



15 Billett Avenue, Waterloooville

Flood Risk Assessment dated 31st October 2018

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1.0 Site Location Plan

- 1.1 The development site is located on land adjacent to 15 Billett Avenue, Waterloooville PO7 7SZ as shown by the location plan included within Appendix A.

2.0 Topographical Survey

- 2.1 The topographical survey is included as part of HDL drawing no. 16-2654-900 P2 included within Appendix D. The site slopes from north west to south east with a level of 42.40m AOD in the north west corner and 39.76m AOD in the south east corner.

3.0 Site Geology & Hydrology / Contamination

- 3.1 Section 4.0 of the Ashdown Site Investigation Limited Combined Geotechnical Assessment & Ground Contamination Status Report Reference R17-12060, included within Appendix G, outlines the encountered geology of the site.
- 3.2 The geology consists of Made Ground over Head over London Clay Formation.
- 3.3 The executive summary of the Ashdown Site Investigation Limited Combined Geotechnical Assessment & Ground Contamination Status Report Reference R17-12060, included within Appendix G, outlines the expected hydrology of the site. The Head & London Clay Formation are classed as a Secondary Undifferentiated Aquifer and an Unproductive Stratum respectively. The site does not lie within any Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. Standing groundwater was recorded at depths of between 2.6m and 5.8m below ground level.
- 3.4 Section 6.0 of the Ashdown Site Investigation Limited Combined Geotechnical Assessment & Ground Contamination Status Report Reference R17-12060, included within Appendix G, outlines the ground contamination status of the site. There is not expected to be a requirement for remediation works at the site.

4.0 Proposed Development Layout & Flood Zones

- 4.1 The development proposals are to redevelop the site from a currently greenfield site to a residential development comprising of 4 no. detached houses with associated car parking and soft landscaping as shown by the site layout plan included within Appendix C.
- 4.2 The EA flood map included within Appendix B and the site layout plan and site sections included within Appendix C show that the proposed

properties have been carefully positioned to ensure there is no encroachment onto the flood zones shown on the EA flood map.

- 4.3 Rainwater run off from adjacent areas drain to the adjacent Hermitage Stream.

5.0 Hermitage Stream Culvert

- 5.1 HDL drawing no. 16-2654-2102 P2 included within Appendix C shows the line of the culvert carrying the Hermitage Stream through the site. This culvert is to be replaced as part of the development proposals and the replacement culvert works have been granted an environmental permit for flood risk activity from the Environment Agency. The replacement of the existing deformed culvert with a new culvert of 1200mm diameter will reduce the risk of flooding.
- 5.2 The replacement culvert is to be constructed with an inlet to allow current flows from the site to be discharged to the new culvert at greenfield run off rates via attenuation tanks and a hydrobreak to ensure that the risk of flooding is not increased as a result of the new development.
- 5.3 The development site has been laid out to ensure that the existing culvert is on the same line as the replacement culvert which in turn has been located a minimum of 5m from the centre line of the proposed buildings, as shown by the plans included within Appendix C, to ensure that the structural integrity and future maintenance of the culvert is not compromised by the proposed properties.
- 5.4 The plans and sections included within Appendix C also show that the new properties are to have piled foundations which will ensure that the loads from the new buildings will be taken to depth and will not have a structural impact upon the replacement culvert carrying the Hermitage Stream.

6.0 Sustainable Drainage Proposals

- 6.1 The Code of Practice for Sustainable Drainage Systems provides a flexible approach to drainage systems with a wide range of components and includes a hierarchy of techniques. These are:-
1. Prevention - The use of good site design and housekeeping measures on site to prevent run-off and pollution.
 2. Source Control - Control of run off at or very near to its source.
 3. Site Control - Management of water from several sub catchment areas.

4. Regional Control - Management of run off from several sites, typically in a detention pond or wetland.
- 6.2 With the above in mind surface water disposal will respect the hierarchy of techniques outlined above.
- 6.3 Prevention will be at the forefront of the development of the site with the site set out to maximise the areas of soft landscaping.
- 6.4 Source control is to be introduced in the following way:-
- The site investigation report indicates that the geology will have poor infiltration characteristics with unacceptable infiltration rates to make the use of soakaways unfeasible.
 - Surface water run off will therefore be stored within below ground storage tanks prior to discharge to the adjacent culvert, which is to be replaced as part of the development works, via a hydrobreak to restrict flows to greenfield run off rates.
- 6.5 HDL drawing no. 16-2654-900 P2, included within Appendix D, indicates that the impermeable area of roofs and hardstanding prior to development will be increased as a result of the proposed development.
- 6.6 Attenuation tanks are to be provided as part of the development works to store the 1 in 100 year storm with 40% climate change allowance prior to discharge to the adjacent culvert via a hydrobreak with a controlled flow to ensure that surface water run off is no greater than that prior to development as required by the Environment Agency / Planning Authority.
- 6.7 Rainfall within soft landscaped areas, which are minimal, will be allowed to permeate through the ground in order to mimic as closely as possible the natural drainage from the site before development.

