



Warblington Road
Emsworth

FLOOD RISK ASSESSMENT

On behalf of
Mr Charles Glanville

MT5042/FRA.7
April 2020

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1.0 INTRODUCTION

- 1.1 Bellamy Roberts LLP has been retained by Mr. Charles Glanville to prepare a Flood Risk Assessment (FRA) in support of a planning application for a residential development of 9 dwellings on land south of Warblington Road, Emsworth. This assessment has been undertaken to ascertain whether there are any constraints to the development of this site, and to assess the impact of the proposal, with regard to flood risk.
- 1.2 The site has an approximate area of 0.83ha and is located in Flood Zone 1. Government guidance states that Flood Risk Assessments are generally only necessary in Flood Zone 1 when the development area is greater than 1ha. However, an FRA is required for developments of less than 1ha when the proposed development will provide a more vulnerable use class. This Assessment has been prepared to accompany an indicative sustainable drainage design, and will also consider the expected greenfield run-off rates, soil types, and Environment Agency (EA) Flood Mapping.
- 1.3 A planning application for 7 residential units on this site was submitted in June 2019 (APP/19/00623). Consultation comments were received from the Environment Agency (30th July 2019) and further information was requested. A copy of the EA comments are provided at **Appendix 1**, and this FRA has been prepared to address the issues raised by the EA. In summary, the EA has requested the following:
- Confirmation of the proposed Finished Floor Levels;
 - Provision of safe access and egress routes; and
 - Provision of resistance and resilience measures.

Site Location and Features

- 1.4 The National Grid reference for the site is 474407, 105452. For clarity, a site location plan is provided at Figure 1.



Figure 1: Site Location Plan

Site Topography

- 1.5 The topography falls from 6.75m in the northern corner to 1.98m in the southern corner. (Source: LIDAR) – Figure 2.

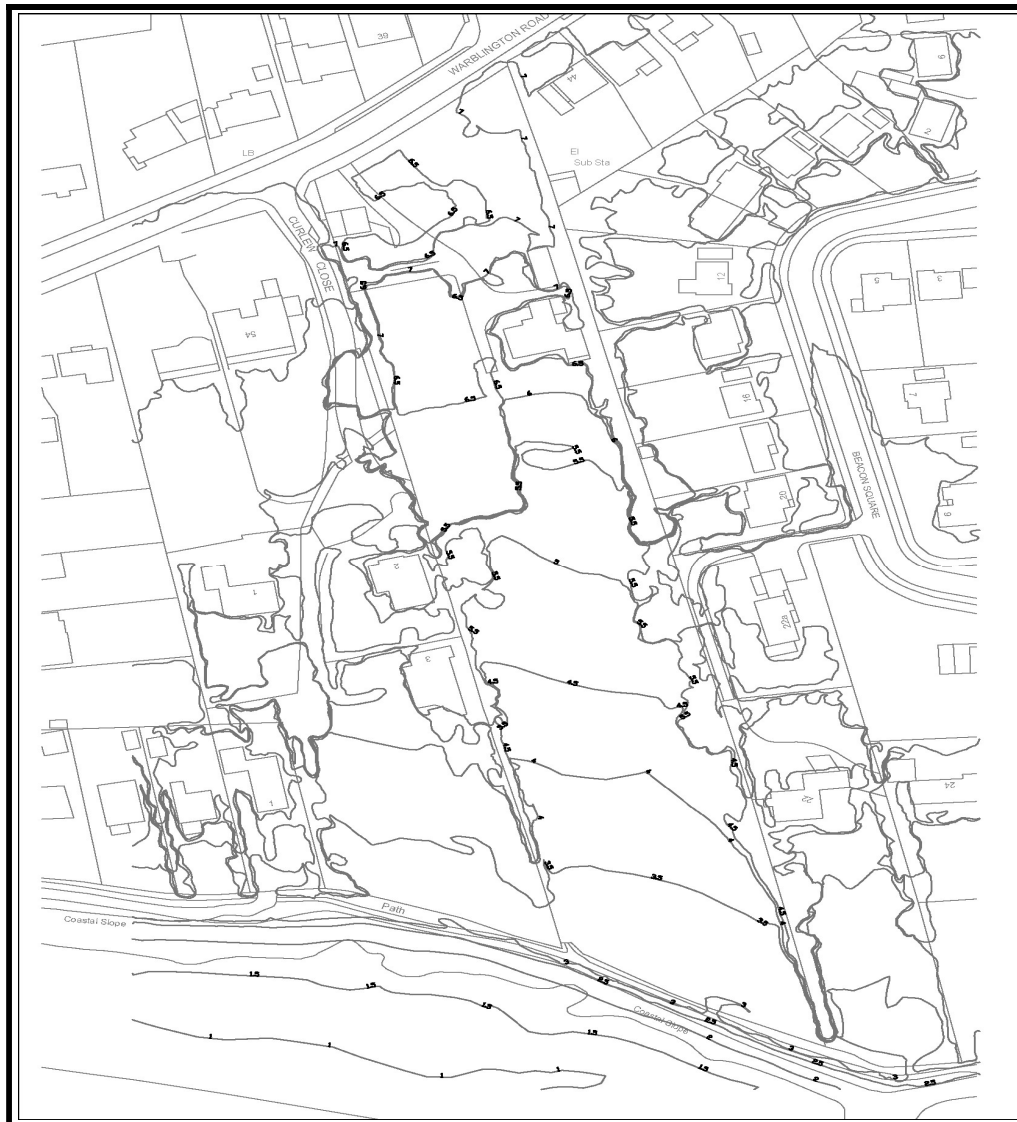


Figure 2: (Source LIDAR) – Topography of site.

- 1.6 The site is accessed off Warblington Road which borders the northern boundary of the site. Residential development is located on all sides other than the southern boundary which is bounded by Chichester Harbour.

Appropriateness of Development Proposal

- 1.7 National guidance states that Flood Zone 1 is suitable for all types of development. Reproduced at Figure 3 is an extract from the EA Flood Zone map which demonstrates that the proposed dwellings will lie within Flood Zone 1. The southern extent of the application site is shown to be located within Flood Zone 3, and it will be ensured that no dwellings will be located within this area. The site access will also be located solely within Flood Zone 1.

