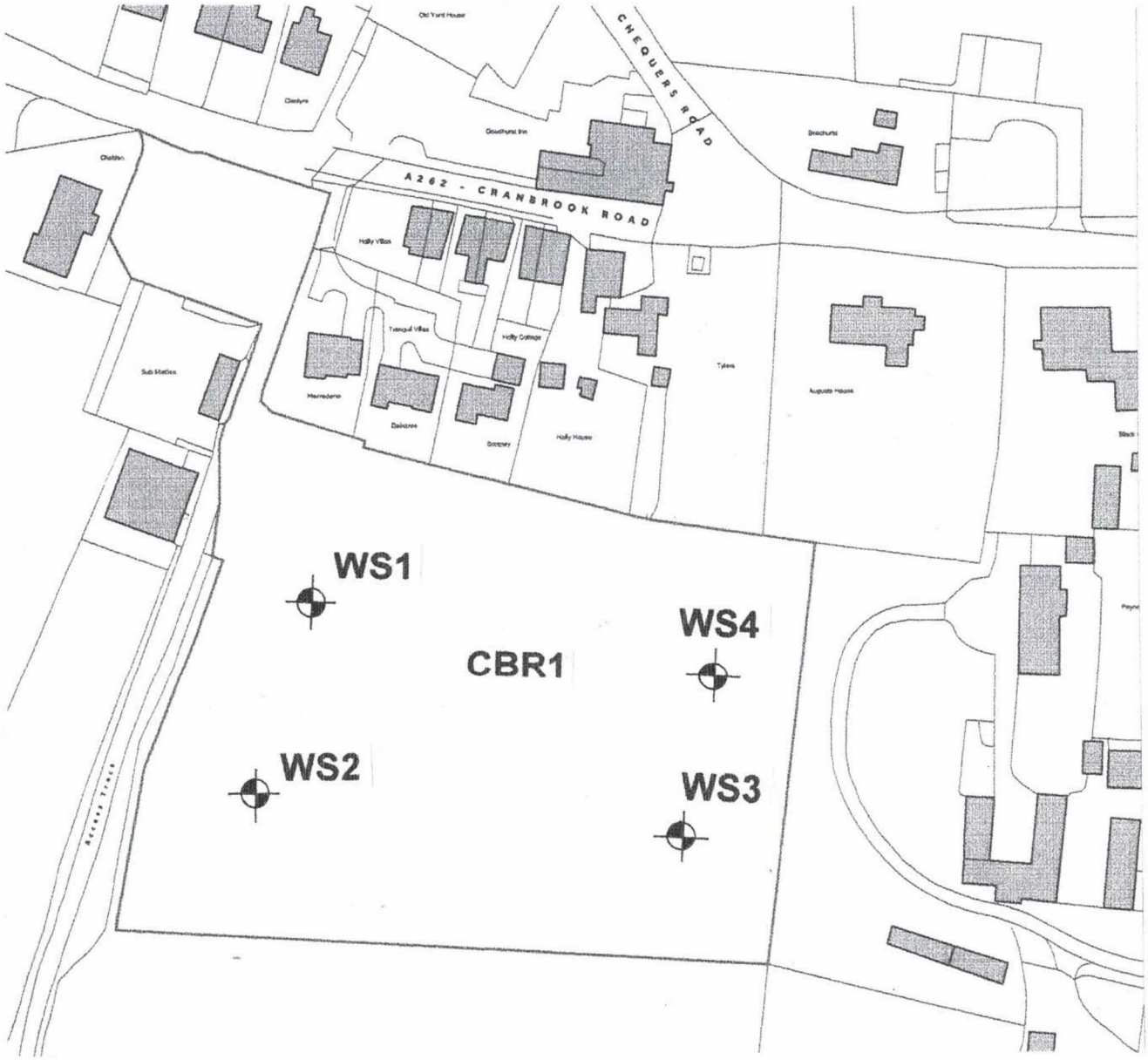
(2) Are flow rates < 5.0 l/s?

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 offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	7.83	7.83
1 in 1 year (l/s):	6.66	6.66
1 in 30 years (l/s):	18.02	18.02
1 in 100 year (l/s):	24.99	24.99
1 in 200 years (l/s):	29.3	29.3



Cranbrook Road, Goudhurst. Plan showing locations of boreholes and CBR test.

