Flood Risk Assessment and Drainage Strategy

Site: Land South of The Den, Richborough, Dover, Kent CT13 9JG

Client: Terraforte

Prepared by: DHA Environment
Eclipse House
Eclipse Park
Sittingbourne Road
Maidstone ME14 3EN

Date: October 2023

1.1 Introduction

1.1.1 DHA has been commissioned by the applicant Terraforte to prepare a Flood Risk Assessment and Drainage Strategy for the change of use application and siting of 8no. holiday units on land south of The Den, Richborough, Dover, Kent CT13 9JG.

1.1.2 Reference to the Environment Agency flood maps show that the site is located within Flood Zone 3 however it is protected by existing raised defences against the 1 in 200-year tidal flood event.

1.1.3 This FRA has been carried out in accordance with the National Planning Policy Framework (NPPF). The NPPF requires an FRA to be prepared for all developments located in Flood Zone 3.

1.1.4 The proposals are classed as major development and as such this report has been prepared to outline the surface water drainage for the site to support the planning application.

1.2 Summary of existing development

Location

1.2.1 The site is located on Land South of The Den, Richborough, Dover, Kent and is centred on approximate grid reference 632295, 158958. The site occupies a total area of 0.652 hectares and currently consists of undeveloped arable land.

Existing Site

1.2.2 A topographical survey of the site is shown on drawings 20014_000_01 and 02 contained within **Appendix A**. The site is generally rectangular in shape and gently falls from a high point of 2.2m AOD in the southeastern corner of the site adjacent

to Richborough Road to a low point of 1.8m AOD in the Northwest corner adjacent to the railway embankment. The site has the following boundary conditions:

- North - Arable Land.
- West - Railway
- South - Arable Land.
- East - Richborough Road with the River Stour beyond.

Existing Drainage regime and surface water run-off

1.2.3 There is no positive surface water outfall from the site so any rainfall will infiltrate to ground with any residual surface water flowing overland and into several watercourses around the site boundary. An 8m margin will need to be retained adjacent to any watercourse to ensure access for future maintenance.

1.2.4 Reference has been made to Southern Water asset plans found at **Appendix B**, which indicate the location of public sewers in the area. These records do not indicate any private drainage that may be present.

1.2.5 In October 2011 the ownership of any private sewer serving more than one property was automatically transferred to the Water Authority although many of these sewers are yet to be recorded on the asset plans.

Surface Water

1.2.6 The Southern Water asset plans confirm there are no surface water sewers within the vicinity of the site.

Foul Water

1.2.7 The Southern Water asset plans show there to be no foul water sewer in the site vicinity. The nearest foul sewer is in Richborough Road located circa 300m to the south of the southern site boundary.

Combined Sewers

1.2.8 The Southern Water asset plans confirm there are no combined water sewers within the vicinity of the site.

Geology and Hydrogeology

1.2.9 The online British Geological Survey maps indicate that the site is underlain by superficial deposits comprising of clay and silt over the Thanet Formation comprising of sand, silt, and clay.

1.2.10 The client has undertaken bespoke infiltration testing at the site, according to BRE365 methodology. The infiltration rate recorded at the site was found to be $5.67x10^{-5}$ m/s (0.204 m/hr). The client's records and results interpretation for use in calculations can be found in **Appendix C**. The site is located outside a Source Protection Zone.

1.3 Site Specific Flood Risk Assessment

Proposed Development

1.3.1 The proposals comprise of a development of 8no. holiday units on Land South of The Den, Richborough, Dover, Kent. The proposed Masterplan is shown in **Appendix D.**

Flood Risk Zones

1.3.2 The National Planning Policy Framework provides guidance on assessing flood risk and seeks to guide development away from areas at risk of flooding from all sources. Planning Practice Guidance defines several Flood Zones based on the probability of flooding and provides guidance on the most appropriate form of development within each zone. The flood risk zones can be summarised as follows:

Zone	Annual probability in any year	
	River Flooding	Sea Flooding
Zone 1 : Low probability	Less than 1:1000 (<0.1%)	Less than 1:1000 (<0.1%)
Zone 2: Medium probability	Between 1:1000 and 1 in 100 (0.1% -1%)	Between 1:1000 and 1 in 200 (0.1% - 0.5%)
Zone 3a : High probability	Greater than 1:100 (>1%)	Greater than 1:200 (>0.5%)
Zone 3b: Functional floodplain	Greater than 1 in 20 (>5%)	N/A

Table 1 – NPPF Guidance

1.3.3 The Reference has been made to the Environment Agency flood risk maps shown in the product 4 report contained in **Appendix E**. This shows the site to be located entirely within Flood Zone 3; high probability of tidal flooding. Although the product 4 report is dated 20th September 2019 the Environment Agency confirmed on the 11th September 2023 that this data is still current.

1.3.4 The flood maps are based on the worst-case scenario and do not account for the existing flood defences which provide a 1 in 200-year standard of protection from flooding from the sea.

1.3.5 Tidal flooding has been derived using data taken from the East Kent Coast, completed by JBA Consulting, in December 2018. The levels are summarised in table 2 and show both the defended and undefended flood levels at node 8 for all return periods up to and including the 1 in 1000-year event.

	0.5% AEP	0.5% AEP CC2070	0.5% AEP CC2115	0.1% AEP
Undefended	3.05	3.76	5.27	3.44
Defended	0.00	0.00	3.92	0.00

Table 2 – Summary of EA Flood levels

Vulnerability Classification

1.3.6 Planning Practice Guidance Table 2, "Flood Risk Vulnerability Classification", states that sites used for holiday or short-let caravans and camping can be classified as "more vulnerable".

Sequential Test

1.3.7 The National Planning Policy Framework states that change of use applications should not be subject to the Sequential Test.

Exception test

1.3.8 The National Planning Policy Framework states that change of use applications should not be subject an Exception Test.

Other sources of flooding

1.3.9 Reference has been made the level 1 Strategic Flood Risk Assessment prepared by Herrington Consulting on behalf of Dover District Council dated March 2019. This provides references on the risk of flooding from all sources including fluvial, surface water, groundwater, and sewers.

Surface water flooding

1.3.10 Reference has also been made to the Environment Agency online mapping. This shows the site is at a very low risk of surface water flooding.

Groundwater

1.3.11 Groundwater flooding occurs as excess water emerges at the ground surface. Reference has also been made to the Environment Agency online mapping which indicate that flooding from groundwater in this area is possible when groundwater levels are high.

Flooding from artificial sources

1.3.12 Flooding from reservoirs is extremely unlikely. An area is considered at risk if peoples' lives could be threatened in the event of a dam or reservoir failure. Reference has been made to the Environment Agency online mapping which indicate that flooding from reservoirs is considered unlikely.

Historic Flooding

1.3.13 Appendix A.1 of the Strategic Flood Risk Assessment show no records of historic flooding on the site. The Environment Agency mapping also show no records of historic flooding.

Mitigation

1.3.14 Given there is a residual risk of flooding in the event of a breach of the existing flood defences the following mitigation measures are suggested to be put in place.

1.3.15 The glamping pods are to be founded on a concrete slab and will be elevated 0.6m above the existing ground level.

1.3.16 It is recommended that the current and any future owners should register with the Environment Agency Flood Warning System. As part of this service the owner is notified of any flood warnings so the appropriate action can be taken. Given the nature of the proposals the site would not be in used if there is a risk of fooding.

1.3.17 A flood evacuation plan should be prepared to demonstrate that the site can be safely evacuated should flood warning be in place. This should include details of;

- The definition of flood warnings.
- Evacuation routes.
- Safe refuge points.
- The point at which evacuation will be triggered.
- Summary of the dangers of flood waters

1.4 Proposed Development

1.4.1 The proposals comprise of a development of 8no. holiday units on Land South of The Den, Richborough, Dover, Kent.

Aims

1.4.2 Sustainable Urban Drainage (SuDS) techniques will be used to deal with the surface water generated by the development. This will replicate the existing drainage regime by dealing with the surface water at source, to prevent increasing the risk of downstream flooding.

Proposed Surface Water Drainage Strategy

1.4.3 The proposed impermeable areas are shown on drawing 31269-D-01 contained in **Appendix F.** This shows that of the total site area of 0.652 hectares, the total impermeable area can be seen to be 0.118 hectares.

1.4.4 The proposed drainage scheme is shown on drawing 31269-D-02 contained in **Appendix F**. It is proposed that area of hardstanding will be constructed as a permeable paving with the roof areas from the 8 pods draining into it.

1.4.5 An infiltration rate of 0.204 m/hr has been taken for the purpose of the drainage design and a factor of safety of 2 applied.

1.4.6 Reference has been made to the Environment Agencies online mapping guidance for peak rainfall allowance for climate change and shows the site to be located within the Stour Management Catchment.

1.4.7 Given the proposed development is to have a design life beyond 2100, a 45% allowance for climate change needs to be considered in the design of the surface

water drainage system. This is based on the upper end allowance for the 2070's epoch.

1.4.8 Based on the above, both proposed drainage systems have been modelled using Windes to accommodate all return periods up to and including the 1 in 100 year + 45% climate change. Calculations are shown in **Appendix F**. The porous pavements have been designed to half drain within 24 hours.

Foul water drainage

1.4.9 A peak foul water flow of 0.275 l/s has been calculated for the development. This is based on the daily usage of 150 litres/person/day.