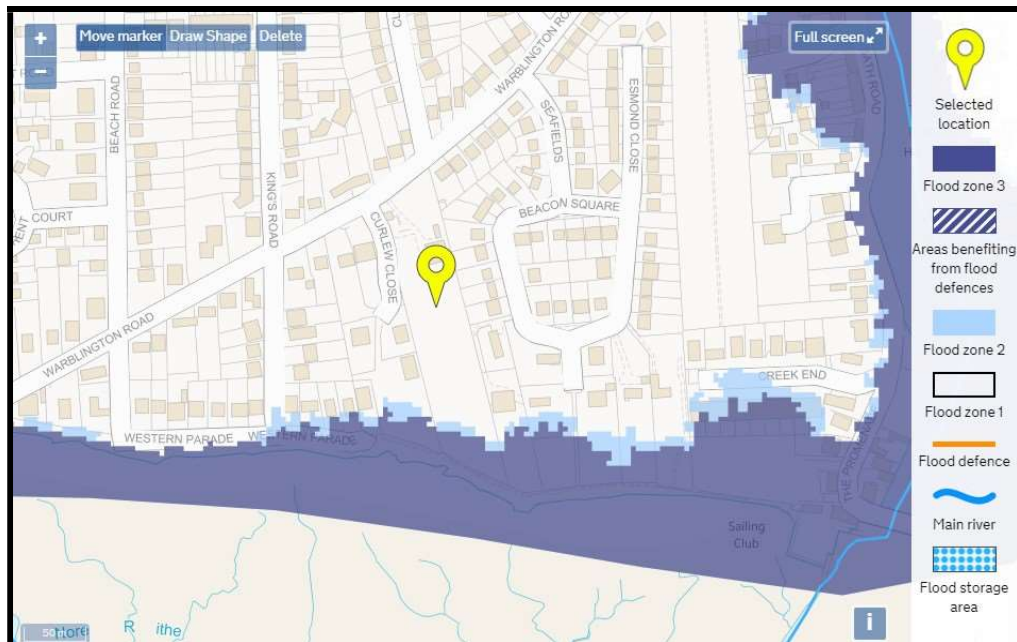


Figure 3: Flood Zone Map (Source: EA)

1.8 An extract from the EA surface water flood risk map is provided in Figure 4. This demonstrates that the site is not at risk of flooding from this source.

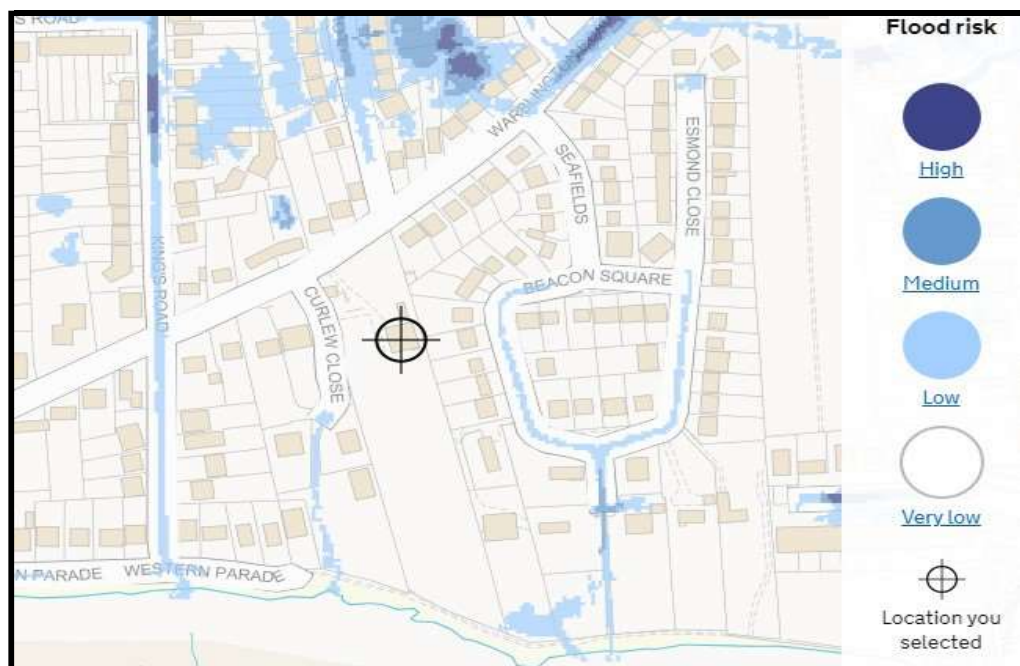


Figure 4: Surface Water Flood Risk Map (Source: EA)

- 1.9 In addition to surface water flood risk, it is also important to consider the risk of flooding from rivers and the sea. In this regard, EA mapping has further been interrogated to determine the risk posed from this type of flooding (see Figure 5).



Figure 5: Rivers/Sea Flood Risk Map (Source: EA)

- 1.10 Figure 5 demonstrates that the southern extremity of the site has a low to medium risk of river or sea flooding.
- 1.11 The proposed development has been designed with due regard to this potential risk. As such, the proposed units have not been located within the area at risk of flooding.
- 1.12 Given the site's location, it is important to consider rising sea levels as a result of climate change and in this regard, the 2115 Tidal Model has been obtained from the EA which illustrates an expected flooding level for 2115 of 4.5m AOD (see Figure 6).



Figure 6: Tidal Model for 2115

- 1.13 It is evident from Figure 6 that the majority of the site falls outside of the area affected by the forecasted 2115 estimated flood levels. Nevertheless due to the topography of the site, the two southernmost properties may be affected (plots 1 and 2). In this regard, it will be ensured that the Finished Floor Level (FFL) of these properties will be a minimum of 4.5m AOD, and therefore above the 2115 estimated flood level. Such an undertaking will ensure that future occupants will remain safe for the lifetime of the development, without the need for additional flood resistance and resilience measures, allowing future occupants the ability to safely access and exit their dwellings in flood conditions.
- 1.14 With regards to the site access road, a small section at its southernmost extremity falls within the 2115 estimated future tidal flood risk area. Due to the topography of the site, the remainder will not be affected. To ensure safe access and egress to the entire development, the level of the access road will be no lower than the flood level estimated for 2115 (4.5m AOD). This will ensure safe access for all vehicles, including emergency vehicles. The detailed design of the site access road and finished floor levels will be considered at the detailed design stage.

Ground Investigation Data

- 1.15 Soakaway testing, in accordance with BRE365, has previously been undertaken at the site. The testing observed that no infiltration was possible and concluded that the soils are not likely to perform to a satisfactory standard. The full testing results are attached at **Appendix 2**.
- 1.16 In addition, British Geological Survey mapping indicates that there are superficial deposits of sand, silt and clay (fluvial in origin), and the bedrock at the site is chalk. The BGS mapping extract is provided at **Appendix 3**.

2.0 FLOOD RISK ASSESSMENT

Flood Risk Assessment Methodology and Objectives

- 2.1 It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. Current guidance on development and flood risk identifies several key aims for a development to ensure that it is sustainable in flood risk terms. These aims are as follows:
- the development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, are threatened;
 - the development should not be at a significant risk of flooding and should not be susceptible to damage due to flooding;
 - safe access to and from the development should be possible during flood events;
 - the development should not increase flood risk elsewhere;
 - the development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
 - the development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;

- future users of the development should be made aware of any flood risk issues relating to the development;
- the development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues;
- the development should not lead to degradation of the environment, and;
- the development should meet all of the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

2.2 This Assessment has been prepared with due consideration of these sustainability aims, to inform the proposed scheme. A development lifetime of 100 years has been assumed in line with PPG guidance on residential development life cycles.