Appendix C

Pre-development surface water volume calculations

Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.388
Areal Reduction Factor	1.00
Area (ha)	1.490
SAAR (mm)	790
CWI	116.613
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	44.90
Greenfield Runoff Volume (m^3)	148.610

Greenfield Runoff Volume

FSR Data

Return Period (years)	30
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.388
Areal Reduction Factor	1.00
Area (ha)	1.490
SAAR (mm)	790
CWI	116.613
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	46.97
Greenfield Runoff Volume (m^3)	341.677

Greenfield Runoff Volume

FSR Data

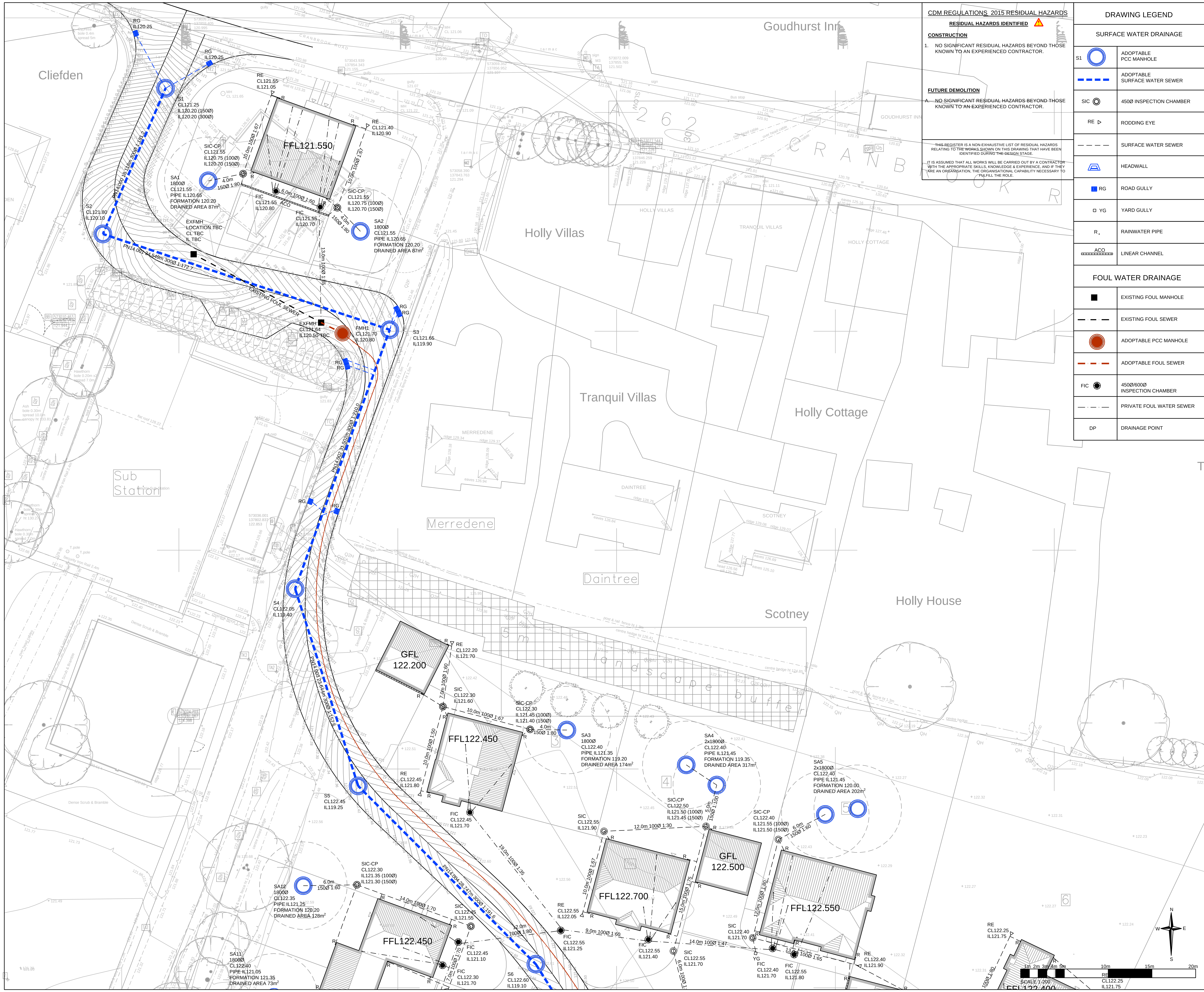
Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.388
Areal Reduction Factor	1.00
Area (ha)	1.490
SAAR (mm)	790
CWI	116.613
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	48.98
Greenfield Runoff Volume (m^3)	461.605