7.0 Sustainable Drainage Design

- 7.1 Surface water calculations, included within Appendix F, show that there is sufficient storage capacity within the attenuation tanks, reference HDL drawing no. 16-2654-2201 P5 included within Appendix E, to accept the 1 in 100 year storm with 40% climate change allowance.

8.0 Third Party Agreements

- 8.1 An application has been made to the Environment Agency for the discharge of the on-site surface water drainage run off to the existing adjacent culvert which is to be replaced as part of the development works. Consent has been granted as part of the environmental permit for flood risk activity.
- 8.2 The on site foul water drainage network, as shown on HDL drawing no. 16-2654-2201 P5, included within Appendix E, is to be connected to the public foul sewer system. A section 106 application will need to be made to Southern Water to connect the public foul drainage network. Southern Water sewer records have been included within Appendix H.

9.0 Foul & Surface Water Drainage Outfalls

- 9.1 HDL drawing no. 16-2654-2201 P5 indicates the location of surface water and foul drainage discharge outfalls from the site.

10.0 Surface Water Drainage Calculations

- 10.1 Drainage calculations have been included within Appendix F to demonstrate runoff rates and the sufficiency of the storage within the proposed attenuation tanks.

11.0 Construction Stage Drainage

- 11.1 The replacement culvert, attenuation tanks and hydrobreak will be constructed as the first stage of construction to allow surface water discharges to be controlled and managed during the construction of the development.

12.0 SuDS Management & Maintenance Plan

Surface Water Drainage

- 12.1 A management company will be set up with responsibility for the maintenance and inspection of the replacement culvert, storm drainage and all associated attenuation tanks and hydrobreaks.
- 12.2 Attenuation tanks will be provided with access to ensure regular inspection and maintenance of the tanks. Tanks to be inspected on an annual basis for the first 3 years after completion of the development and thereafter every 5 years.

- 12.3 The new culvert will be inspected on an annual basis for the first 3 years after completion of the development and thereafter every 5 years to ensure that it remains in good condition.

Appendix A

Location Plan

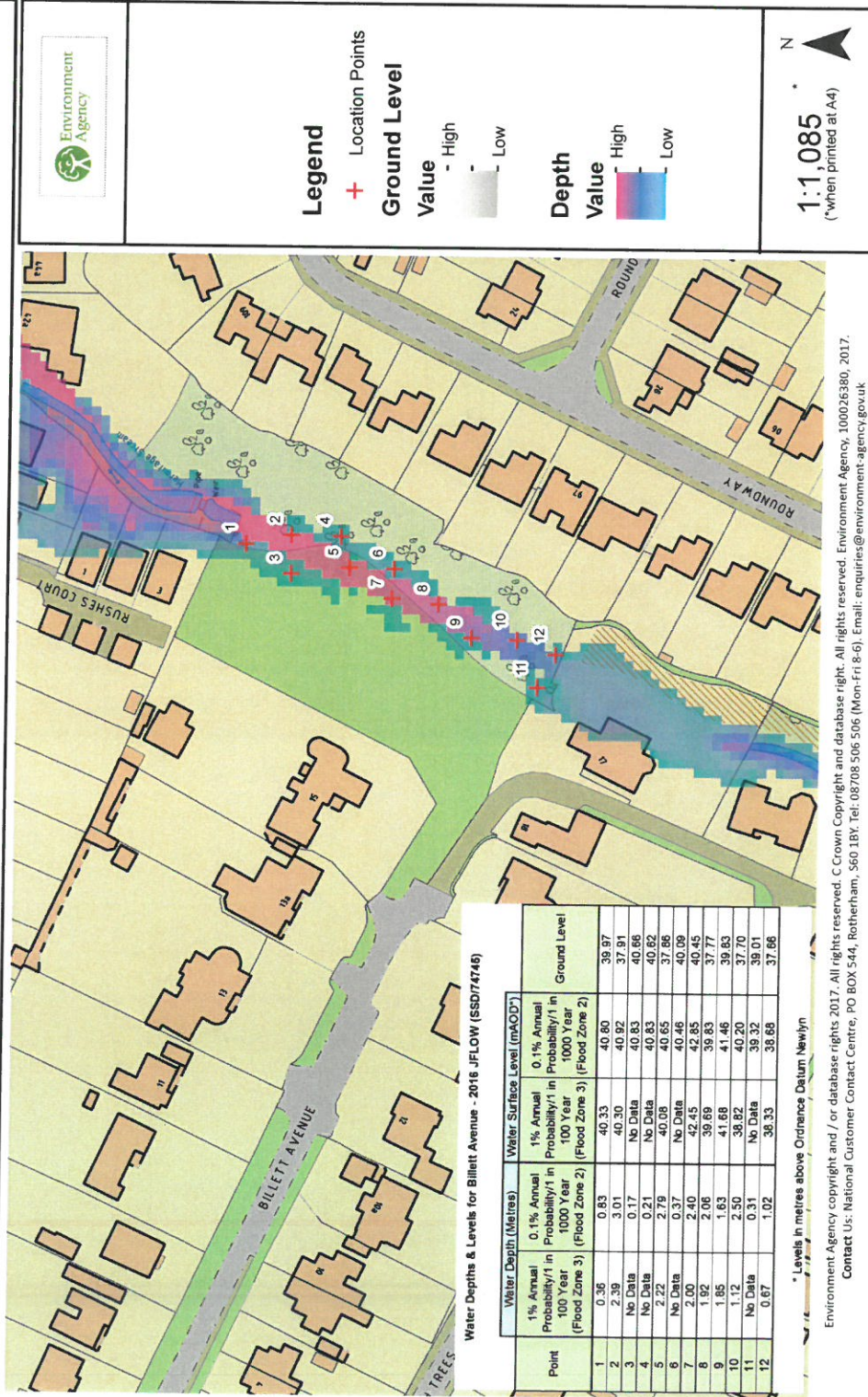
The Site - Land Adjacent to 15 Billett Avenue, Waterloooville.