Existing Greenfield Run-off Rates

2.3 The existing greenfield run-off rates have been obtained from within the MicroDrainage computer software (see **Appendix 4**), which has identified the following Qbar figures:

- Qbar - 3.4l/s
- Q1 - 2.9l/s
- Q30 - 7.7l/s
- Q100 - 10.9l/s

3.0 DRAINAGE STRATEGY

Disposal of Surface and Foul Water

3.1 The existing dwelling utilises the Southern Water surface water and foul water sewers located in the vicinity of the application site. The location of the existing foul and surface water sewers is provided on the plan attached at **Appendix 5**.

3.2 The surface water sewer borders the western boundary of the application site and outfalls into Chichester Harbour. There are two foul water sewers in the vicinity of the site, one bisects the application site on a broadly west/east alignment and the other is present within Warblington Road.

Surface Water

- 3.3 In accordance with SuDS principles, the proposal will initially seek to provide soakaway drainage to serve each plot. However, based on the results of the infiltration testing previously undertaken at the site, the sub-strata is not suitable for soakaway drainage (see Appendix 2).
- 3.4 In this regard, an alternative option has been considered which will provide three storage tanks within the site to store the surface water from each property and carriageway (all driveways to be permeable paving). Each tank will discharge into the nearby surface water sewer. The discharge rate will be controlled via a hydro-brake, and will be limited to 10.9 l/s, as per the calculated Qbar figure (see paragraph 2.3). The total storage capacity has been calculated using the MicroDrainage software. The indicative surface water drainage strategy is provided at **Appendix 6**, and the MicroDrainage analysis is at **Appendix 7**.
- 3.5 In accordance with Planning Practice Guidance, it is suggested that the buildings are designed and constructed with flood resilience measures in mind, thus reducing reduce the impact of flood water entering the building to ensure no permanent damage is caused, structural integrity is maintained and drying and cleaning is easier. Furthermore, flood resistant construction can prevent entry of water or minimise the amount that may enter a building where there is short duration flooding outside with water depths of 0.6 metres or less. This form of construction should be used with caution and accompanied by resilience measures, as effective flood exclusion may depend on occupiers ensuring some elements, such as barriers to doorways, are put in place and maintained in a good state.

Foul Water

- 3.6 With regards to the foul water strategy, it is proposed that plots 6-9 will connect to the existing foul water sewer within Warblington Road, and the remainder (plots 1-5) will connect to the foul water sewer that bisects the site. The foul strategy is shown on the plan at Appendix 6.

Maintenance and Management

- 3.7 The continued management and maintenance of the drainage system will be essential in ensuring the continued protection of the development from the surface water flooding.
- 3.8 Visual inspection of the drainage network and outfalls should be undertaken on a regular basis to identify any siltation/blockage/disrepair of the drainage network and attenuation facilities.
- 3.9 A surface water management system therefore needs to be drawn up as part of any planning consent that is issued for the site.

4.0 SUMMARY AND CONCLUSIONS

- 4.1 Bellamy Roberts LLP has been retained by Mr. Charles Glanville to undertake a Flood Risk Assessment (FRA) in support of a planning application for a residential development of 19 units on land south of Warblington Road, Emsworth.
- 4.2 Environment Agency mapping has been reviewed and it has been determined that the site lies wholly within Flood Zone 1, and no risk of flooding from sources such as surface water and rivers.
- 4.3 Due to the topography of the application site, part of the proposed built development falls within the estimated future tidal flood risk area for 2115. In this regard, floor levels of the southernmost properties and access road will be designed to be above the 2115 estimated flood level of 4.5m AOD.
- 4.4 Surface water storage tanks will be provided to serve the proposed dwellings and access road. Each tank will discharge into the nearby surface water sewer and the discharge rate will be controlled via a hydro-brake, limited to the calculated Qbar figure of 10.9l/s.
- 4.5 With regards to the foul water strategy, it is proposed that the northernmost plots will connect to the existing foul water sewer within Warblington Road, and the remaining plots will connect to the foul water sewer that bisects the site.

APPENDICES

APPENDIX 1

Havant Borough Council
Development Control
Civic Offices Civic Centre Road
Havant
Hampshire
PO9 2AX

Our ref: HA/2019/121470/01-L01
Your ref: APP/19/00623
Date: 30 July 2019

Dear Sir/Madam

RETAIN THE EXISTING 'FOWLEY COTTAGE' DWELLING AND CONSTRUCTION OF 6NO. 5 BED DETACHED DWELLINGS, TWO ON THE WARBLINGTON ROAD FRONTAGE AND FOUR TO THE REAR GARDEN AREA. ACCESS TO PLOT 5 TO BE TAKEN OFF WARBLINGTON ROAD, ACCESS TO PLOTS 1-4 AND 6 TO BE TAKEN OFF CURLEW CLOSE FOWLEY COTTAGE, 46 WARBLINGTON ROAD, EMSWORTH, PO10 7HH

Thank you for the consultation on the above application, please quote our reference on all correspondence.

We have reviewed the information as submitted and have the following comments.

Environment Agency position

In the absence of an acceptable flood risk assessment (FRA) we object to this application and recommend that planning permission is refused.

Reason

The submitted FRA does not comply with the requirements for site-specific flood risk assessments, as set out in paragraphs 30 to 32 of the Flood Risk and Coastal Change section of the planning practice guidance.

The FRA does not therefore adequately assess the flood risks posed by the development. In particular, the FRA fails to:

- take the impacts of climate change into account adequately. Flood risk mitigation measures to address flood risk for the lifetime of the development included in the design are inadequate because they will not make the development resilient to the flood levels for 2115 of 4.5mAOD as stated in paragraph 1.14 of FLOOD_RISK_ASSESSMENT-1180237 (FRA) submitted with the application. Consequently the development proposes inadequate:

Environment Agency
Guildbourne House Chatsworth Road, Worthing, West Sussex, BN11 1LD.
Customer services line: 03708 506 506
www.gov.uk/environment-agency

Cont/d..

- Raised finished floor levels. Paragraph 1.16 of the FRA states “*In this regard, floor levels of the southernmost properties could be designed to be above the 2115 estimated flood level of 4.5m AOD*”, but it does not specify what they will actually be. The drawing in Appendix 6 titled “*Foul and Surface Water Drainage Strategy*” shows the 2 southern most properties as having finished floor levels (FFL) of 4.2mAOD and 4.1mAOD which are both below the expected 2115 flood level of 4.5mAOD.
- consider the requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event
 - Safe access and egress routes
- consider how a range of flooding events (including extreme events) will affect people and property
 - Resistance and resilience measures

Overcoming our objection

To overcome our objection, the applicant should submit a revised FRA which addresses the points highlighted above.