Appendix D

Drainage Layout



CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED

CONSTRUCTION

1. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

FUTURE DEMOLITION

A. ~~NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.~~

THIS REGISTER IS A NON-EXHAUSTIVE LIST OF RESIDUAL HAZARDS RELATING TO THE WORKS SHOWN ON THIS DRAWING THAT HAVE BEEN IDENTIFIED DURING THE DESIGN STAGE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A CONTRACTOR WITH THE APPROPRIATE SKILLS, KNOWLEDGE & EXPERIENCE, AND IF THEY ARE AN ORGANISATION, THE ORGANISATIONAL CAPABILITY NECESSARY TO FULFILL THE ROLE.

DRAWING LEGEND

SURFACE WATER DRAINAGE

S1	ADOPTABLE PCC MANHOLE
	ADOPTABLE SURFACE WATER SEWER
SIC	450Ø INSPECTION CHAMBER
RE	RODDING EYE
	SURFACE WATER SEWER
	HEADWALL
RG	ROAD GULLY
YG	YARD GULLY
R	RAINWATER PIPE
ACO	LINEAR CHANNEL

FOUL WATER DRAINAGE

	EXISTING FOUL MANHOLE
	EXISTING FOUL SEWER
	ADOPTABLE PCC MANHOLE
	ADOPTABLE FOUL SEWER
FIC	450Ø/600Ø INSPECTION CHAMBER
	PRIVATE FOUL WATER SEWER
DP	DRAINAGE POINT

NOTES

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS

DO NOT SCALE FROM THIS DRAWING

NOTES

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERING DRAWINGS AND CALCULATIONS ASSOCIATED WITH THIS PROJECT.
3. ALL COMPONENTS AND MATERIALS ARE TO BE MANUFACTURED AND SUPPLIED IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, AND LAID AND BACKFILLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THE RELEVANT BRITISH STANDARDS.
4. THE CONTRACTOR SHALL, BEFORE COMMENCING THE WORKS, VERIFY ALL SITE AND SETTING OUT DIMENSIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRUE AND PROPER SETTING OUT OF THE WORKS AND FOR THE CORRECTNESS OF THE POSITION, LEVELS, DIMENSIONS, AND ALIGNMENT OF ALL PARTS OF THE WORKS.
5. ALL BUILDING DRAINAGE TO BE INSTALLED AND TESTED IN COMPLIANCE WITH THE BUILDING REGULATIONS DRAINAGE AND WASTE DISPOSAL APPROVED DOCUMENT H CURRENT EDITION.
6. SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.
7. ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.
8. INSITU CONCRETE FOR USE IN GENERAL DRAINAGE WORKS, GRADE TO BS: 5328.
9. FOR INTERNAL DRAINAGE POSITIONS REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.
10. FOR LANDSCAPING SURFACE MATERIAL FINISHES REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.
11. ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE AND SUBJECT TO DETAILED DESIGN.
12. ALL ADOPTABLE DRAINAGE WORK TO BE COMPLETED IN ACCORDANCE WITH SEWERS FOR ADOPTION CURRENT EDITION AND TO THE SATISFACTION OF SOUTHERN WATER SERVICES LTD.
13. ALL WORK WITHIN THE PUBLIC HIGHWAY TO BE COMPLETED IN ACCORDANCE WITH THE KENT COUNTY COUNCIL HIGHWAY REQUIREMENTS AND SPECIFICATIONS.
14. ALL IRONWORK WITHIN TRAFFICKED AREAS IS TO BE 150mm THICK, CLASS D400.
15. THE FOUL WATER SEWER CONNECTION IS SUBJECT TO A SECTION 106 SEWER CONNECTION APPLICATION WITH SOUTHERN WATER SERVICES LTD.