1.4.10 The development will be collected in a system of gravity sewers discharging into package treatment plant which will discharge to ground.

1.4.11 As stated in section 1.2.7 the nearest foul sewer is located approximately 300m to the south of the site. Environment Agency guidance states that connection via a package treatment plant is permitted if there is a public sewer within 30 x the number of proposed units. For this development this would be 240m (8 x 30m).

1.5 Maintenance

1.5.1 All the onsite drainage will remain under the control of the site owners who will be responsible for the ongoing maintenance.

1.6 Conclusions

1.6.1 The proposals comprise of a development of 8no. holiday units on Land South of The Den, Richborough, Dover, Kent.

1.6.2 The site is located within defended Flood Zone 3 and has a 1 in 200-year level of protection from tidal flooding and as such the residual risk of flooding from this source is considered low.

1.6.3 The site is not at risk from any other source of flooding.

1.6.4 Surface water for the site will drain via infiltration which will comprise of porous paving.

1.6.5 Foul drainage from the development will be via a system of gravity sewers into a package treatment plant which will discharge to ground.

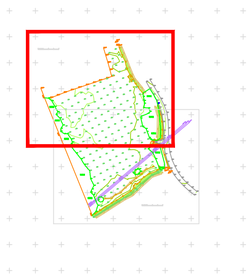
APPENDIX A

Topographical survey

NOTES:

The Coordinate System used is a Single Point Localisation based upon Ordnance Survey National Grid And Datum established using GNSS. and Ordnance Survey Active RINEX Data.
The requirement of Scale Factor for Ground measurements is eliminated

Contour intervals are 1.000m major and 0.200m minor.



REV	DATE	MODIFICATION

robotic positioning

land survey GNSS HDS site control setting-out terrain modelling analysis

North View, 11 Tudor Road, Folkestone, Kent CT19 4HJ
Mbl: +44(0)7834 770577
Email: robotic-positioning@ntlworld.com

PROJECT
THE DEN LEISURE PARK
RICHBOROUGH ROAD
SANDWICH

DRAWING TITLE
TOPOGRAPHICAL SURVEY 1 OF 2
ORIGINAL GROUND LEVELS
AS SURVEYED 22.04.2020

CLIENT
G. J. ELGAR CONSTRUCTION

GJ Elgar Construction Ltd.
306 Sandyhurst Lane, Ashford, TN25 4PD
Tel: 01233 623739

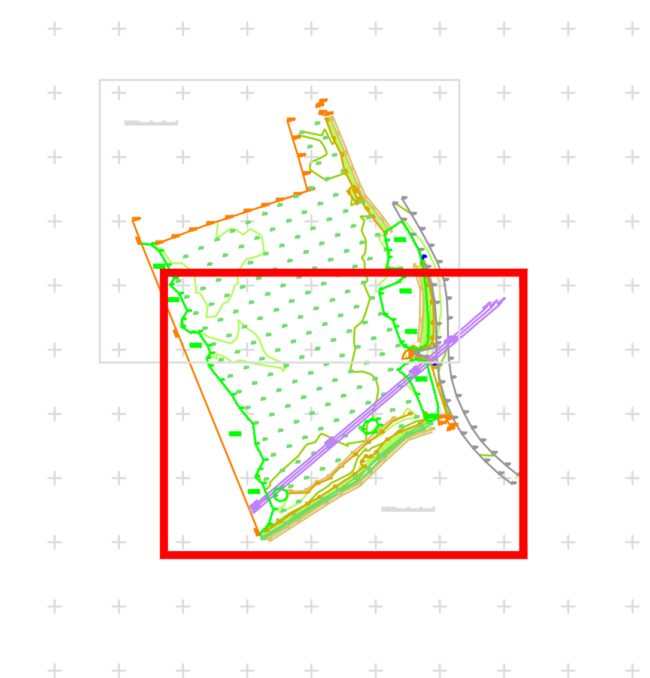
DRAWN	CHECKED
AM	AM
DATE	SCALE
23.04.2020	1:200@A1

DWG No.	REV
20014_000_01	OR

NOTES:

The Coordinate System used is a Single Point Localisation based upon Ordnance Survey National Grid And Datum established using GNSS. and Ordnance Survey Active RINEX Data.
The requirement of Scale Factor for Ground measurements is eliminated

Contour intervals are 1.000m major and 0.200m minor.



REV	DATE	MODIFICATION

robotic positioning

land survey GNSS HDS site control setting-out terrain modelling analysis

North View, 11 Tudor Road, Folkestone, Kent CT19 4HJ
Mbl: +44(0)7834 770577
Email: robotic-positioning@ntlworld.com

PROJECT

THE DEN LEISURE PARK
RICHBOROUGH ROAD
SANDWICH

DRAWING TITLE

TOPOGRAPHICAL SURVEY 2 OF 2
ORIGINAL GROUND LEVELS
AS SURVEYED 22.04.2020

CLIENT

G. J. ELGAR
CONSTRUCTION

GJ Elgar Construction Ltd.
306 Sandyhurst Lane, Ashford, TN25 4PD
Tel: 01233 623739

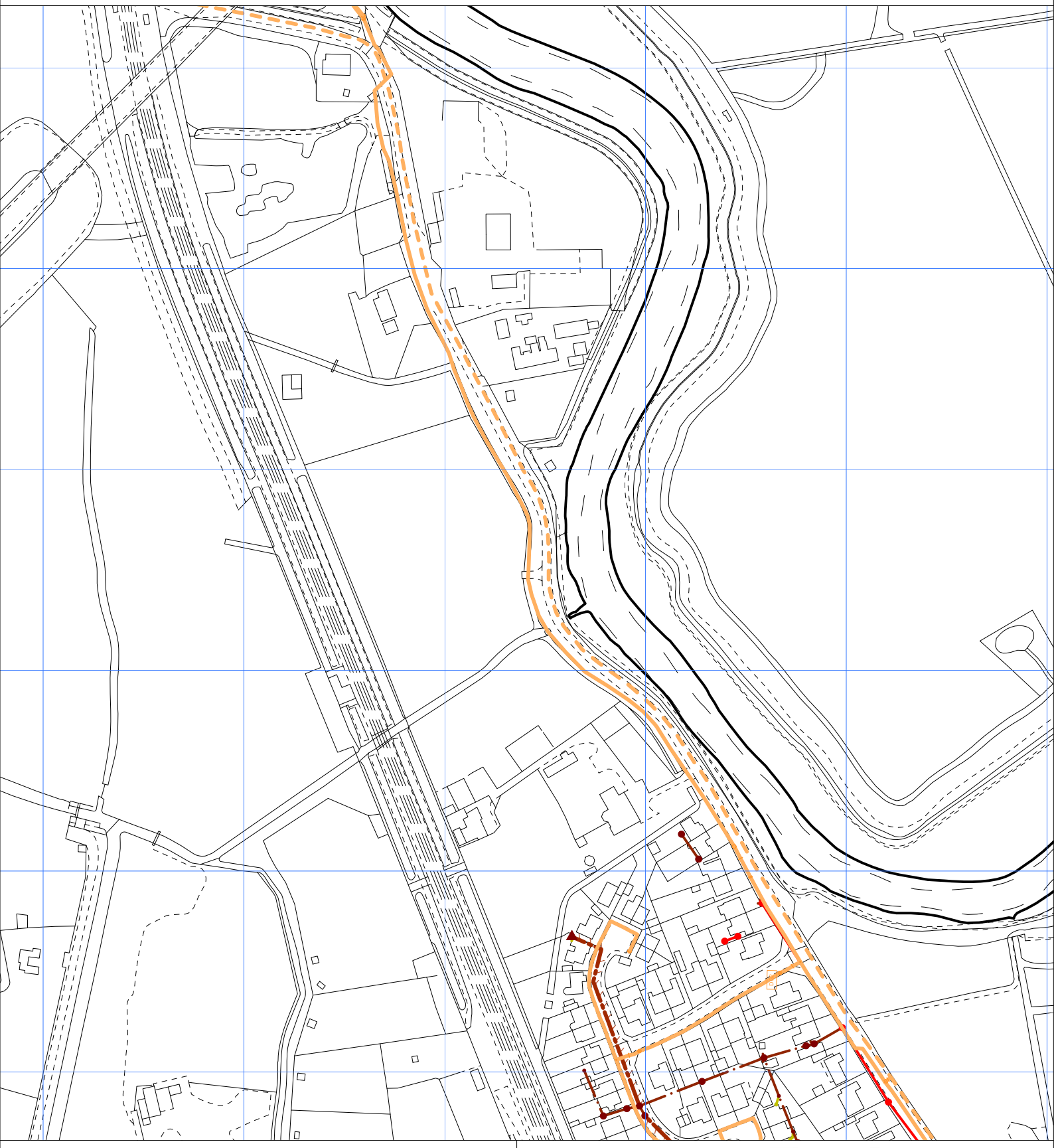
DRAWN	CHECKED
AM	AM
DATE	SCALE
23.04.2020	1:200@A1

DWG No.	REV
20014_000_02	OR

APPENDIX B

Southern Water Asset plans

SOUTHERN WATER



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 determined on site.