Advice to Applicant

Finished floor levels (FFL)

The FRA needs to ensure that built development proposals incorporate adequate flood risk mitigation up to the design flood level for 2115 of 4.5mAOD (as stated in the FRA). The following government website will assist the applicant in determining the adequate freeboard for the development (this includes coastal, estuarine and tidal) :

<https://www.gov.uk/government/publications/accounting-for-residual-uncertainty-an-update-to-the-fluvial-freeboard-guide>

Safe access and egress

The application needs to demonstrate that occupants can remain safe for the lifetime of the development when allowances for climate change are taken into consideration. There needs to be sufficient flood risk mitigation up to the design flood level and/or specified arrangements for safe access and egress.

Flood resistance and resilience

We strongly recommend the use of flood resistance and resilience measures if appropriate. Physical barriers, raised electrical fittings and special construction materials are just some of the ways you can help reduce flood damage.

Revised FRA

If this cannot be achieved, we are likely to maintain our objection. Please re-consult us on any revised FRA submitted and we'll respond within 21 days of receiving it.

Environmental permit

Planning permission does not remove the requirement for an Environmental Permit. The Environmental Permitting (England and Wales) Regulations 2016 require a permit to be obtained for any activities which will take place:

- on or within 8 metres of a main river (16 metres if tidal)
- on or within 8 metres of a flood defence structure or culvert (16 metres if tidal)
- on or within 16 metres of a sea defence
- involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert

- in a floodplain more than 8 metres from the river bank, culvert or flood defence structure (16 metres if it's a tidal main river) and you don't already have planning permission.

For further guidance please visit <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits> or contact our National Customer Contact Centre on 03702 422 549. The applicant should not assume that a permit will automatically be forthcoming once planning permission has been granted, and we advise them to consult with us at the earliest opportunity.

Please do not hesitate to contact me on the number below should you have any queries on the above information.

Yours faithfully

Mrs Sophie Brown
Sustainable Places Planning Advisor

Direct dial 02030 257250

Direct e-mail planningSSD@environment-agency.gov.uk

APPENDIX 2

CLIENT	Charles Glanville c/o Re-Format Limited		
SITE ADDRESS	Fowley Cottage, 46 Warblington Road, Emsworth, Hampshire PO10 7HD		
REPORT REFERENCE	GWPR1704		
ENGINEER	Joshua Laite, Ground and Water Limited		
INVESTIGATION LOCATIONS	Please see Figure 1 attached. Site works were undertaken on 20 th June 2016 and comprised the excavation of six trial pits (TP1-TP6) with soakaway testing in accordance with the principles of BRE365 in TP1-TP3 and TP5-TP6.		
GROUND CONDITIONS ENCOUNTERED	Summary of Strata Encountered (TP1-TP6)		
	Strata	Depth Encountered (m bgl)	Thickness (m)
	TOPSOIL: Mid brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare to occasional, sub-angular to sub-rounded, fine to coarse flint.	GL	0.15 – 0.30
	MADE GROUND (TP6): Light brown silty sandy gravelly clay. Sand is fine to medium grained. Gravel is fine to abundant, fine to coarse, angular to sub-rounded flints, chalk and bricks.	0.20	0.60
	RIVER TERRACE DEPOSITS: Mottled light / mid brown / orange, silty sandy gravelly CLAY. Sand is fine grained. Gravel is rare to occasional, fine to medium, sub-angular to sub-rounded flint.	0.15 – 0.30	0.90 – 1.55
	RIVER TERRACE DEPOSITS: Mottled light / mid brown / orange silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine to coarse, sub-rounded to sub-angular flints and chalk.	0.80 – 1.70	0.90 - 2.90
	RIVER TERRACE DEPOSITS (TP1 and TP4): Light brown / off white sandy gravelly CLAY. Sand is fine to coarse grained. Gravel is abundant, fine to medium, sub-angular to sub-rounded, flint and chalk.	2.90 - 3.90	0.20 – 0.40
	LEWES NODULAR CHALK FORMATION (TP3): Structureless CHALK composed of cream gravelly sandy SILT. Gravel are moderately weak, high density, white and sub-angular. Locally white / light brown with a trace of light brown clay.	2.40	0.60
ROOTS	Roots were noted between 0.70 - 1.80m bgl.		
GROUNDWATER	Groundwater was not encountered during this investigation.		

INFILTRATION RATE

Soakaway tests, in accordance with the principles of BRE365, were undertaken at depths from 3.10m bgl – 4.30m bgl (TP1, TP3, TP5 and TP6) within the soils of the 1st River Terrace Deposits, comprising a silty sandy gravelly clay.

No infiltration was recorded and therefore soakaways constructed within the soils of the 1st River Terraced Deposits are **not** likely to perform to a satisfactory standard.

Soakaway Testing (TP1, TP2, TP5 and TP6)				
Trial Hole	Starting Depth (m bgl)	Final Depth (m bgl)	Time Elapsed (mins)	Infiltration Rate (m/sec)
TP1	2.50	2.49	125	0
TP2	2.03	2.01	156	0
TP5	1.82	1.80	154	0
TP6	2.10	2.20	190	0

A soakaway test, in accordance with the principles of BRE365, was undertaken at a depth of 3.00m bg in TP3 within the soils of the Lewes Nodular Chalk Formation, comprising a cream gravelly sandy SILT. No infiltration was noted and therefore the soils of the Lewes Nodular Chalk Formation are also **not** likely to perform to a satisfactory standard.

Soakaway Testing (TP3)				
Trial Hole	Starting Depth	Final Depth	Time Elapsed	Infiltration Rate
TP3	1.10m bgl	1.10m bgl	116 min	0 m/sec

The site was located within a **Secondary A Aquifer** relating to superficial deposits of the River Terrace Deposits, beneath a **Principal Aquifer** comprising the bedrock deposits of Lewes Nodular Chalk Formation is present.

Examination of the Environment Agency records showed that the site **was not** located within a **Groundwater Source Protection Zone** as classified in the Policy and Practice for the Protection of Groundwater.

Consultation with the Environment Agency must be sought regarding any use that may have an impact on groundwater resources.

ANTICIPATED VOLUME CHANGE POTENTIAL

RIVER TERRACE DEPOSITS: Likely to have moderate to high volume change potential.

LEWES NODULAR CHALK FORMATION: Likely to have no volume change potential.

All in accordance with NHBC Standards Chapter 4.2 and BRE240. Subject to confirmation of results of geotechnical classification testing.

FOUNDATION RECOMMENDATIONS

At the time of reporting, June 2016, it is our understanding that the proposed development will incorporate the retention of the existing property and construction of 6No. detached properties with gardens in the surrounding grounds. Ancillary structures, such as site access, parking areas and private gardens will also be formed.