Appendix B

EA Flood Map

2016 JFLOW Levels Centred on Billett Avenue - Created 6 March 2018



Appendix C

Site Layout Plan & Site Sections

NOTES

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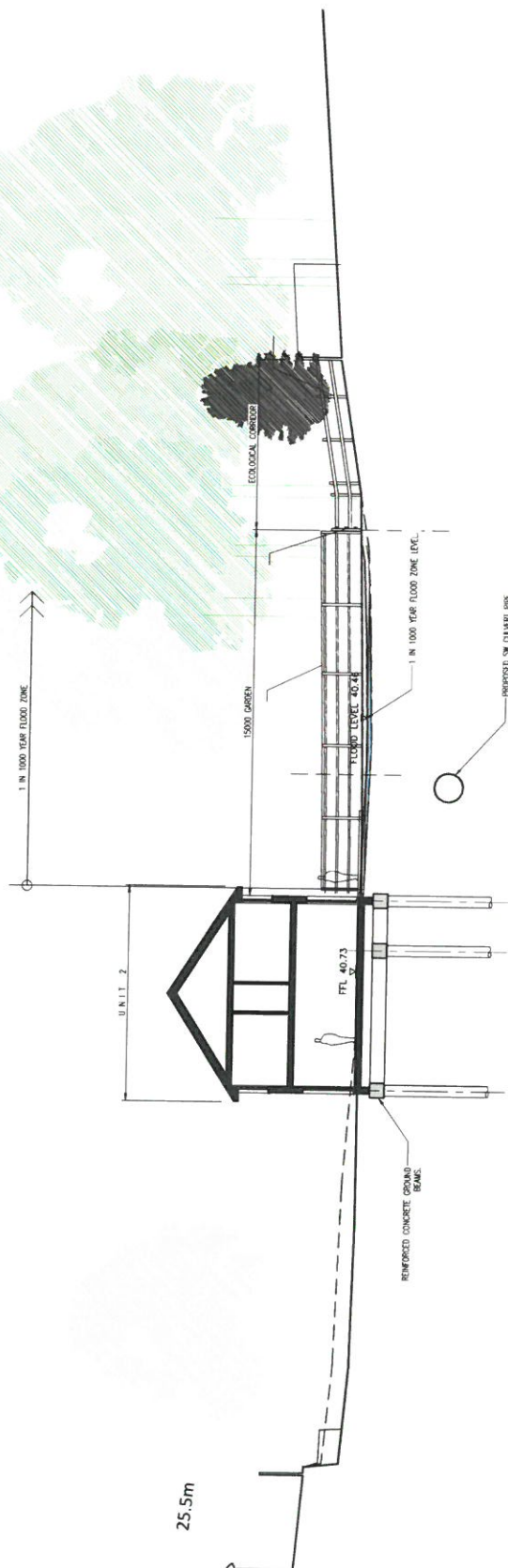
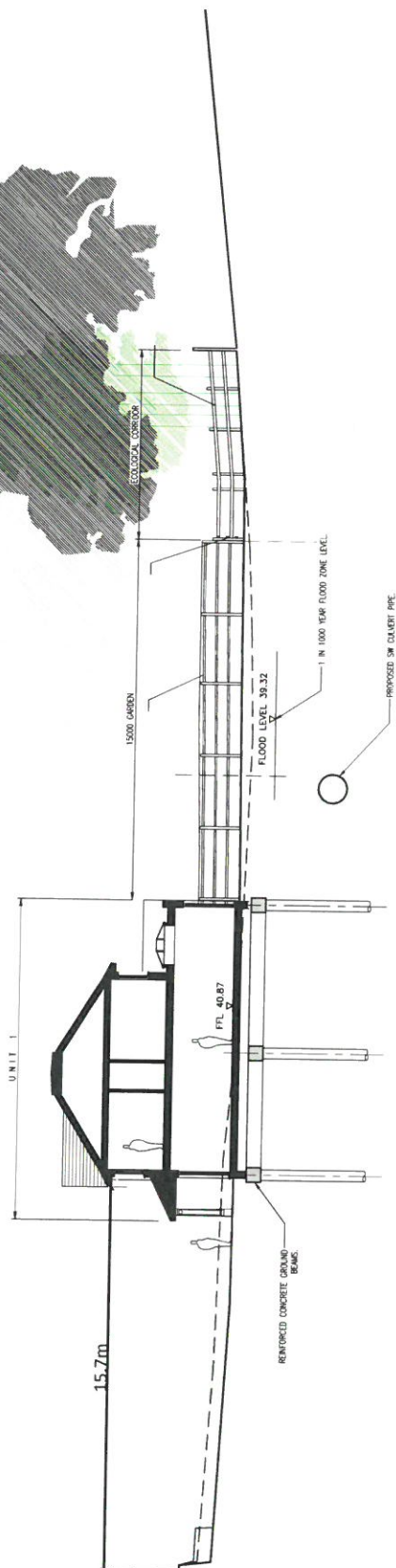
ALL WORKS IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION.