Southern Water

O.S. REF: TR3258NW	Scale: 1:2500	Printed By: kishoku	Date: 16-4-2021
Screen Print		Southern Water MapGuide Browser	
WARNING: BAC pipes are constructed of Bonded Asbestos Cement		Requested By:	
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement			

APPENDIX C

Infiltration Testing

650 litre of Water
47 From Start

Pit length 160cm
Pit Width 70 cm
pit depth 60 cm

max Water depth
60cm

Time (min)	Water depth from top pit	Depth of Water Start 60cm
5	37 cm	50 cm
10	43 cm	45 cm
15	48 cm	39 cm
20	52.5 cm	33 cm
25	56 cm	28 cm
30	58 cm	26 cm
40	61.5 cm	22.5 cm
50	65 cm	19 cm
60	67 cm	17 cm
90	73 cm	10 cm
120	78 cm	6 cm
150	84 cm	0 cm

Time	Top of pit	Depth 60cm
5	38	51
10	43	45
15	49	40
20	52	33
25	56	28
30	59	25
40	61	22
50	65	19
60	67	17
90	73	10
120	79	5
150	84	0

Interpretation of soakage test

Client test

Date 03-11-20
By MN

PIT ONE **Test TWO** TEST RESULTS PROV DED BY CLIENT

RATE CALCULATED BASED ON 25% - 75% WATER DROP OF EFFECTIVE DEPTH OF PIT IN ACCORDANCE WITH BRE365 GUIDANCE

pit length (m)	1 60
pit width (m)	0.70
pit depth (m)	0 60
max water depth (m)	0.600
water volume (m3)	0.672
assuming pit is square, then pit wetted areas are:	
base	1.120
sides	**1.920**
ends	**0.840**
Total wetted area	3.880

Ap50 =Base area + (side area + end area / 2)
Volume = Effective depth x length x width
Vp25 = Volume x 0.25
Vp75 = Volume x 0.75

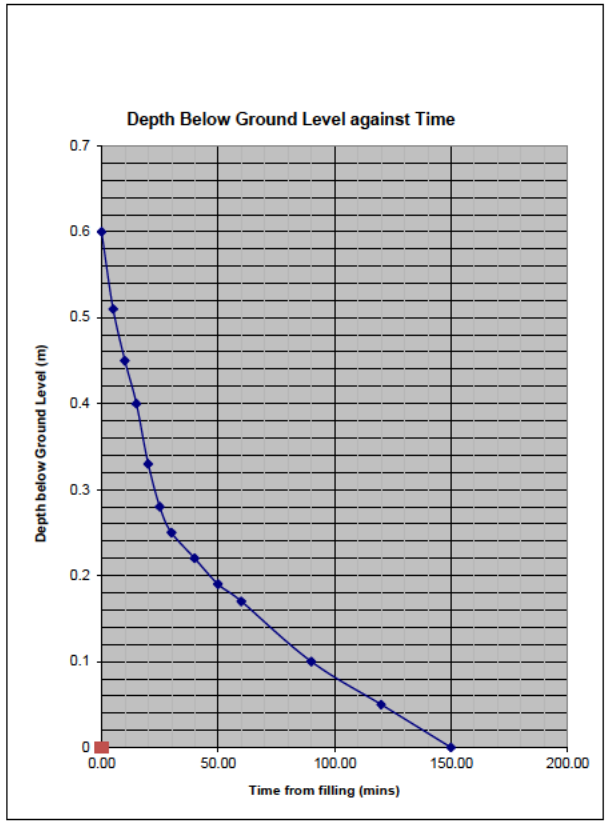
If water drop does not achieve 25% - 75% of pit depth then test does not comply with BRE365 requirements

a_{p50}	1 520
V_{p75}	0 504
V_{p25}	0.168
V_{p75-25}	0 336

effective depth	**0.60**
D_{p25}	0.45
D_{p75}	0.15
t_{p25}	10.000
t_{p75}	75.000

effective area of loss	effective volume between 75% and 25% effective depth	time for water to fall from 75% to 25% effective depth	**Soil Infiltration Rate, m/s**
a_{p50}	V_{p75-25}	t_{p75-25}	
1.520	**0.336**	**3900**	**5.67E-05**
m^2	m^3	s	
			m/h
			0.204

Time (mins)	depth of water
0.00	0.6
5.00	0.51
10.00	0.45
15.00	0.4
20.00	0.33
25.00	0.28
30.00	0.25
40.00	0.22
50.00	0.19
60.00	0.17
90.00	0.1
120.00	0.05
150.00	0



[redacted]

Interpretation of soakage test

Client test

Date 03-11-20
By MN

PIT ONE **Test ONE** TEST RESULTS PROV DED BY CLIENT

RATE CALCULATED BASED ON 25% - 75% WATER DROP OF EFFECTIVE DEPTH OF PIT IN ACCORDANCE WITH BRE365 GUIDANCE

pit length (m)	1 60
pit width (m)	0.70
pit depth (m)	0 60
max water depth (m)	0.600
water volume (m3)	0.672
assuming pit is square, then pit wetted areas are:	
base	1.120
sides	**1.920**
ends	**0.840**
Total wetted area	3.880

Ap50 =Base area + (side area + end area / 2)
Volume = Effective depth x length x width
Vp25 = Volume x 0.25
Vp75 = Volume x 0.75

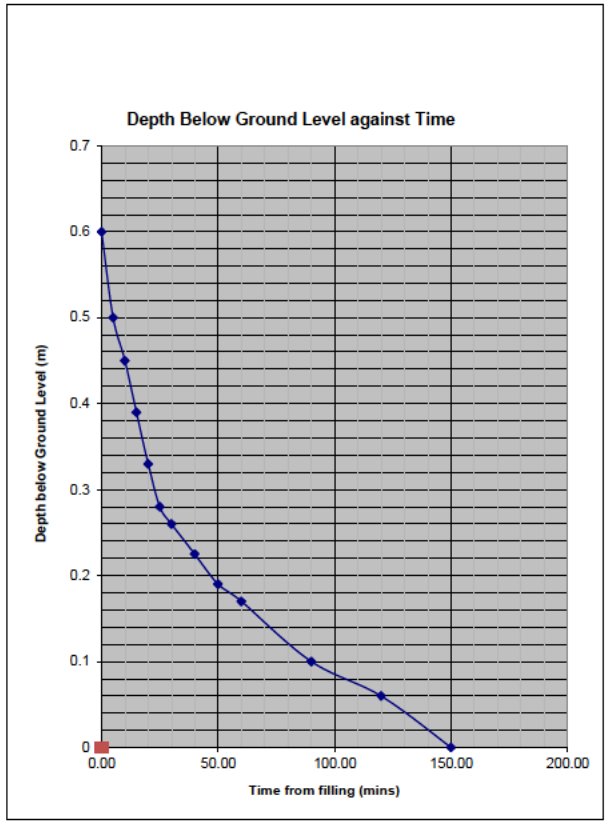
If water drop does not achieve 25% - 75% of pit depth then test does not comply with BRE365 requirements

a_{p50}	1 520
V_{p75}	0 504
V_{p25}	0.168
V_{p75-25}	0 336

effective depth	**0.60**
D_{p25}	0.45
D_{p75}	0.15
t_{p25}	10.000
t_{p75}	75.000

effective area of loss	effective volume between 75% and 25% effective depth	time for water to fall from 75% to 25% effective depth	**Soil Infiltration Rate, m/s**
a_{p50}	V_{p75-25}	t_{p75-25}	
1.520	**0.336**	**3900**	**5.67E-05**
m^2	m^3	s	
			m/h
			0.204

Time (mins)	depth of water
0.00	0.6
5.00	0.5
10.00	0.45
15.00	0.39
20.00	0.33
25.00	0.28
30.00	0.26
40.00	0.225
50.00	0.19
60.00	0.17
90.00	0.1
120.00	0.06
150.00	0



APPENDIX D

Proposed Site Plan

Agricultural Land

Proposed Exit

Refuse Store

Open fronted Cycle store with 8No. spaces

5No. EV Charging Pods to Serve 10No. Parking Spaces

Mud

MHW

Existing Access to Site to be Retained

MP 85.5

Sluice

Mean High Water

RICHBOROUGH ROAD

Richborou...

95m of Proposed footway on Richborough Road constructed of tarmac at a width of 1.5m

MLWS

Ward Bdy

Agricultural Land

CS

RICHBOROUGH ROAD

Proposed Site Layout Plan
1:500 @ A2

0 5 10 15 20 25
Metres (1:500)

N

Site Area: 0.65 Ha

- Application Boundary
- Approximate Location of Existing Tree
- Approximate Location of Existing Hedgerow
- Proposed Native Hedgerows
- Proposed Trees
- EVC Proposed Vehicle Charging

Rev: Reason: Date:

Client:
TERRAFORTE, MS L

Project:
LAND SOUTH OF THE DEN,
RICH BOROUGH ROAD, SANDWHICH, CT13 9JG

Title:
PROPOSED SITE LAYOUT PLAN

Drawing No:	Rev:	Scale:	Date:
DHA/31158/03		1:500	OCT 2023

Eclipse House, Eclipse Park, Sittingbourne Road
Maidstone, Kent, ME14 3EN
t: 01622 776226 f: 01622 776227
e: info@dhaplanning.co.uk w: www.dhaplanning.co.uk

CAD Reference: DHA_31158_LAND SOUT OF THE DEN_MC01 A2

APPENDIX E

E A Flood map

Product 4 (Detailed Flood Risk) for: The Den, Richborough Road, Sandwich,CT13 9JG
Requested by: Lauren Adams of Terraforte
Reference: KSL 141673 KB
Date: 20 September 2019

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made to the data for this location. Should you contact us again, after a period of time, please quote the above reference in order to help us deal with your query.