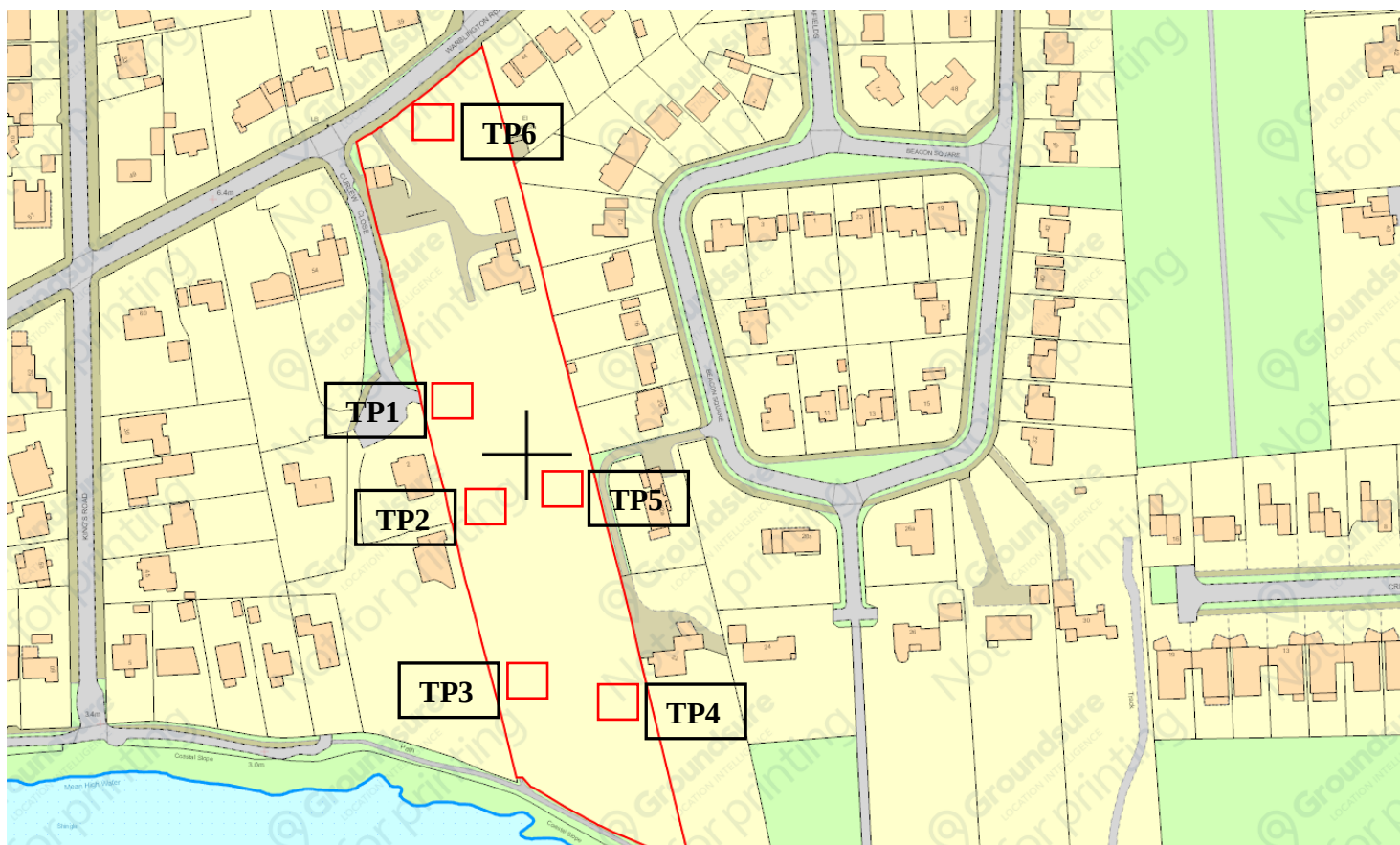
Foundations must not be placed within cohesive root penetrated and/or desiccated soils and the influence of the trees surrounding the site must be taken into account. The base of foundation excavations must extend at least 300mm into non-root penetrated soils. Should trees be removed from footprint of proposed development then a piled foundation should be considered.

Roots were generally noted ranging between 0.70 - 1.80m bgl, foundations minimum foundations depths rare likely to range from 1.00 - 2.10m bgl into the River Terrace Deposits.

Foundations constructed on the River Terrace Deposits at 1.00m bgl can be designed based on a presumed safe bearing capacity of 75kN/m², increasing to 100kN/m² at 2.10m bgl. This is based on trial hole records, inspection of samples recovered, geotechnical laboratory results, and referral to BS 8004:1986, Code of Practice for Foundations, the results of the insitu testing, and based on a 5m long by 1.0m wide foundation and a maximum settlement of ~25mm.

Given that the cohesive soils of the 1st River Terrace Deposits are likely to have a volume change potential in accordance with BRE Digest 240 and NHBC Chapter 4.2, a suspended slab should be considered. The volume change potential of the shallow surface soils must be taken into account in final design (underfloor void diameter/compressible material/void formers etc).

This preliminary information may be subject to amendment in the final report and no liability can be accepted for any actions based on this preliminary information.



NOT TO SCALE

APPROXIMATE SITE BOUNDARY

Project:

Fowley Cottage, 46 Warblington Road, Emsworth, Hampshire PO10 7HD

Client:

Charles Glanville c/o Re-Format Limited

Date:

July 2016

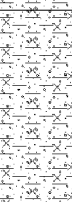
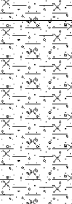
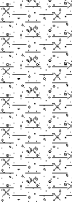
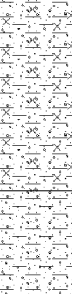
Trial Hole Location Plan

Ref:

GWPR1704

Figure 1

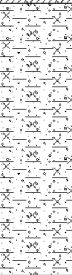
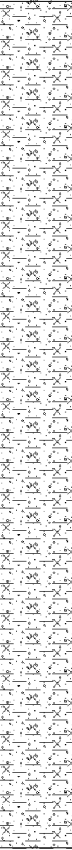
ground&water

Ground and Water Ltd							Trialpit No TP1 Sheet 1 of 1	
Project Name Fowley Cottage			Project No. GWPR1704		Co-ords: - Level: -		Date 20/06/2016	
Location: 46 Warblington Road, Emsworth, Hampshire PO10 7HD					Dimensions: -		Scale 1:25	
Client: Charles Glanville c/o Re-Format Ltd					Depth 4.30m		Logged By JL	
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
Depth (m)	Type	Results						
0.20	D		0.30			TOPSOIL: Mid brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare to occasional, sub-angular to sub-rounded, fine to coarse flint.		
0.50	D					RIVER TERRACE DEPOSITS: Mottled light/mid brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is rare to occasional, fine to medium, sub-angular to sub-rounded flint.		
0.80	D							
1.20	D		1.30			RIVER TERRACE DEPOSITS: Mottled light brown/orange silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine, sub-angular to sub-rounded flint and chalk fragments.		
1.50	D							
1.80	D							
2.20	D		2.00			RIVER TERRACE DEPOSITS: Mottled light brown/grey/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is abundant, fine, sub-angular to sub-rounded chalk fragments.		
2.50	D							
2.80	D							
3.00	D		3.90					
3.40	D							
3.80	D							
4.30	D		4.30			RIVER TERRACE DEPOSITS: Light brown/off white sandy gravelly CLAY. Sand is fine to coarse grained. Gravel is abundant, fine to medium, sub-angular to sub-rounded flint and chalk.		
						Trialpit Complete at 4.30 m		
Remarks: Roots noted to 1.80m bgl.								
Groundwater: No groundwater encountered.								