REV	AMENDMENT	DATE	CHKD
P4	DRAINAGE CHANGED TO SOAKAWAYS.	18.12.2023	RAC
P3	PLOT DRAINAGE ADDED.	15.11.2023	RAC
P2	PRELIMINARY ISSUE.	13.01.2022	RAC
P1	PRELIMINARY ISSUE.	05.01.2022	RAC

DRAWING STATUS

PRELIMINARY

RCD

RCD CONSULTANTS LTD
9 BIRCH TREE WAY, MAIDSTONE, KENT, ME15 7RP
MOBILE: 07702 052 137
EMAIL: ray@rcd-consultants.com

CLIENT

MR D MASTERS

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
TRIGGS FARM
GOUDHURST

DRAWING TITLE

DRAINAGE LAYOUT
SHEET 1 OF 3

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1 1:400 @ A3	LD	RAC	JAN 2022

DRAWING NUMBER	REVISION
1183-2201-CIV-10	P4

DRAWING LEGEND

SURFACE WATER DRAINAGE

S1	ADOPTABLE PCC MANHOLE
	ADOPTABLE SURFACE WATER SEWER
SIC	450Ø INSPECTION CHAMBER
RE	RODDING EYE
	SURFACE WATER SEWER
	HEADWALL
RG	ROAD GULLY
YG	YARD GULLY
R	RAINWATER PIPE
ACO	LINEAR CHANNEL

FOUL WATER DRAINAGE

	EXISTING FOUL MANHOLE
	EXISTING FOUL SEWER
	ADOPTABLE PCC MANHOLE
	ADOPTABLE FOUL SEWER
FIC	450Ø/600Ø INSPECTION CHAMBER
	PRIVATE FOUL WATER SEWER
DP	DRAINAGE POINT

CDM REGULATIONS 2015 RESIDUAL HAZARDS

RESIDUAL HAZARDS IDENTIFIED

CONSTRUCTION

1. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

FUTURE DEMOLITION

A. NO SIGNIFICANT RESIDUAL HAZARDS BEYOND THOSE KNOWN TO AN EXPERIENCED CONTRACTOR.

THIS REGISTER IS A NON-EXHAUSTIVE LIST OF RESIDUAL HAZARDS RELATING TO THE WORKS SHOWN ON THIS DRAWING THAT HAVE BEEN IDENTIFIED DURING THE DESIGN STAGE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A CONTRACTOR WITH THE APPROPRIATE SKILLS, KNOWLEDGE & EXPERIENCE, AND IF THEY ARE AN ORGANISATION, THE ORGANISATIONAL CAPABILITY NECESSARY TO FULFILL THE ROLE.

NOTES

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS

DO NOT SCALE FROM THIS DRAWING

NOTES

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEERING DRAWINGS AND CALCULATIONS ASSOCIATED WITH THIS PROJECT.
3. ALL COMPONENTS AND MATERIALS ARE TO BE MANUFACTURED AND SUPPLIED IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, AND LAID AND BACKFILLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THE RELEVANT BRITISH STANDARDS.
4. THE CONTRACTOR SHALL, BEFORE COMMENCING THE WORKS, VERIFY ALL SITE AND SETTING OUT DIMENSIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE TRUE AND PROPER SETTING OUT OF THE WORKS AND FOR THE CORRECTNESS OF THE POSITION, LEVELS, DIMENSIONS, AND ALIGNMENT OF ALL PARTS OF THE WORKS.
5. ALL BUILDING DRAINAGE TO BE INSTALLED AND TESTED IN COMPLIANCE WITH THE BUILDING REGULATIONS DRAINAGE AND WASTE DISPOSAL APPROVED DOCUMENT H CURRENT EDITION.
6. SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.
7. ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.
8. INSITU CONCRETE FOR USE IN GENERAL DRAINAGE WORKS, GRADE TO BS: 5328.
9. FOR INTERNAL DRAINAGE POSITIONS REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.
10. FOR LANDSCAPING SURFACE MATERIAL FINISHES REFER TO ARCHITECT'S CURRENT WORKING DRAWINGS.
11. ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE AND SUBJECT TO DETAILED DESIGN.
12. ALL ADOPTABLE DRAINAGE WORK TO BE COMPLETED IN ACCORDANCE WITH SEWERS FOR ADOPTION CURRENT EDITION AND TO THE SATISFACTION OF SOUTHERN WATER SERVICES LTD.
13. ALL WORK WITHIN THE PUBLIC HIGHWAY TO BE COMPLETED IN ACCORDANCE WITH THE KENT COUNTY COUNCIL HIGHWAY REQUIREMENTS AND SPECIFICATIONS.
14. ALL IRONWORK WITHIN TRAFFICKED AREAS IS TO BE 150mm THICK, CLASS D400.
15. THE FOUL WATER SEWER CONNECTION IS SUBJECT TO A SECTION 106 SEWER CONNECTION APPLICATION WITH SOUTHERN WATER SERVICES LTD.