Please refer to the Open Government Licence which explains the permitted use of this information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood Map Confirmation

Environment Agency

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from fluvial and tidal flooding. The floodplain is specifically mapped ignoring the presence and effects of flood defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be overtopped or breached during a flood event.

The Flood Map shows the probability of a flood of a particular magnitude, or greater, occurring in any given year. This is known as the Annual Exceedance Probability (AEP). Flood Zone 3 indicates areas of land having a 1 in 100 or greater annual probability (1% AEP) of flooding from rivers, or a 1 in 200 or greater annual probability (0.5% AEP) of flooding from the sea. Flood Zone 2 indicates areas of land having up to a 1 in 1000 annual probability (0.1% AEP) of flooding from rivers or the sea. The Flood Map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time of completion, taking into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at https://flood-map-for-planning.service.gov.uk/.

At this Site:

The Flood Map shows that this site lies within the outline of the 0.5% (Flood Zone 3) chance of flooding from the sea in any given year.

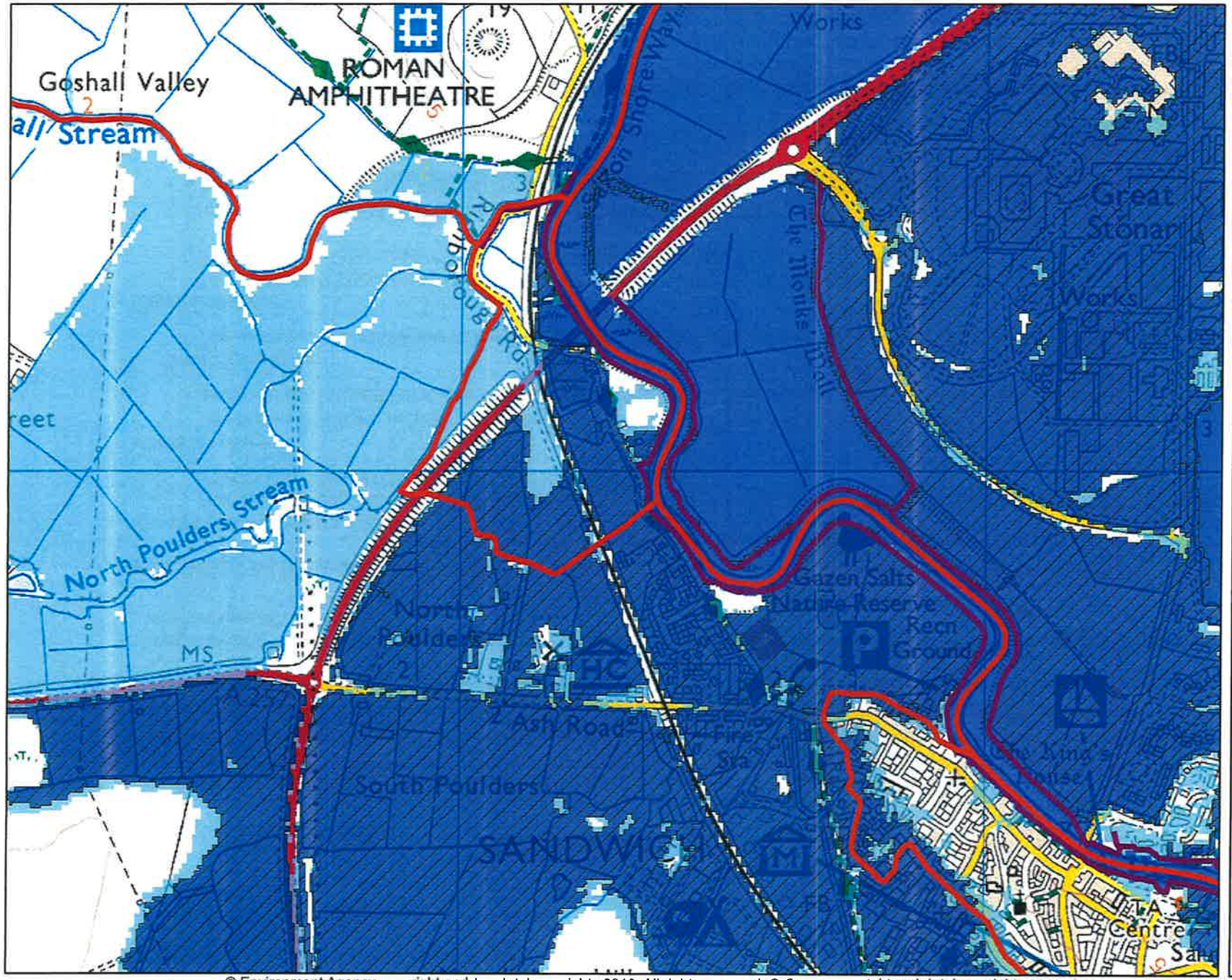
Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed tidal modelling of the East Kent Coast, completed by JBA Consulting in 2018. The Flood Zones produced by this model are made up of the combined risk from the defended and undefended scenarios to capture the full risk from still water and wave overtopping.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood map centred on The Den, Richborough road, Sandwich,CT13 9JG
Created 20 September 2019 [Ref: KSL 141673 KB]



Environment Agency

N

Legend

- Main River
- Flood Defences
- Flood Storage Areas
- Areas Benefiting from Flood Defences
- 1% AEP Fluvial 0.5% AEP Tidal
- 0.1% AEP Flooding

Annual Exceedance Probability (AEP). The probability of a flood of a particular magnitude, or greater, occurring in any given year.

Scale 1:10,000

0 250 500

Metres

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Model Output Data

You have requested flood levels and depths for various return periods at this location.

A 2D TuFLOW model has been used to represent the floodplain as a grid. The flood water levels and/or depths have been calculated for each grid cell. The modelled flood levels / depths presented here are for the closest most appropriate model grid cells. Any additional information you may need to know about the modelling from which they are derived and any specific health warnings for their use are set out below.

A map showing the location of the points from which the data is taken is enclosed. Please refer to the Open Government Licence which explains the permitted use of this information.

East Kent Coast tidal mapping and data

Coastal flood boundary data set

The extreme sea levels used in the model were derived from the 'Coastal flood boundary conditions for UK mainland and islands' (*Defra; SEPA; The Scottish Government; Environment Agency*, 2011.)

Model limitations

The flood inundation model has not considered infiltration losses into the ground. Additionally, no surface water drainage systems or sewer networks are included in the model. All wave overtopping calculations assume a static beach profile.

Undefended outputs

The undefended model scenarios are still water only and did not include any inflow boundaries for wave overtopping.

Climate change

The 0.5% AEP climate change scenarios projected to 2070 and 2115 were modelled using National Planning Policy Framework (NPPF) guidance. The increases in sea level are shown in the table below.

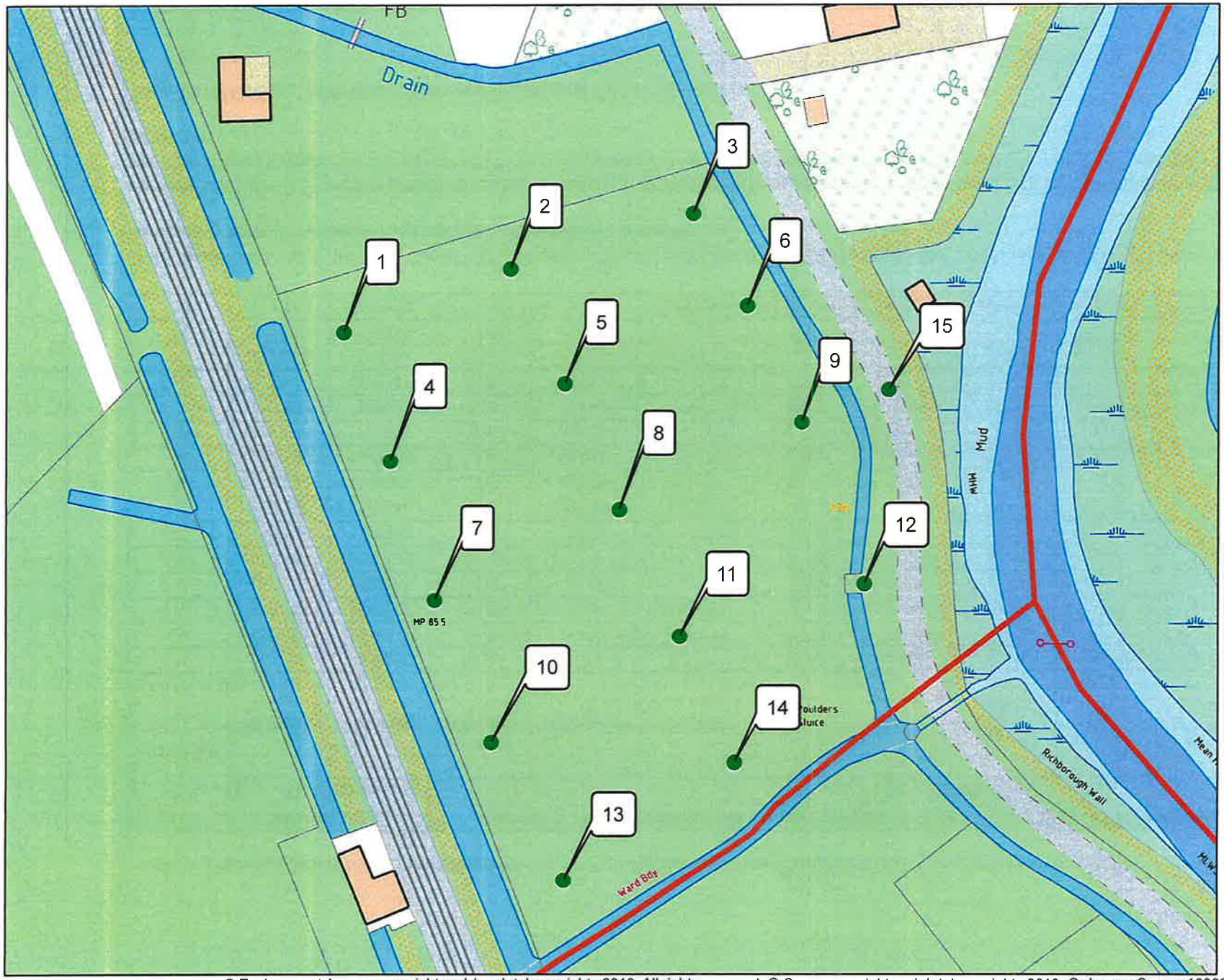
NPPF sea level rise (SLR) estimates, metres per year (2008 base year)