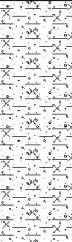


Ground and Water Ltd							Trialpit No TP2 Sheet 1 of 1	
Project Name Fowley Cottage			Project No. GWPR1704		Co-ords: - Level: -		Date 20/06/2016	
Location: 46 Warblington Road, Emsworth, Hampshire PO10 7HD					Dimensions: -		Scale 1:25	
Client: Charles Glanville c/o Re-Format Ltd					Depth 3.40m		Logged By JL	
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
Depth (m)	Type	Results						
0.20	D		0.30			TOPSOIL: Mid brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare, sub-angular to sub-rounded, fine to coarse flint.		
0.50	D					RIVER TERRACE DEPOSITS: Mottled light brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is rare, fine to medium, sub-angular to sub-rounded flint.		
0.80	D							
1.20	D		1.30			RIVER TERRACE DEPOSITS: Mottled light brown/orange silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine, sub-angular to sub-rounded flint and chalk.		
1.50	D							
1.80	D					2.10		
2.20	D							
2.50	D		3.40					
2.80	D							
3.40	D							
Remarks: Roots noted to 0.80m bgl								
Groundwater: No groundwater encountered.								

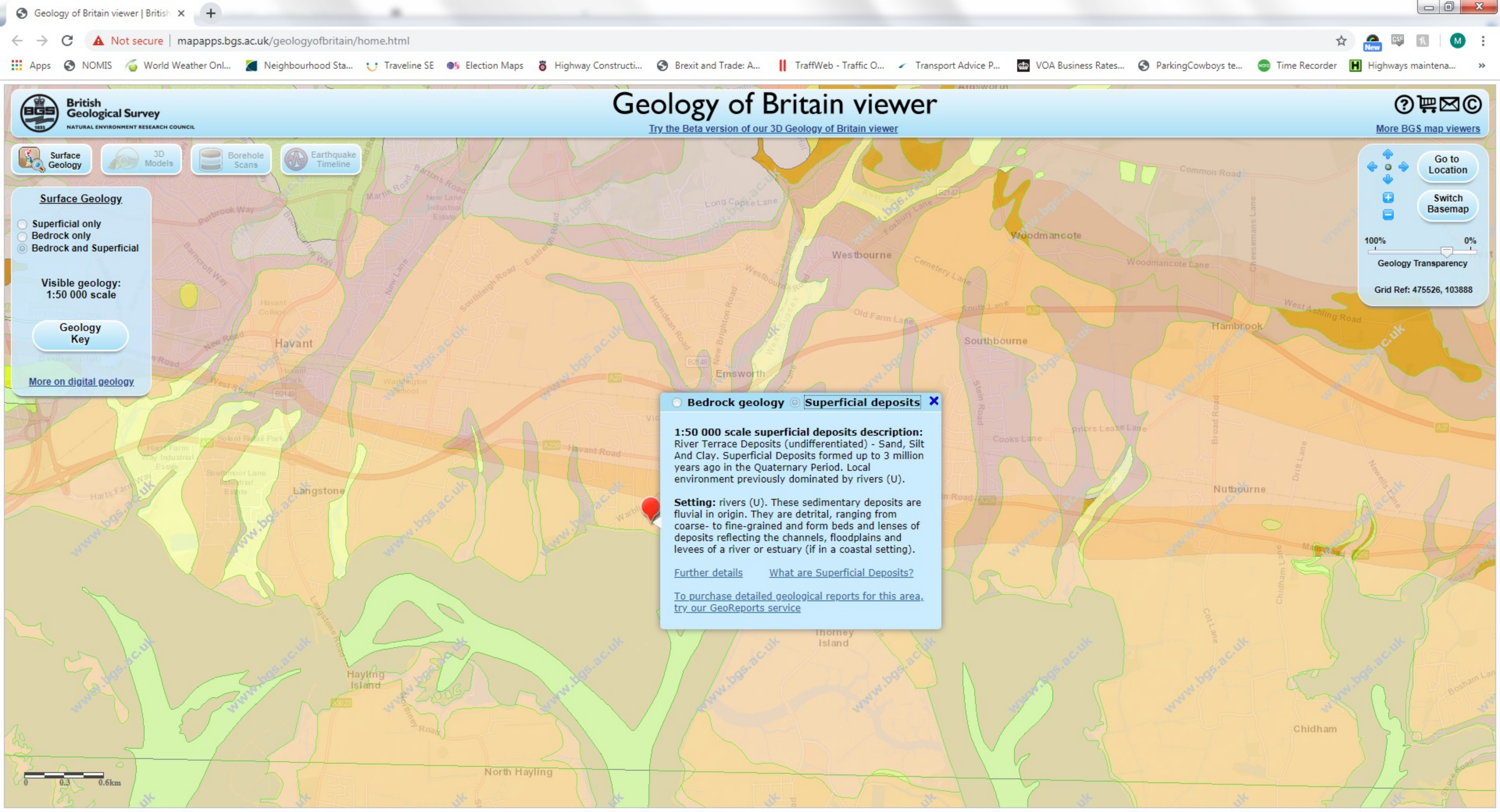
Ground and Water Ltd						Trialpit No TP4 Sheet 1 of 1	
Project Name Fowley Cottage			Project No. GWPR1704		Co-ords: - Level: -		Date 20/06/2016
Location: 46 Warblington Road, Emsworth, Hampshire PO10 7HD					Dimensions: - Depth 3.10m		Scale 1:25
Client: Charles Glanville c/o Re-Format Ltd							Logged By JL
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.15	D		0.15			TOPSOIL: Mid brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare, fine to coarse, sub-angular to sub-rounded flint.	1
0.30	D					RIVER TERRACE DEPOSITS: Light brown/mid-brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is rare to occasional, fine to medium, sub-angular to sub-rounded flint.	
0.90	D						
1.20	D						
1.50	D						
1.80	D		1.70			RIVER TERRACE DEPOSITS: Light brown/orange silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine, sub-angular to sub-rounded flint and chalk.	2
2.20	D		2.10			RIVER TERRACE DEPOSITS: Light brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is abundant, fine to coarse, flint and chalk.	
2.50	D						
3.00	D		2.90			RIVER TERRACE DEPOSITS: Light grey/off white sandy gravelly CLAY. Sand is fine to coarse grained. Gravel is abundant, sub-angular to sub-rounded, fine to coarse flint and chalk.	3
			3.10				
Trialpit Complete at 3.10 m							4
Remarks: Roots noted to 1.00m bgl.							
Groundwater: No groundwater encountered.							