NO RAISING OF EXISTING GROUND LEVELS INSIDE 1 IN 1000 YEAR FLOOD ZONE.

PRELIMINARY

Rev	Description	Date	By	Check	Appr
P2	PRELIMINARY	10/07/18	10/07/18	10/07/18	
P1	PRELIMINARY	10/07/18	10/07/18	10/07/18	
Rev	Revised	By	Check	Appr	
ORIGINAL DRAWING SIZE - A1					
A - 80% S					
DATE: 10/07/18					

PETER ERNEST HOMES LTD.		15 BULLETT AVENUE, WATERLOOVILLE	
HAMIL DAVIES LIMITED		SHEET 1	
Consulting Civil and Structural Engineers		PRELIMINARY	
16-2654-2302		1:100 @ A1	
01489 883 595		16-2654-2302	



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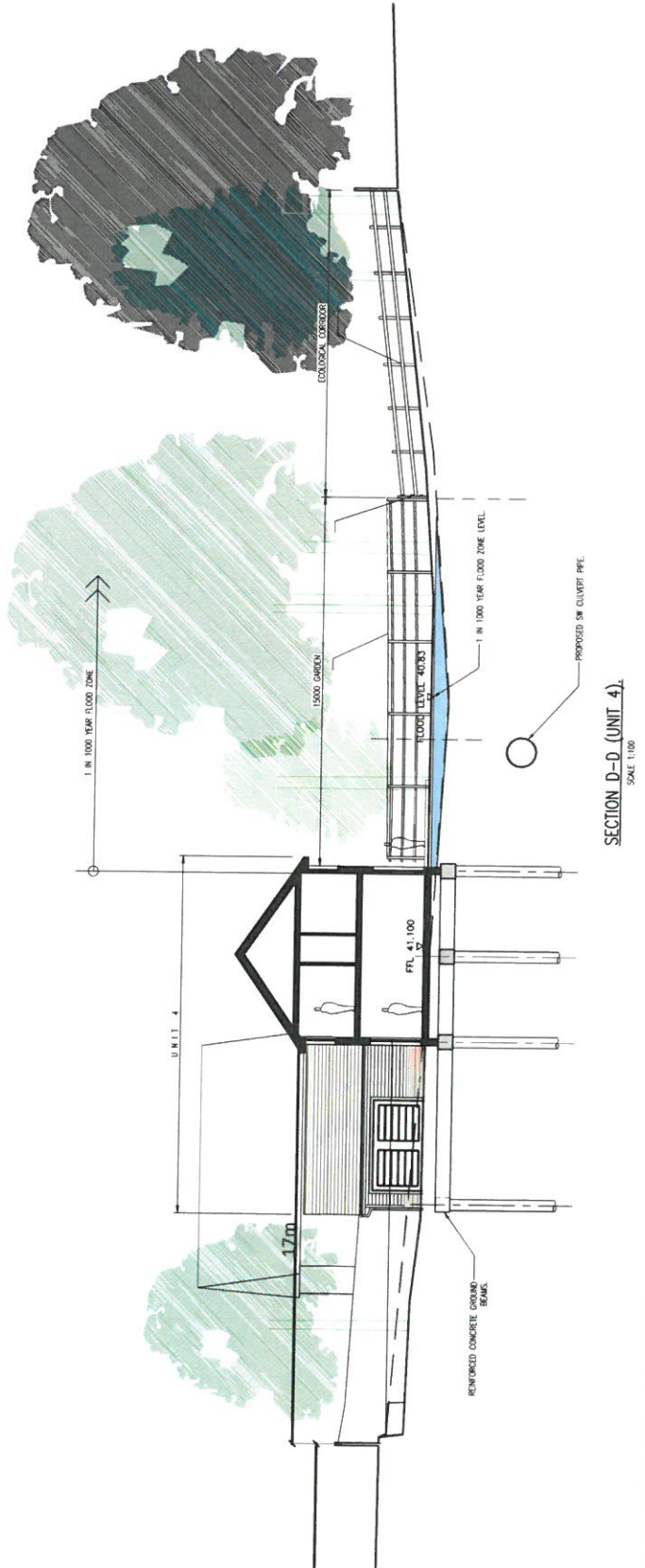
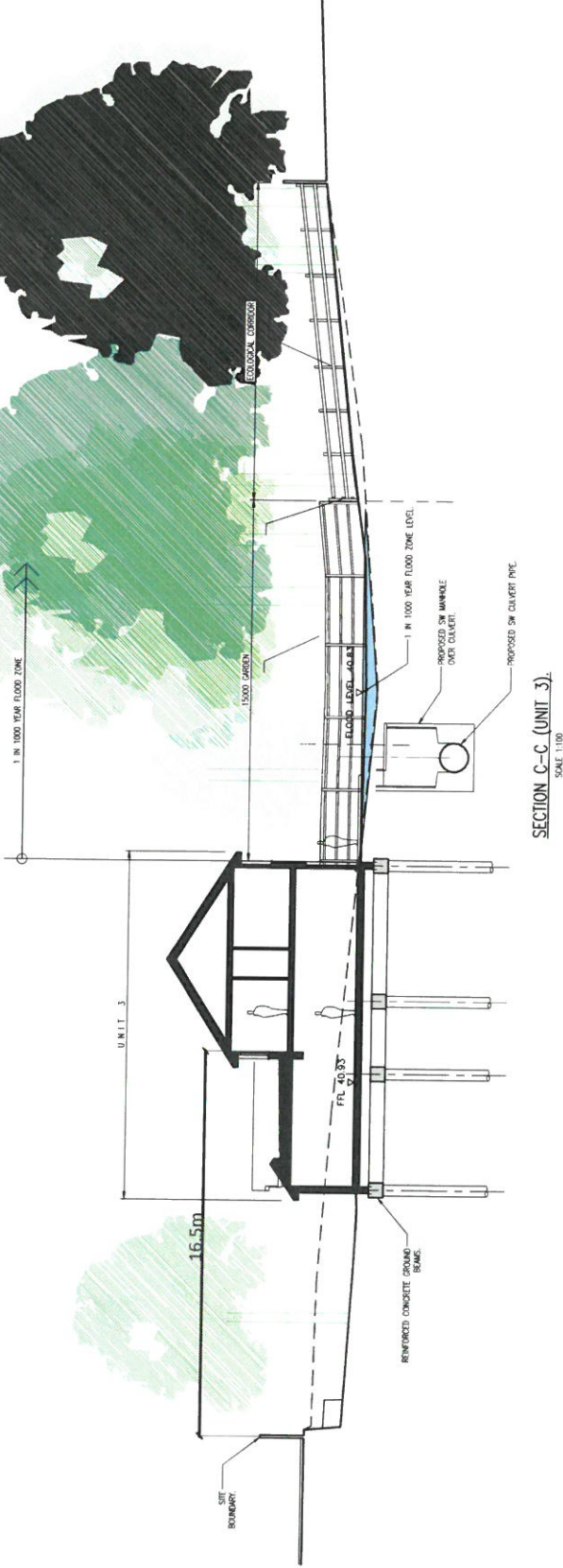
ALL WORKS IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION.