Guidance	SLR projected to 2070	SLR projected to 2115
NPPF	0.521	1.166

In addition to sea level rise, the model applied an increase of 10% to both offshore wind speed and wave height for the 2070 and 2115 epochs. This is in line with NPPF guidance.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Data points map centred on The Den, Richborough road, Sandwich,CT13 9JG
Created 20 September 2019 [Ref: KSL 141673 KB]



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Table 1: Modelled undefended tidal flood levels for Annual Exceedance Probability (AEP) events shown (mAOD)

Point ID	National Grid Reference		Modelled Tidal Flood Levels for Annual Exceedance Probability (AEP) events shown (metres AOD)									
			Undefended									
	Easting	Northing	20% AEP	10% AEP	5% AEP	3.33% AEP	2% AEP	1.33% AEP	0.5% AEP	0.1% AEP	0.5% AEP + CC (2070)	0.5% AEP + CC (2115)
1	632243	158995	0.00	1.88	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
2	632274	159007	0.00	1.88	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
3	632309	159017	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.75	5.27
4	632252	158971	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
5	632285	158985	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
6	632320	159000	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
7	632260	158944	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.28
8	632295	158961	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
9	632330	158978	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.27
10	632271	158917	0.00	0.00	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.28
11	632307	158937	0.00	2.04	2.27	2.39	2.68	2.79	3.05	3.44	3.76	5.28
12	632342	158947	0.00	0.00	0.00	0.00	2.68	2.79	3.05	3.44	3.76	5.26
13	632285	158891	0.00	0.00	2.27	2.38	2.68	2.79	3.05	3.44	3.76	5.30
14	632317	158913	0.00	2.08	2.28	2.39	2.68	2.79	3.05	3.44	3.76	5.28
15	632347	158984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.44	3.76	5.26

Data taken from the East Kent Coast Tidal Mapping Study, completed by JBA Consulting in 2018. Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

Climate change (CC) data represents modelled levels and depths with an allowance for sea level rise for the years specified. In addition to sea level rise, the model applied an increase of 10% to both offshore wind speed and wave height for the 2070 and 2115 epochs. This is in line with NPPF guidance.

See Model Output Data section for health warnings and further information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Table 2: Modelled defended tidal flood levels for Annual Exceedance Probability (AEP) events shown (mAOD)

Point ID	National Grid Reference		Modelled Tidal Flood Levels for Annual Exceedance Probability (AEP) events shown (metres AOD)									
			Defended									
	Easting	Northing	20% AEP	10% AEP	5% AEP	3.33% AEP	2% AEP	1.33% AEP	0.5% AEP	0.1% AEP	0.5% AEP + CC (2070)	0.5% AEP + CC (2115)
1	632243	158995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
2	632274	159007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
3	632309	159017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
4	632252	158971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.93
5	632285	158985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
6	632320	159000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
7	632260	158944	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
8	632295	158961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
9	632330	158978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
10	632271	158917	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
11	632307	158937	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
12	632342	158947	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.88
13	632285	158891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.91
14	632317	158913	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92
15	632347	158984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.32

Data taken from the East Kent Coast Tidal Mapping Study, completed by JBA Consulting in 2018. Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

Climate change (CC) data represents modelled levels and depths with an allowance for sea level rise for the years specified. In addition to sea level rise, the model applied an increase of 10% to both offshore wind speed and wave height for the 2070 and 2115 epochs. This is in line with NPPF guidance.

See Model Output Data section for health warnings and further information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Environment Agency

Table 3: Modelled undefended tidal flood depths for Annual Exceedance Probability (AEP) events shown (m)

Point ID	National Grid Reference		Modelled Tidal Flood Depths for Annual Exceedance Probability (AEP) events shown (metres)									
			Undefended									
	Easting	Northing	20% AEP	10% AEP	5% AEP	3.33% AEP	2% AEP	1.33% AEP	0.5% AEP	0.1% AEP	0.5% AEP + CC (2070)	0.5% AEP + CC (2115)
1	632243	158995	0.00	0.05	0.44	0.56	0.85	0.97	1.22	1.61	1.93	3.45
2	632274	159007	0.00	0.00	0.35	0.48	0.77	0.88	1.14	1.53	1.85	3.36
3	632309	159017	0.00	0.00	0.27	0.32	0.61	0.72	0.98	1.37	1.68	3.20
4	632252	158971	0.00	0.00	0.36	0.52	0.81	0.92	1.18	1.57	1.89	3.40
5	632285	158985	0.00	0.00	0.38	0.50	0.79	0.91	1.16	1.55	1.87	3.38
6	632320	159000	0.00	0.00	0.44	0.35	0.64	0.75	1.01	1.40	1.72	3.23
7	632260	158944	0.00	0.00	0.30	0.43	0.72	0.83	1.09	1.48	1.80	3.32
8	632295	158961	0.00	0.00	0.34	0.46	0.75	0.86	1.12	1.51	1.83	3.34
9	632330	158978	0.00	0.00	0.12	0.16	0.45	0.56	0.82	1.21	1.53	3.04
10	632271	158917	0.00	0.00	0.29	0.40	0.69	0.81	1.07	1.46	1.78	3.29
11	632307	158937	0.00	0.02	0.26	0.37	0.66	0.77	1.03	1.42	1.74	3.26
12	632342	158947	0.00	0.00	0.00	0.00	0.35	0.47	0.72	1.11	1.43	2.94
13	632285	158891	0.00	0.00	0.12	0.23	0.52	0.64	0.89	1.29	1.61	3.14
14	632317	158913	0.00	0.02	0.21	0.32	0.61	0.73	0.98	1.37	1.70	3.21
15	632347	158984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.87	2.38

Data taken from the East Kent Coast Tidal Mapping Study, completed by JBA Consulting in 2018. Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

Climate change (CC) data represents modelled levels and depths with an allowance for sea level rise for the years specified. In addition to sea level rise, the model applied an increase of 10% to both offshore wind speed and wave height for the 2070 and 2115 epochs. This is in line with NPPF guidance.

See Model Output Data section for health warnings and further information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Table 4: Modelled defended tidal flood depths for Annual Exceedance Probability (AEP) events shown (m)

Point ID	National Grid Reference		Modelled Tidal Flood Depths for Annual Exceedance Probability (AEP) events shown (metres)									
			Defended									
	Easting	Northing	20% AEP	10% AEP	5% AEP	3.33% AEP	2% AEP	1.33% AEP	0.5% AEP	0.1% AEP	0.5% AEP + CC (2070)	0.5% AEP + CC (2115)
1	632243	158995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.11
2	632274	159007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02
3	632309	159017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.85
4	632252	158971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06
5	632285	158985	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04
6	632320	159000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88
7	632260	158944	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96
8	632295	158961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.99
9	632330	158978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69
10	632271	158917	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
11	632307	158937	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.91
12	632342	158947	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56
13	632285	158891	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76
14	632317	158913	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.85
15	632347	158984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11