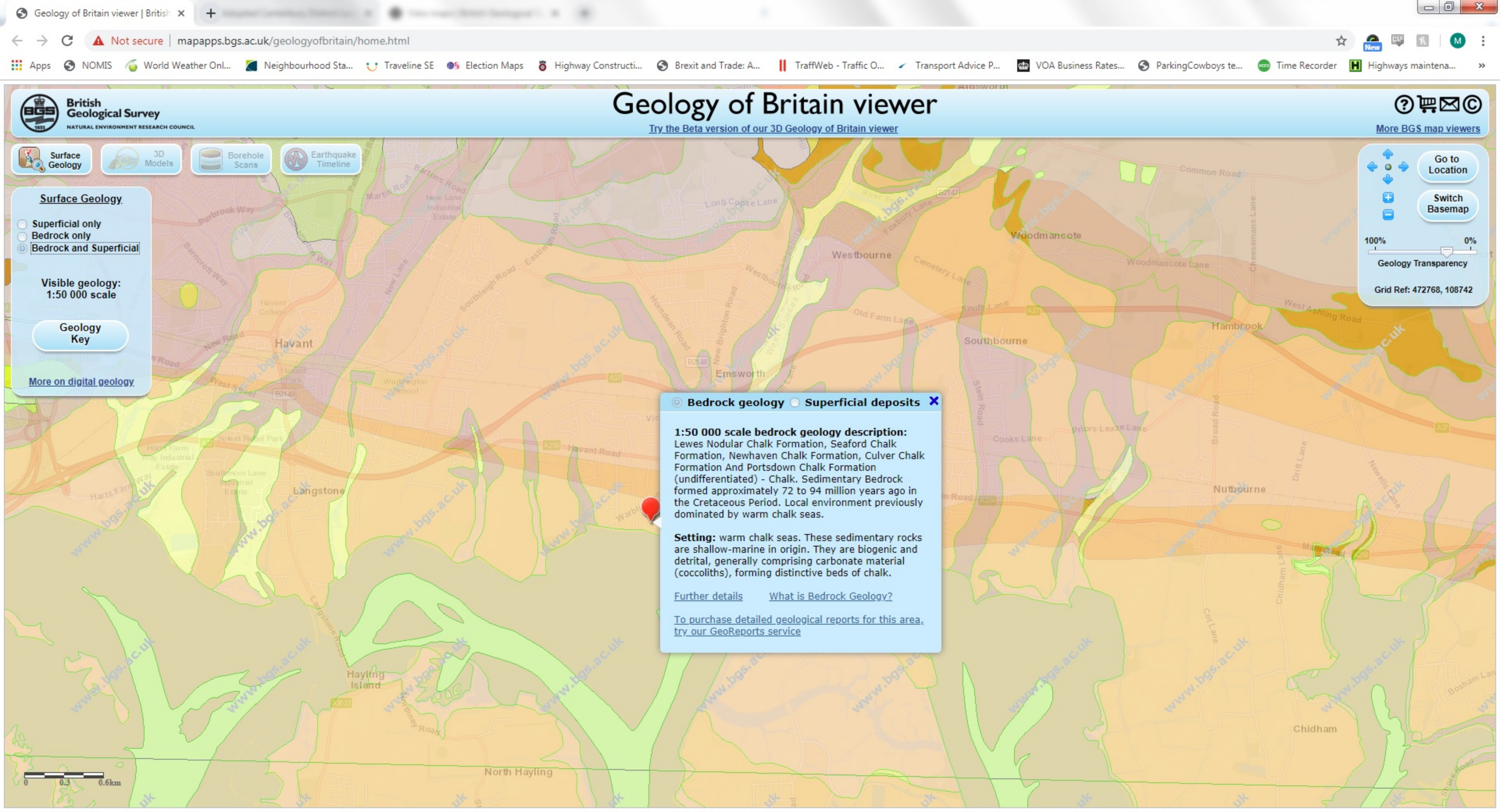
Ground and Water Ltd						Trialpit No TP5 Sheet 1 of 1	
Project Name Fowley Cottage			Project No. GWPR1704		Co-ords: - Level: -		Date 20/06/2016
Location: 46 Warblington Road, Emsworth, Hampshire PO10 7HD					Dimensions: - Depth 3.90m		Scale 1:25
Client: Charles Glanville c/o Re-Format Ltd							Logged By JL
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.20	D		0.20			TOPSOIL: Mid brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare, fine to medium, sub-angular to sub-rounded flint.	
0.50	D					RIVER TERRACE DEPOSITS: Mid brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is rare, fine to medium, sub-angular to sub-rounded flint.	
0.80	D						
1.20	D		1.10			RIVER TERRACE DEPOSITS: Light brown/orange/grey silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine to coarse, sub-angular to sub-rounded flint and chalk. Coarse chalk fragments noted from 2.40m bgl.	
1.50	D						
1.80	D						
2.20	D						
2.70	D						
3.40	D						
3.80	D		3.90				
						Trialpit Complete at 3.90 m	
Remarks: Roots to 1.30m bgl.							
Groundwater: No groundwater encountered.							



Ground and Water Ltd							Trialpit No TP6 Sheet 1 of 1	
Project Name Fowley Cottage			Project No. GWPR1704		Co-ords: - Level: -		Date 20/06/2016	
Location: 46 Warblington Road, Emsworth, Hampshire PO10 7HD					Dimensions: -		Scale 1:25	
Client: Charles Glanville c/o Re-Format Ltd					Depth 3.70m		Logged By JL	
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
Depth (m)	Type	Results						
0.20	D		0.20			TOPSOIL: Mid to dark brown silty sandy gravelly clay. Sand is fine grained. Gravel is rare, fine to coarse, sub-angular to sub-rounded flint.		
0.50	D					MADE GROUND: Light brown silty sandy gravelly clay. Sand is fine to medium grained. Gravel is fine to abundant, angular to sub-rounded, fine to coarse flint, chalk and brick.		
0.80	D		0.80			RIVER TERRACE DEPOSITS: Mottled light brown/orange silty sandy gravelly CLAY. Sand is fine to medium grained. Gravel is abundant, fine to medium, sub-angular to sub-rounded flint and chalk.		
1.20	D							
1.50	D							
1.80	D							
2.20	D							
2.70	D							
			2.90			RIVER TERRACE DEPOSITS: Mottled light brown/orange silty sandy gravelly CLAY. Sand is fine grained. Gravel is abundant, sub-angular to sub-rounded, fine to medium chalk and flint.		
3.20	D							
3.70	D		3.70			Trialpit Complete at 3.70 m		
Remarks: Roots noted to 1.80m bgl.								
Groundwater: No groundwater encountered.								