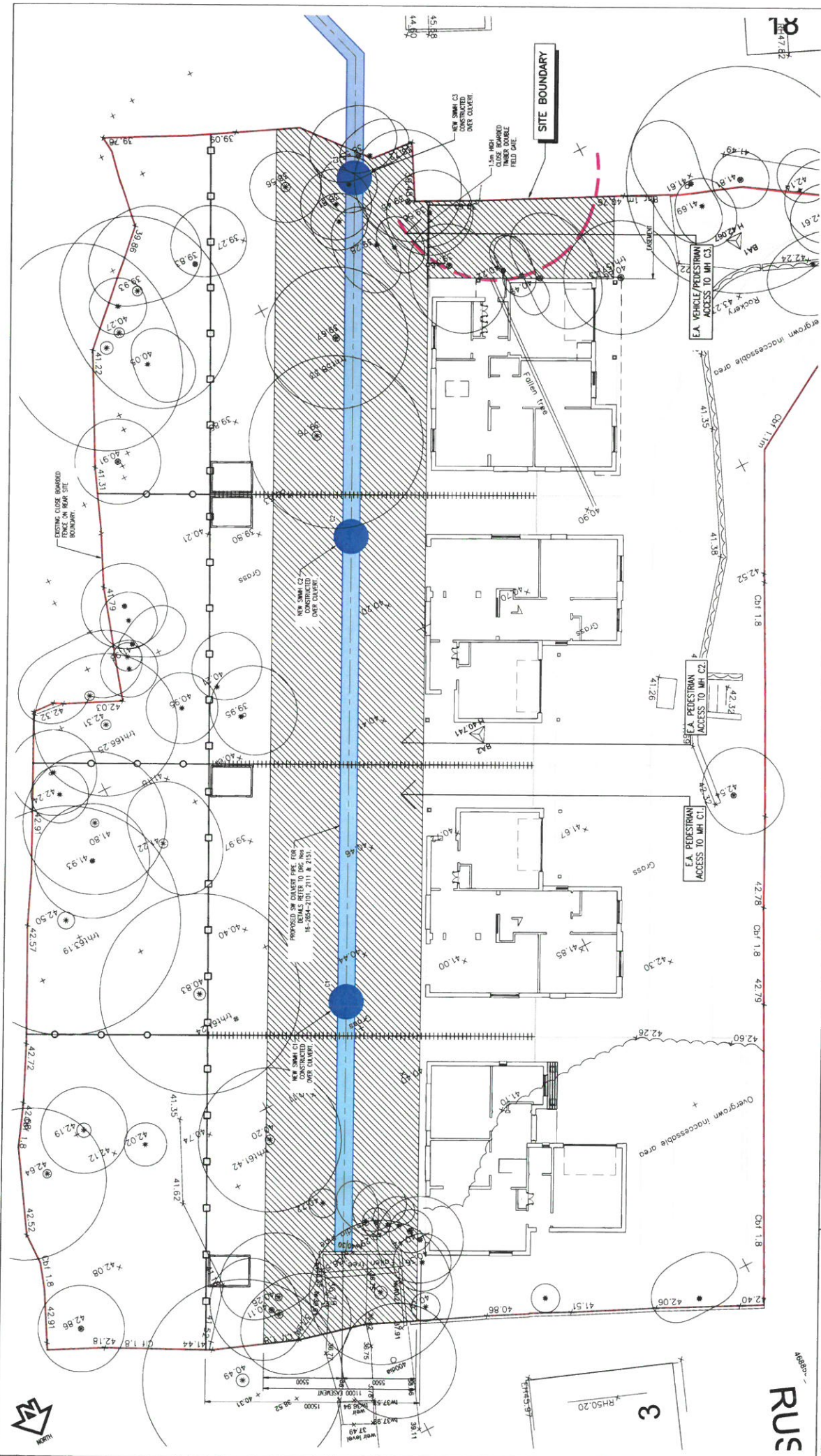
NO RAISING OF EXISTING GROUND LEVELS INSIDE 1 IN 1000 YEAR FLOOD ZONE.

PRELIMINARY

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Rev	3	18/01/18	18/01/18	18/01/18
Rev	4	18/01/18	18/01/18	18/01/18
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Client	PETER ERNEST HOMES LTD.
Address	15 BELLETT AVENUE, WATERLOOVILLE
Project Name	FLOOD LEVELS
Site Sections	SITE SECTIONS - SHEET 2
Drawn By	PRELIMINARY
Checked By	PRELIMINARY
Scale	1:100 @ A1
Project No.	16-2654-2303
Sheet No.	P2
Company	HAMIL DAVIES LIMITED
Consulting Civil Engineer	01480 883 595





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KEY:

- 1.2m HIGH - 1 RAIL FENCE
- 1.2m HIGH - 2 RAIL FENCE
- 1.8m HIGH - CULVERT MARKED FENCE WITH REMOVABLE POSTS & FENCE PANELS
- E.A. EXISTING 24 HOURS A DAY, 365 DAYS A YEAR

ALL EXISTING LATERAL PIPE CONNECTIONS TO EXISTING CULVERTS TO BE MAINTAINED WITH NEW PROPOSED CULVERT.

ALL WORKS IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION.

FOR STANDARD DETAILS REFER TO DRC No 16-2654-2153.

ORIGINAL DRAWING SIZE - A1

CAD REF.

X-REFS.

NO.	DESCRIPTION	DATE	BY	CHECKED
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P2	PRELIMINARY	14/07/18	14/07/18	14/07/18
P3	PRELIMINARY	14/07/18	14/07/18	14/07/18

PETER ERNEST HOMES LTD.

15 BULLETT AVENUE, WATERLOOVILLE

CULVERT WORKS - ENVIRONMENT AGENCY

EMERGENCY ACCESS LAYOUT

PRELIMINARY

Drawn: HCL

Checked: HCL

Scale: 1:500 @ A1

Project No: SHAWMOORE

Drawn: SHAWMOORE

16-2654-2102

P3

Appendix D

Pre & Post Development Impermeable Areas

Appendix E

Foul & Surface Water Drainage Layouts

Appendix F

Drainage Calculations



HAMILL DAVIES LIMITED

Consulting Civil & Structural Engineers
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Tel: 01489 893 596 Fax: 01489 890 715
brian.w.hamill@btopenworld.com

Job No.	16-2654		
Sheet no.	1		
Date	30/10/18		
By	Checked	Reviewed	
B.H.			