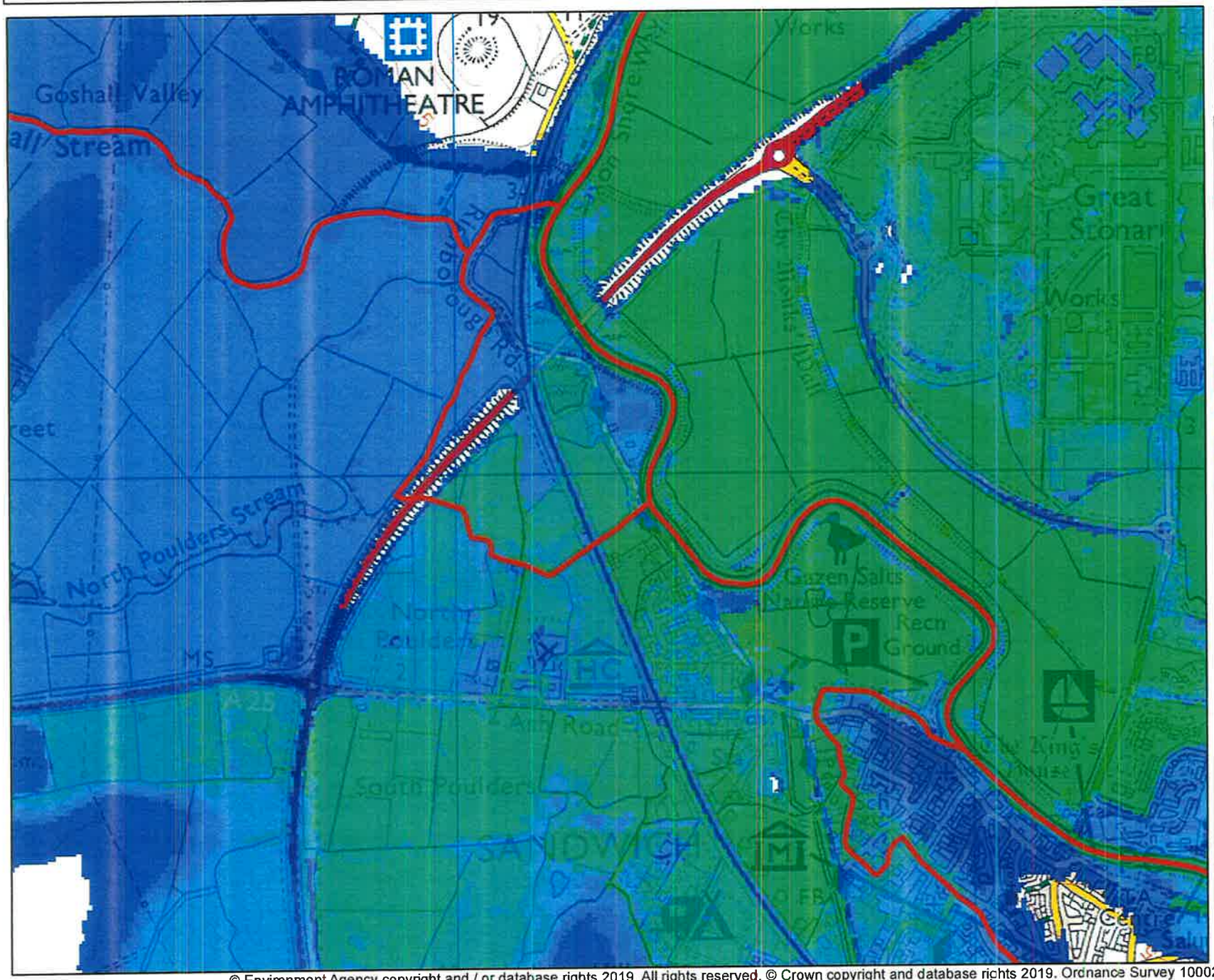
Data taken from the East Kent Coast Tidal Mapping Study, completed by JBA Consulting in 2018. Values of 0.00 indicate locations at which the selected points lie outside of a particular modelled flood extent.

Climate change (CC) data represents modelled levels and depths with an allowance for sea level rise for the years specified. In addition to sea level rise, the model applied an increase of 10% to both offshore wind speed and wave height for the 2070 and 2115 epochs. This is in line with NPPF guidance.

See Model Output Data section for health warnings and further information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Undefended tidal flood extents map centred on The Den, Richborough road, Sandwich,CT13 9JG
Created 20 September 2019 [Ref: KSL 141673 KB]



Environment Agency

N

Legend

Main River

Undefended Tidal Flood Extents

- 20% AEP
- 10% AEP
- 5% AEP
- 3.33% AEP
- 2% AEP
- 1.33% AEP
- 0.5% AEP
- 0.1% AEP
- 0.5% AEP + CC (2070)
- 0.5% AEP + CC (2115)

Annual Exceedance Probability (AEP). The probability of a flood of a particular magnitude, or greater, occurring in any given year.

Climate Change (CC) extents based on modelled flood extents with an allowance for sea level rise, for the years specified.

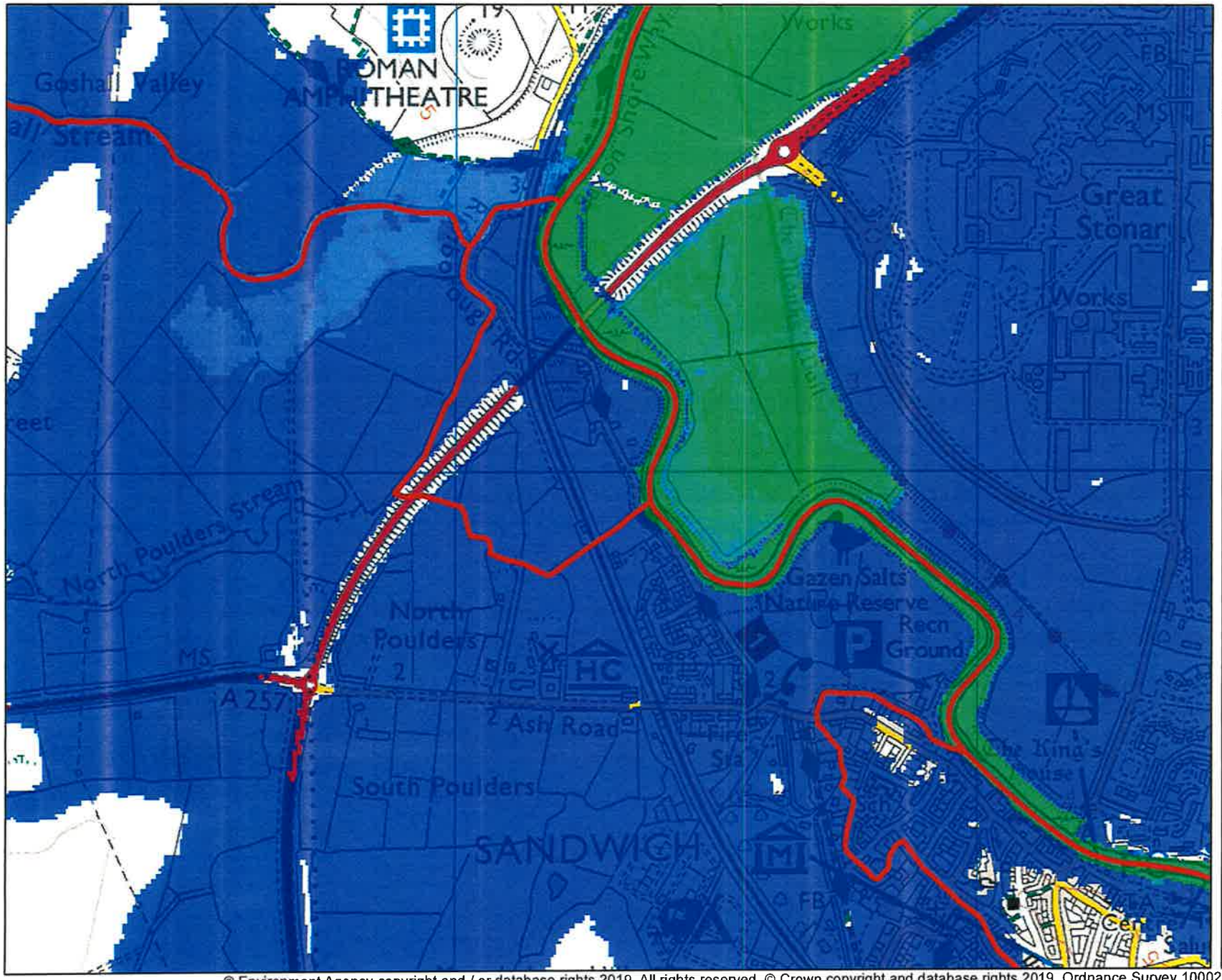
Scale 1:10,000

0 250 500

Metres

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Defended tidal flood extents map centred on The Den, Richborough road, Sandwich,CT13 9JG
Created 20 September 2019 [Ref: KSL 141673 KB]



Environment Agency

N

Legend

Main River

Defended Tidal Flood Extents

- 20% AEP
- 10% AEP
- 5% AEP
- 3.33% AEP
- 2% AEP
- 1.33% AEP
- 0.5% AEP
- 0.1% AEP
- 0.5% AEP + CC (2070)
- 0.5% AEP + CC (2115)

Annual Exceedance Probability (AEP). The probability of a flood of a particular magnitude, or greater, occurring in any given year.

Scale 1:10,000

0 250 500

Metres

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Defence Details

Following the Pegwell Bay to Kingsdown Coastal Defence Strategy (2008), the Environment Agency developed a flood defence scheme to provide a 1 in 200 year standard of protection to 488 homes and 94 commercial properties in Sandwich. The scheme will also protect other key assets including Discovery Park, valuable infrastructure such as the main coastal access routes and key tourist and employment areas.
The Sandwich Town Tidal Defence Scheme consists of 16 sections of defence around the River Stour. The works included:

- a new tidal flood storage area outside of the town at Broadsalts;
- 14km of flood walls and embankments of varying heights (between 0.5m and 1.2m in town) on both banks of the River Stour;
- a 1m high flood wall at Sandwich Quay.