TABLE A

STORM EVENT (1 IN)	GREENFIELD FLOW RATE l/s	POST-DEVELOPMENT FLOW RATE l/s
1	6.66	4.9
30	18.02	5.0
100	24.99	5.0
100 + 40%CC	-	5.0

REV	AMENDMENT	DATE	CHKD
P4	DRAINAGE CHANGED TO SOAKAWAYS.	18.12.2023	RAC
P3	PLOT DRAINAGE ADDED.	15.11.2023	RAC
P2	PRELIMINARY ISSUE.	13.01.2022	RAC
P1	PRELIMINARY ISSUE.	05.01.2022	RAC

DRAWING STATUS: PRELIMINARY

RCD

RCD CONSULTANTS LTD
9 BIRCH TREE WAY, MAIDSTONE, KENT, ME15 7RP
MOBILE: 07702 052 137
EMAIL: ray@rcd-consultants.com

CLIENT: MR D MASTERS

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT
TRIGGS FARM
GOUDHURST

DRAWING TITLE: DRAINAGE LAYOUT
SHEET 2 OF 3

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1 1:400 @ A3	LD	RAC	JAN 2022

DRAWING NUMBER: 1183-2201-CIV-11

REVISION: P4

SCALE 1-200

Appendix E

Impermeable area plan

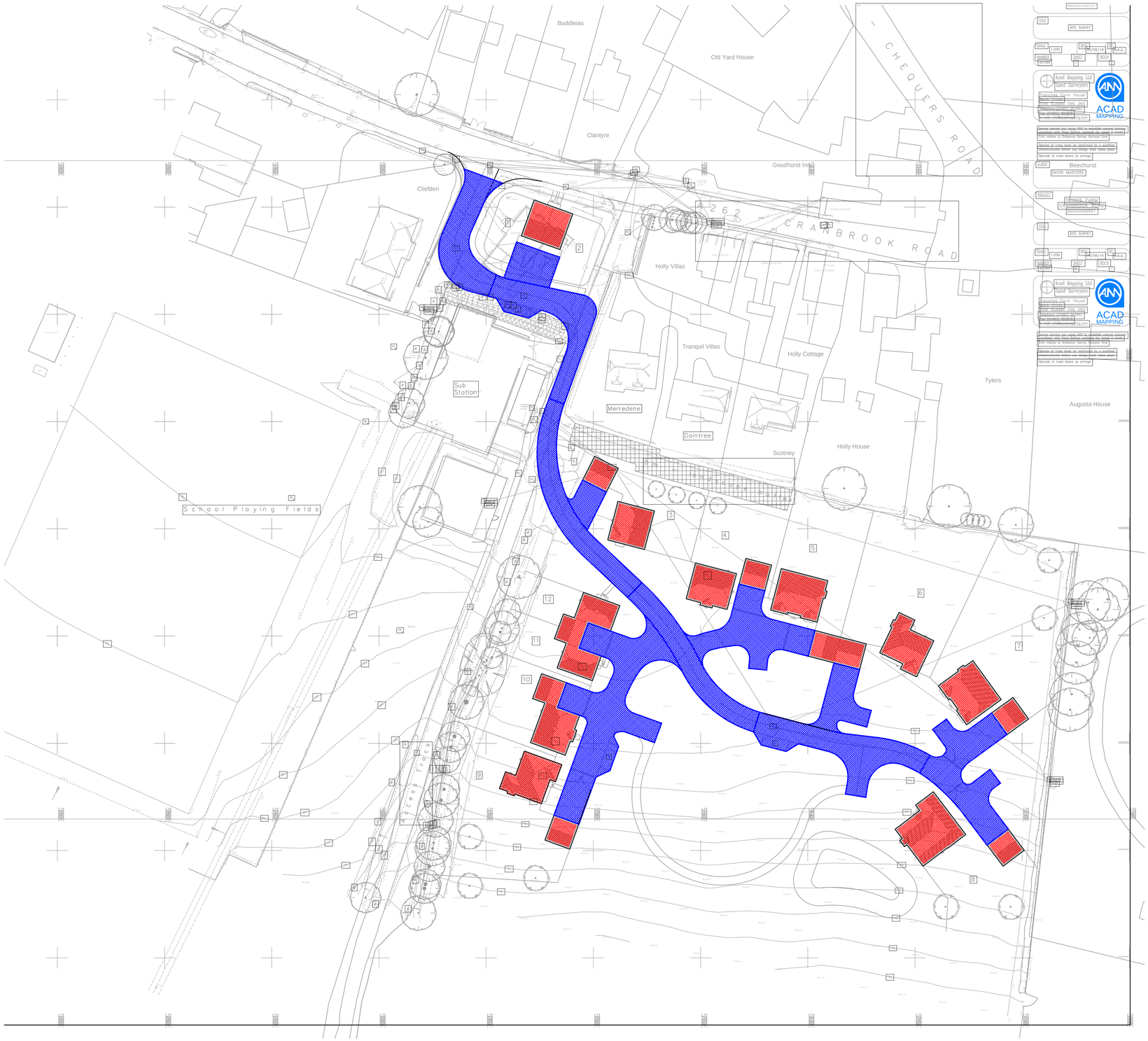
NOTES

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS

DO NOT SCALE FROM THIS DRAWING

DRAWING LEGEND

	2,446m² ROAD/DRIVE AREA
	1,364m² ROOF AREA



N
W E
S

1m 2m 3m 4m 5m 10m 15m 20m

SCALE 1-200

REV	AMENDMENT	DATE	CHKD
P1	PRELIMINARY ISSUE.	07.01.2022	RAC

DRAWING STATUS

PRELIMINARY

RCD

RCD CONSULTANTS LTD
9 BIRCH TREE WAY, MAIDSTONE, KENT, ME15 7RP
MOBILE: 07702 052 137