MasterDrain
HY 10.07

Project 15 Billetts Avenue
Title BREEAM SUR1 calculations for Waterlooville

Data:-

Hydrology (FSR):-
Location = Waterlooville ✓
Long reference = 468110
M5-60 (mm) = 20
r = 0.35
Hyd. area = 7
Hydrograph = Summer

WRAP = 4
Grid reference = SU6810
SAAR (mm/yr) = 800
Soil = 0.47
Hyd. zone = 7
Area = England & Wales

Site values used in design:-

Total site area = 0.4200 ha ✓
Pre-dev area drained = 0.0000 ha ✓
Imperm runoff factor = 98%
Climate change factor = 40% ✓
Post-dev area drained = 0.1426 ha ✓
Perm runoff factor = 20%

Pre-development

Area to soakaways = 0.0000 ha
Perv. area to SUDS = 0.0000 ha
Post-development
Area to soakaways = 0.0000 ha
Perv. area to SUDS = 0.0000 ha
Area to other SUDS = 0.0000 ha
Pre-dev flow to drain = 0.00 l/s
Area to other SUDS = 0.0000 ha
Post-dev flow to drain = 2.37 l/s ✓

Calculations:-

Revised Post-dev Imperm. area = 0.143 ha
Equiv. Post-dev Imperm. area = 0.140 ha
Equiv. Post-dev Perm. area = 0.055 ha
Total Pre-dev equiv. area ha = 0.084 ha
Total Post-dev equiv. area ha = 0.195 ha
100 yr 6 hour mean intensity = 10.98mm/hr

Results:-

Pre-dev peakflow runoff (l/s) (m³/s)												
R.P.	15	30	60	120	240	360	480	600	Max	CCF	Final	R.P.
1	27.4	18.5	12.1	7.5	4.8	3.6	3.0	2.5	27.4	N/A	27.4	1
30	66.5	44.2	28.2	17.4	10.5	7.8	6.3	5.3	66.5	N/A	66.5	30
100	86.1	57.9	37.1	22.9	13.6	10.0	8.1	6.8	86.1	N/A	86.1	100

Post-dev peakflow runoff (l/s)												
R.P.	15	30	60	120	240	360	480	600	Max	CCF	Final	R.P.
1	63.6	43.1	28.1	17.4	11.3	8.4	6.9	5.8	63.6	40	89.1	1
30	154.5	102.8	65.5	40.5	24.4	18.1	14.6	12.3	154.5	40	216.3	30
100	200.2	134.5	86.1	53.2	31.7	23.3	18.7	15.8	200.2	40	280.3	100

100 year 6 hour (x Climate Change Factor) storm gives:-

Pre-dev runoff volume m³ = 55.3m³
Post-dev rainfall volume = 180.0m³
Post-dev volume m³ (excess above SUDS) = 180.0m³
100 yr 6 hour mean intensity = 10.98mm/hr
Pre-dev volume to drain at 0 l/s = 0.0 m³
Post-dev volume to drain at 2.371 l/s = 52.1 m³
Post-dev storage volume = 127.9m³
Post-dev 5mm imperm volume = 7.1 m³
Post-dev 5mm perm volume = 13.9 m³

$Q_{BAR(rural)} = 2.371 \text{ l/s}$ or 5.644 l/s/ha or 0.002 cumecs - from IoH 124.

The rainfall rates are calculated using the location specific values above in accordance with the Wallingford procedure.



MasterDrain
HY 10.07

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Job No.
16-2654

Sheet no.
2

Date
30/10/18

Project
15 Billetts Avenue

Title
BREEAM SUR1 calculations for Waterloooville

By
B.H.

Checked

Reviewed

Data summary.

Use the data below for the SUR1 form

Site areas:-

Total site area	=	0.4200 ha	; 4200.0 m ²	[3A]
Pre-development impermeable area	=	0.0000 ha		[3B]
Pre-development permeable area	=	0.4200 ha		
Post-development impermeable area	=	0.1426 ha		[3C]
Post-development permeable area	=	0.2774 ha		

Peak runoff:-

Pre-development 1 year storm (15min)	=	27.4 l/s	[6A]
Pre-development 100 year storm (15min)	=	86.1 l/s	[6C]
Post-development 1 year storm (15min)	=	63.6 l/s	[6B]
Post-development 100 year storm (15min)	=	200.21 l/s	[6D]

Greenfield runoff:-

$Q_{BAR(rural)} = 2.371 \text{ l/s}$ or 5.644 l/s/ha or 0.002 cumecs - from IoH 124.