Areas Benefiting from Flood Defences

This site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Historic Flood Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site are provided below and in the enclosed map.

Dates of historic flood events in this area – January 1978, November 2000, and February 2001.

Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

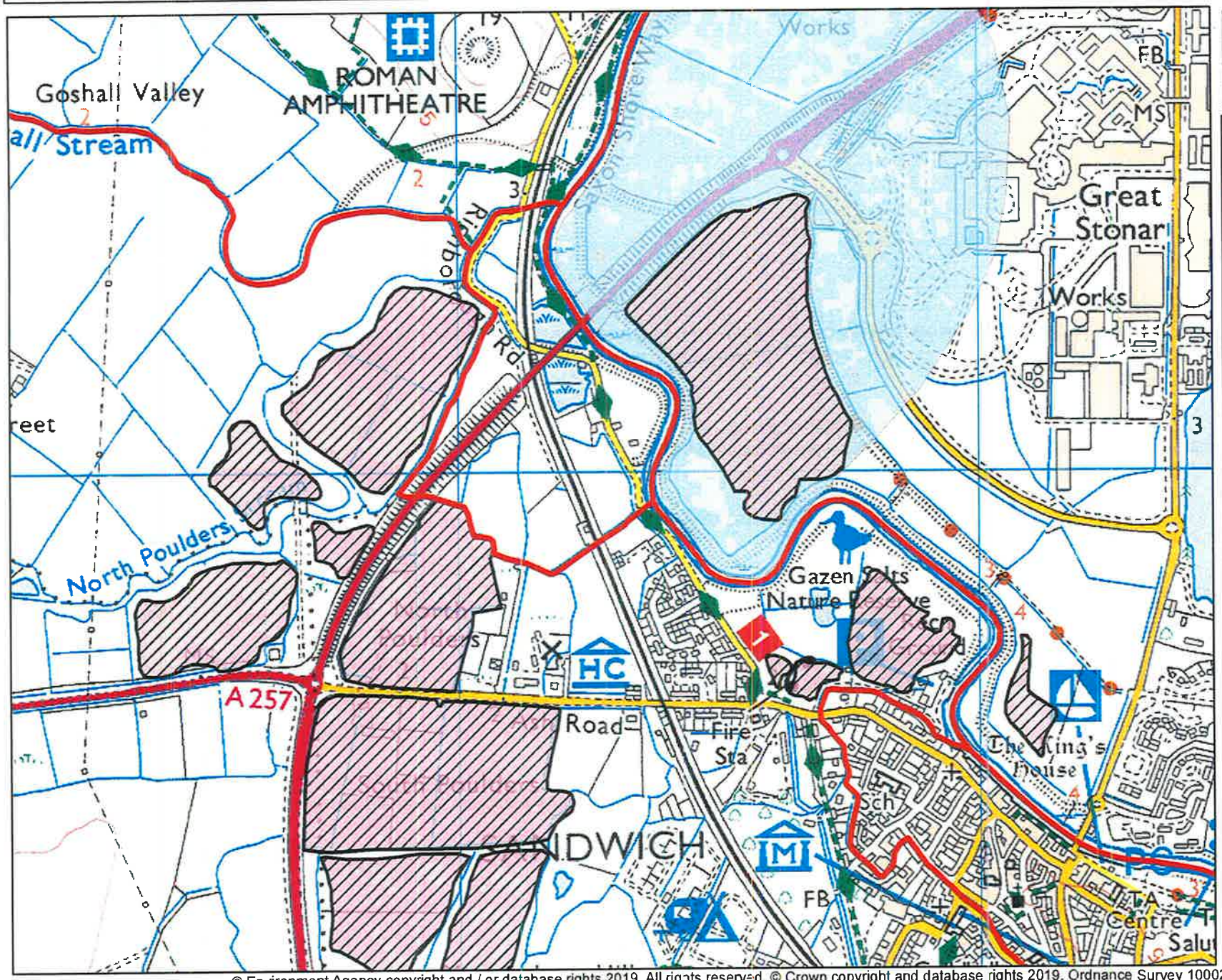
Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system)
- overflowing or backing up of sewer or drainage systems which have been overwhelmed
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Historic flood extents map centred on The Den, Richborough road, Sandwich,CT13 9JG
Created 20 September 2019 [Ref: KSL 141673 KB]



Environment Agency

N

Legend

- Main River
- Nov 2000
- Feb 2001
- Jan 1978

Scale 1:10,000

0 250 500

Metres

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Additional Information

Information Warning - OS background mapping

The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.

Planning advice and guidance

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Complete the form in the link and email back to kslplanning@environment-agency.gov.uk.

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Flood Risk Assessments Guidance

Flood risk standing advice for applicants

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

https://www.gov.uk/flood-risk-assessment-standing-advice

http://planningguidance.planningportal.gov.uk/

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

https://www.gov.uk/guidance/flood-risk-and-coastal-change

You should also consult the Strategic Flood Risk Assessment and flood risk local plan policies produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. You should discuss surface water management with your Lead Local Flood Authority.
3. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection due to insufficient information

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Your Lead Local Flood Authority have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

Product 8

Breach scenarios were modelled for eleven locations along the East Kent coast. These locations are listed in the table below.

Breach Location	Defence Type	Flood source	Breach Width (m)	Breach time (hrs)	Model method	Water Level trigger	Est. Breach start (T50)	Est. Breach end (T50)	Model start	Model end	Model run time (hrs)	Tidal cycles
Whitstable Tennis Courts	Reinforced concrete walkway	Open coast	50m	44	Breach when occurs during lead up to peak tide, when WL is half of defence level	2.405	81.83	125.83	79.00	128.50	49.50	4
Whitstable Harbour street	Reinforced concrete walkway	Open coast	50m	44	Breach when occurs during lead up to peak tide, when WL is half of defence level	2.940	82.25	126.25	79.00	128.50	49.50	4
Whitstable Quay flood gate (next to harbour office)	Flood gate	Open coast	10m (gate width)	37	Flood gate open for all 3 tidal cycles (simulating operating failure)	n/a	66.75	103.75	66.75	103.75	37.00	3
Northern Sea Wall Groyne Bay 3	Earth embankment	Open coast	200m	56	Breach when occurs during lead up to peak tide, when WL is half of defence level	3.100	82.50	138.50	79.00	141.00	62.00	5
Northern Sea Wall Groyne Bay 9	Earth embankment	Open coast	200m	56	Breach when occurs during lead up to peak tide, when WL is half of defence level	3.075	82.50	138.50	79.00	141.00	62.00	5
Margate Flood gate	Flood gate	Open coast	10m (gate width)	37	flood gate open for all 3 tidal cycles (simulating operating failure)	n/a	66.75	103.75	66.75	103.75	37.00	3
Sandwich Gazen Salts car park	Flood wall	Estuary/Tidal River	20m	18	Breach when occurs during lead up to peak tide, when WL is half of defence level	2.090	82.17	100.17	79.00	103.75	24.75	2