EMAIL: ray@rcd-consultants.com

CLIENT

MR D MASTERS

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
TRIGGS FARM
GOUDHURST

DRAWING TITLE

IMPERMEABLE AREA PLAN

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:500 @ A1 1:1000 @ A3	LD	RAC	JAN 2022

DRAWING NUMBER	REVISION
1183-2201-CIV-13	P1

Appendix F

1 in 10 year Post Development surface water flow calculations

Appendix G

Post Development surface water flow calculations
2 year
30 year with 35% climate change allowance
100 year with 40% climate change allowance

Appendix H

Flood exceedance plan

NOTES

CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS

DO NOT SCALE FROM THIS DRAWING

FLOOD EXCEEDANCE ROUTE

N
W E
S

1m 2m 3m 4m 5m 10m 15m 20m

SCALE 1-200

REV	AMENDMENT	DATE	CHKD
P1	PRELIMINARY ISSUE.	07.01.2022	RAC

DRAWING STATUS

PRELIMINARY

RCD

RCD CONSULTANTS LTD
9 BIRCH TREE WAY, MAIDSTONE, KENT, ME15 7RP
MOBILE: 07702 052 137
EMAIL: ray@rcd-consultants.com

CLIENT

MR D MASTERS

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
TRIGGS FARM
GOUDHURST

DRAWING TITLE

FLOOD EXCEEDANCE PLAN

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:500 @ A1 1:1000 @ A3	LD	RAC	JAN 2022

DRAWING NUMBER	REVISION
1183-2201-CIV-14	P1