Climate change factor:-

CCF = 40%

Volumes:-

Pre-development 100 yr/6hr storm [12A]	=	77.4m ³
Post-development 100 yr/6hr storm (add. volume with no SUDS) [12B]	=	180.0m ³
Post-development 100 yr/6hr storm (add. volume with SUDS)	=	180.0m ³
Post-development add. predicted volume (No SUDS) [12C]	=	102.5m ³

You may also require

Data relating to the infiltration test calculations (if applicable)
Evidence to show runoff reduction (if applicable)
Information on calculation methods (if applicable see next sheet)

Note

Numbers in square brackets relate to the
Nov. 2010 v1.1 / issued 11/02/10 copy of SUR1

✓



MasterDrain
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By	B.H.	Checked	Reviewed

Project 15 Billetts Avenue

Title BREEAM SUR1 calculations for Waterlooville

Definitions and methods

Hydrology

The hydrological constants are derived from the Wallingford maps. They are used to calculate location specific rainfall figures.

Site values and factors

Areas of the site should be entered in hectares (10000 m²). If the Pre-development site is a green field, this box is blank.

Climate Change Factor is initially set at 20% - this may be changed as required.

Greenfield runoff is calculated using the method described in IoH 124.

Runoff factors

The impermeable runoff factor is initially set at 98%

The permeable runoff factor is initially set at 20%

Note: the CCF and the runoff factors may be changed by the user to suit the development

The areas draining to soakaways and other SUDS are entered in the appropriate box (in hectares)

Calculations

The post-development area is reduced by subtracting the areas that drain to soakaways or other SUDS, to give a revised figure.

All areas are then multiplied by the appropriate runoff factor to give an equivalent area with 100% runoff.

These are then summated.

This gives a total pre-development equivalent area, and a similar figure for the post-development area.

The 'Post-dev volume to drain (no SUDS)' gives the total runoff to drain if no SUDS were used.

Results

The pre- and post-development areas are subjected to 1,30 and 100 year return period storms with a duration of 15 to 600 minutes.

The Revised Post-dev Imperm. area is the area (in ha) that is not going to SUDS x impervious runoff factor.

The runoff rates are calculated for the chosen hydrograph (Summer or Winter) as l/s. Figures in red indicate m³/s

The peak value is measured, multiplied by the CCF and the total maximum rate is shown.

The pre- and post-development volumes for a 100 year / 6 hour storm are calculated from the area under the hydrograph curve.

Post-dev volume (i.e. excess above SUDS) is that volume produced by the drained area that does not go to SUDS.

Qbar(rural) is calculated in accordance with the procedure laid down in IoH 124

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Appendix G

Combined Geotechnical Assessment and Ground Contamination Status Report

**Land Adjacent to 15 Billett Avenue
Waterlooville
Hampshire**

**Combined Geotechnical Assessment and
Ground Contamination Status Report**



Report No. R17-12060

May 2017

Report prepared for the benefit of:

Peter Ernest Homes Ltd
112 South Lane
Clanfield
Waterlooville
PO8 0RY

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the ground investigation. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

The development proposals are understood to comprise the construction of four houses with associated access roads, parking and gardens.

Reference to geological datasets indicates that the site is expected to be underlain by Head deposits overlying the London Clay Formation. The ground investigation confirmed the underlying soils to comprise a significant thickness of made ground, extending to depths of up to 4.2m below ground level, underlain by the expected London Clay Formation deposits. Locally within the south westernmost part of the site, a shallow thickness of made ground overlying Head soils and in turn the London Clay Formation deposits was encountered.

The Head and London Clay Formation are classed as a Secondary Undifferentiated Aquifer and an Unproductive Stratum, respectively. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. Standing groundwater was recorded at depths of between 2.6m and 5.8m below ground level.

Precautions against shrinkage and heave for any new foundation system should assume a high volume change potential for the fine grained soils and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

Given the significant depth of made ground encountered it is recommended that a piled foundation solution should be adopted. Further ground investigation works would be needed, including deep boreholes, in order to provide suitable information to enable detailed piled foundation design.

A DS-4 Design Sulfate Class and an AC-4 ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground.

In view of the significant thickness of made ground and the presence of soils of high volume change potential, it is recommended that ground floors should be suspended.

A design equilibrium CBR value of no greater than 3% should be assumed for the design of pavement bearing on the fine grained Head or derived made ground soils. The subgrade is not likely to be susceptible to frost heave.

Based upon the review of historical mapping data and the results of the laboratory testing undertaken to date there is not expected to be a requirement for remediation works at this site. However it is recommended that confirmation in this regard is sought from relevant regulators and warrantors at an early stage in progressing the design of the development proposal for this site.

Appendix H

Southern Water Sewer Records

SEWER RECORDS PAGE 1 OF 2



C.S. REF. SU6809NE		Drawn by: yadava Scale: 1:1250 Date: 02/05/2016	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. © Crown Copyright 2016. All Rights Reserved. This document is the property of Southern Water Services Ltd. It is to be used for the purpose for which it was issued and is not to be reproduced or transmitted in any form or by any means electronic, mechanical, photocopying, recording, or by any information storage and retrieval system without the prior written permission of Southern Water Services Ltd.
Title: 214307_15 Billett Avenue, Wate		Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WD 28630	469054 Southern Water N 469583 Page 67 of 72