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

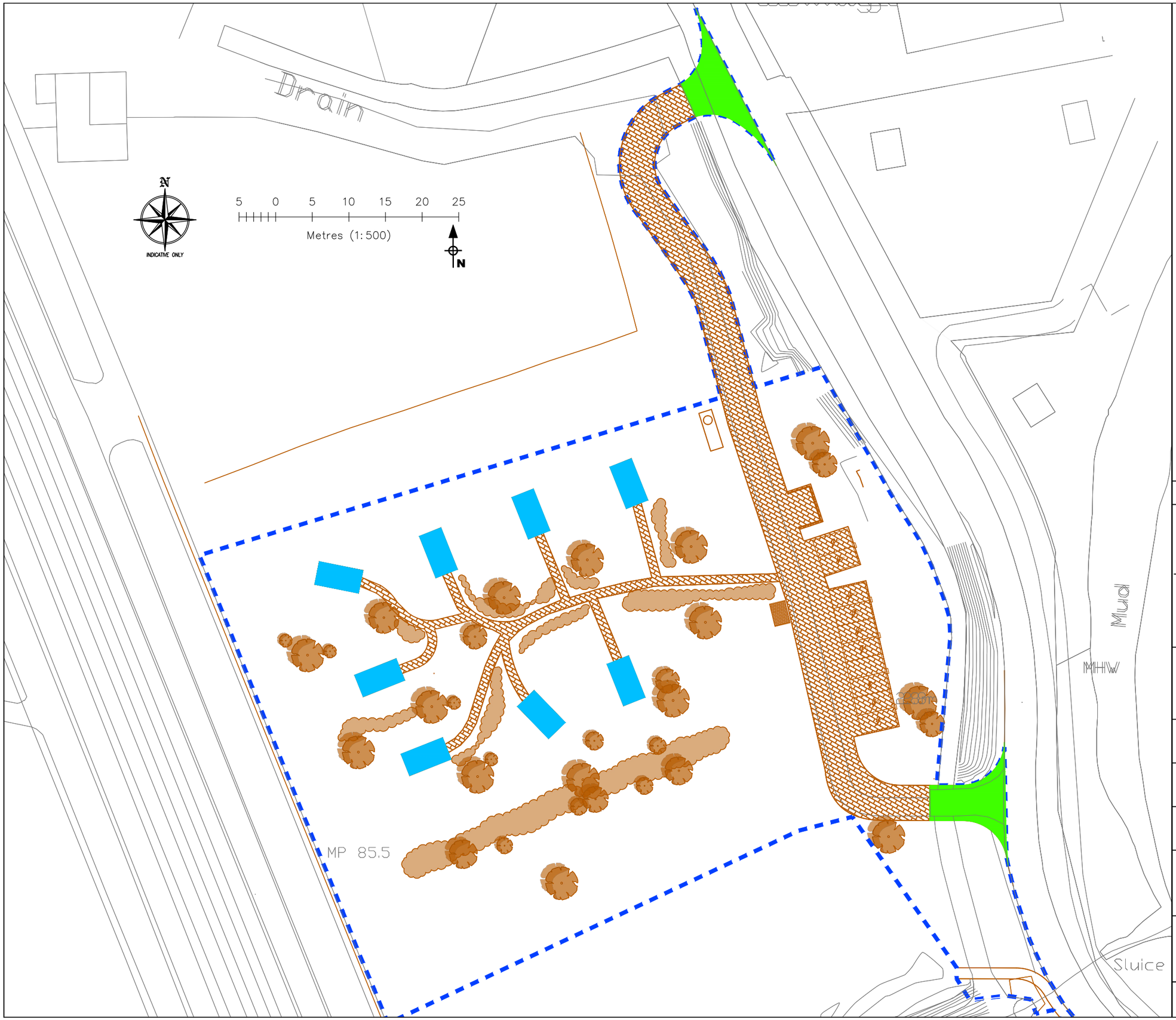
Breach Location	Defence Type	Flood source	Breach Width (m)	Breach time (hrs)	Model method	Water Level trigger	Est. Breach start (T50)	Est. Breach end (T50)	Model start	Model end	Model run time (hrs)	Tidal cycles
Sandwich Strand Street	Flood wall	Estuary/Tidal River	20m	18	Breach when occurs during lead up to peak tide, when WL is half of defence level	2.075	82.08	100.08	79.00	103.75	24.75	2
Sandwich Quay	Flood wall	Estuary/Tidal River	20m	18	Breach when occurs during lead up to peak tide, when WL is half of defence level	2.100	82.17	100.17	79.00	103.75	24.75	2
Sandwich Estate	Earth embankment	Open coast	200m	56	Breach when occurs during lead up to peak tide, when WL is half of defence level	3.340	82.67	138.67	79.00	141.00	62.00	5
Embankment North Sandown Castle	Earth embankment	Open coast	200m	56	Breach when occurs during lead up to peak tide, when WL is half of defence level	3.340	82.67	138.67	79.00	141.00	62.00	5

Your site does not fall within the extent of these breaches.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Email: kslenquiries@environment-agency.gov.uk

APPENDIX F

Proposed Drainage Strategy Drawings and Calculations



DO NOT SCALE

Notes:

- This drawing has been prepared in accordance with the scope of DHA's appointment with its client and is subject to the terms and conditions of that appointment. DHA accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
- If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
- Where applicable Ordnance Survey (c) Crown Copyright 2022 All rights reserved. Licence Number 100031961.

Site Area	- 0.652ha
Proposed Roof Area	- 0.015ha
Proposed Hardstaniding Area	- 0.013ha
Proposed Area of Porous Paving	- 0.090ha
Total Impermeable Area	- 0.118ha

REV	DATE	BY	DESCRIPTION	CHK	APD
P1	11.10.23	CS	First Issue	CS	CS

client

TERRAFORTE

project

LAND SOUTH OF THE DEN
RICHBOROUGH

title

PROPOSED IMPERMEABLE AREAS

project	drwg	rev
31269	D-01	P1

Drawn	Checked	Approved	scale @ A3	date
CS	CS	CS	1:500	11.10.23

status: FOR INFORMATION — P

Eclipse House, Eclipse Park. Sittingbourne Road
Maidstone, Kent. ME14 3EN
t: 01622 776226 f: 01622 776227
e: info@dhaplanning.co.uk w: www.dhaplanning.co.uk

CAD Reference: A3

DO NOT SCALE

Notes:

- This drawing has been prepared in accordance with the scope of DHA's appointment with its client and is subject to the terms and conditions of that appointment. DHA accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
- If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
- Where applicable Ordnance Survey (c) Crown Copyright 2022 All rights reserved. Licence Number 100031961.

REV	DATE	BY	DESCRIPTION	CHK	APD
P1	11.10.23	CS	First Issue	CS	CS

client

TERRAFORTE

project

LAND SOUTH OF THE DEN
RICHBOROUGH

title

PROPOSED DRAINAGE PLAN

project	drwg	rev
31269	D-02	P1

Drawn	Checked	Approved	scale @ A3	date
CS	CS	CS	1:500	11.10.23

status: FOR INFORMATION — P

Eclipse House, Eclipse Park. Sittingbourne Road
Maidstone, Kent. ME14 3EN
t: 01622 776226 f: 01622 776227
e: info@dhaplanning.co.uk w: www.dhaplanning.co.uk

CAD Reference: A3

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 11 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	1.594	0.094	25.0	25.4	O K
30 min Summer	1.607	0.107	25.0	28.8	O K
60 min Summer	1.599	0.099	25.0	26.6	O K
120 min Summer	1.569	0.069	25.0	18.7	O K
180 min Summer	1.550	0.050	25.0	13.5	O K
240 min Summer	1.543	0.043	21.4	11.5	O K
360 min Summer	1.533	0.033	16.4	8.8	O K
480 min Summer	1.527	0.027	13.6	7.3	O K
600 min Summer	1.523	0.023	11.6	6.2	O K
720 min Summer	1.520	0.020	10.1	5.4	O K
960 min Summer	1.516	0.016	8.1	4.4	O K
1440 min Summer	1.512	0.012	5.9	3.2	O K
2160 min Summer	1.509	0.009	4.4	2.3	O K
2880 min Summer	1.507	0.007	3.4	1.8	O K
4320 min Summer	1.505	0.005	2.4	1.3	O K
5760 min Summer	1.504	0.004	1.9	1.1	O K
7200 min Summer	1.503	0.003	1.6	0.9	O K
8640 min Summer	1.503	0.003	1.4	0.7	O K
10080 min Summer	1.503	0.003	1.4	0.7	O K
15 min Winter	1.609	0.109	25.0	29.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	192.260	0.0	14
30 min Summer	124.873	0.0	22
60 min Summer	76.528	0.0	40
120 min Summer	45.025	0.0	70
180 min Summer	32.838	0.0	98
240 min Summer	26.190	0.0	128
360 min Summer	18.990	0.0	188
480 min Summer	15.094	0.0	248
600 min Summer	12.621	0.0	308
720 min Summer	10.899	0.0	368
960 min Summer	8.640	0.0	490
1440 min Summer	6.218	0.0	734
2160 min Summer	4.466	0.0	1100
2880 min Summer	3.528	0.0	1428
4320 min Summer	2.529	0.0	2204
5760 min Summer	1.999	0.0	2936
7200 min Summer	1.666	0.0	3624
8640 min Summer	1.436	0.0	4344
10080 min Summer	1.266	0.0	5120
15 min Winter	192.260	0.0	15

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	1.620	0.120	25.0	32.4	O K
60 min Winter	1.603	0.103	25.0	27.8	O K
120 min Winter	1.558	0.058	25.0	15.6	O K
180 min Winter	1.542	0.042	21.2	11.4	O K
240 min Winter	1.535	0.035	17.4	9.3	O K
360 min Winter	1.526	0.026	12.9	6.9	O K
480 min Winter	1.521	0.021	10.4	5.5	O K
600 min Winter	1.517	0.017	8.6	4.6	O K
720 min Winter	1.515	0.015	7.6	4.0	O K
960 min Winter	1.512	0.012	6.1	3.2	O K
1440 min Winter	1.509	0.009	4.4	2.3	O K
2160 min Winter	1.506	0.006	3.1	1.6	O K
2880 min Winter	1.505	0.005	2.6	1.4	O K
4320 min Winter	1.504	0.004	1.9	1.0	O K
5760 min Winter	1.503	0.003	1.4	0.7	O K
7200 min Winter	1.502	0.002	1.1	0.6	O K
8640 min Winter	1.502	0.002	1.1	0.6	O K
10080 min Winter	1.502	0.002	0.9	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	124.873	0.0	24
60 min Winter	76.528	0.0	42
120 min Winter	45.025	0.0	72
180 min Winter	32.838	0.0	100
240 min Winter	26.190	0.0	130
360 min Winter	18.990	0.0	190
480 min Winter	15.094	0.0	248
600 min Winter	12.621	0.0	310
720 min Winter	10.899	0.0	376
960 min Winter	8.640	0.0	494
1440 min Winter	6.218	0.0	710
2160 min Winter	4.466	0.0	1076
2880 min Winter	3.528	0.0	1496
4320 min Winter	2.529	0.0	2332
5760 min Winter	1.999	0.0	2832
7200 min Winter	1.666	0.0	3744
8640 min Winter	1.436	0.0	4096
10080 min Winter	1.266	0.0	5056

Rainfall Details

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)	26.250	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.118

Time (mins) From:	To:	Area (ha)
0	4	0.118

Model Details

Storage is Online Cover Level (m) 2.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.20100	Width (m)	7.8
Membrane Percolation (mm/hr)	1000	Length (m)	115.0
Max Percolation (l/s)	249.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.500	Membrane Depth (m)	0