APPENDIX 3





APPENDIX 4

Bellamy Roberts		Page 1
Clover House Western Lane Odiham Hants RG29 1TU		
Date 14/01/2020 12:33 File	Designed by jasonbrown Checked by	
XP Solutions Source Control 2015.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	1.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 7

Results l/s

QBAR Rural	3.4
QBAR Urban	3.4
Q100 years	10.9
Q1 year	2.9
Q30 years	7.7
Q100 years	10.9

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APPENDIX 5



Atkins Global
The Hub, 500
Park Avenue
Bristol
BS32 4RZ

Your ref 54886
Our ref 245484
Date 22 May 2017
Contact searches@southernwater.co.uk
Tel 0845 272 0845
0330 303 0276
Fax 01634 844514

Attention: Andrew Aitken

Dear Customer

Re: Provision of public sewer record extract

Location: Site surrounding Warblington Road, Emsworth, PO10 7HD

Thank you for your order regarding the provision of extracts of our sewer and/or water main records. Please find enclosed the extracts from Southern Water's records for the above location.

We confirm payment of your fee in the sum of £49.92 and enclose a VAT receipt for your records.

Customers should be aware that there are areas within our region in which there are neither sewers nor water mains. Similarly, whilst the enclosed extract may indicate the approximate location of our apparatus in the area of interest, it should not be relied upon as showing that further infrastructure does not exist and may subsequently be found following site investigation. Actual positions of the disclosed (and any undisclosed) infrastructure should therefore be determined on site, because Southern Water does not accept any responsibility for inaccuracy or omission regarding the enclosed plan. Accordingly it should not be considered to be a definitive document.

Should you require any further assistance regarding this matter, please contact the LandSearch team.

Yours faithfully

LandSearch

105739



SU7405SW



Southern
Water

474074

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
0301X	3.761	2.554	300	UNK	CIRC	2350X	3.269	1.749	UNK	UNK	CIRC	4652X	6.132	5.232	150	UNK	CIRC	8707Y			UNK	UNK	UNK
0302X			UNK	UNK	CIRC	2401X	5.779	2.487	500	PP	CIRC	4751X	6.436		300	UNK	CIRC	870DX			150	UNK	CIRC
0303X	4.279		225	UNK	CIRC	2402X	6.144		500	PP	CIRC	4752X	6.61		225	UNK	CIRC	871DY			150	UNK	CIRC
0304X	3.429	2.478	300	UNK	CIRC	2406Y	4.75		300	UNK	CIRC	* 5301X	3.761		300	UNK	CIRC	8750X	3.035		450	UNK	RECT
0350X	4.382	3.312	225	UNK	CIRC	2406X	4.75	2.065	500	PP	CIRC	* 5350X	3.558	2.478	225	UNK	CIRC	9401X			UNK	UNK	CIRC
0351X	4.281		300	UNK	CIRC	2408X	4.61	2.628	500	PP	CIRC	5401X	5.069	3.094	225	UNK	CIRC	9404X			UNK	UNK	CIRC
0352X	3.562	2.652	300	UNK	CIRC	2450X			UNK	UNK	CIRC	5402X	4.721		UNK	UNK	CIRC	9405X			UNK	UNK	CIRC
0354X	2.62	2.17	UNK	UNK	CIRC	2451X	4.8	3.277	500	PP	CIRC	* 5450X	4.82	3.43	225	UNK	CIRC	9450X			225	UNK	CIRC
0401X	5.599	4.229	UNK	UNK	CIRC	2451Y	4.8	3.254	300	UNK	CIRC	* 5451X	4.536		225	UNK	CIRC	9550X	4.952	3.512	225	UNK	CIRC
0402X	5.583	4.033	UNK	UNK	CIRC	2452X	4.61	2.796	500	PP	CIRC	5501X	5.974	4.325	150	UNK	CIRC	9551X	4.471	3.701	225	UNK	CIRC
0403X	5.363	3.933	UNK	UNK	CIRC	2501X	6.334		200	UNK	CIRC	5502X	5.63	3.572	225	UNK	CIRC	9552X	4.469	3.619	225	UNK	CIRC
0404X	5.397	3.907	150	UNK	CIRC	2502X			100	VC	CIRC	552DX			150	UNK	CIRC	9554X	4.054	3.478	225	UNK	CIRC
0405X	4.398	3.258	150	UNK	CIRC	250DX			200	UNK	CIRC	5550X	6.155	5.055	150	UNK	CIRC	9555X	4.368		225	UNK	CIRC
0406X			UNK	UNK	CIRC	2550X	6.489	4.519	225	UNK	CIRC	5551X	5.922	4.792	150	UNK	CIRC	9601X			UNK	UNK	CIRC
0407X			UNK	UNK	CIRC	2551X	6.244		300	UNK	CIRC	5552X	5.777	4.387	150	UNK	CIRC	9602X			UNK	UNK	CIRC
040DX			UNK	UNK	CIRC	2601X	6.507	5.09	200	UNK	CIRC	* 5553X	5.624		225	UNK	CIRC	9603X			UNK	UNK	CIRC
0450X	4.919	3.109	150	UNK	CIRC	2601Y	6.507		200	UNK	CIRC	* 5552X			225	UNK	CIRC	9604Y			UNK	UNK	CIRC
0451X	5.558	4.518	225	UNK	CIRC	2602X			150	VC	CIRC	5601X	5.352	4.59	150	UNK	CIRC	9605X			150	UNK	CIRC
0452X	5.642	4.362	225	UNK	CIRC	2603X			150	VC	CIRC	5650X	5.568		450	UNK	CIRC	9606X			150	UNK	CIRC
0453X	5.758		225	UNK	CIRC	263DX			150	VC	CIRC	5651X	4.815	3.935	450	UNK	CIRC	9650X			225	UNK	CIRC
0454X	5.33	4.18	UNK	UNK	CIRC	264DX			150	VC	CIRC	5652X	5.352	4.812	150	UNK	CIRC	9651X	5.669	4.109	225	UNK	CIRC
0455X	4.635	3.835	225	UNK	CIRC	2650X	6.516	4.916	UNK	UNK	CIRC	5653X	5.902	4.602	150	UNK	CIRC	9652X			225	UNK	CIRC
0456X	4.379	3.409	225	UNK	CIRC	2701Y	6.571	4.596	225	UNK	CIRC	565ZX			450	UNK	CIRC	9703X			150	UNK	CIRC
0501X	5.7	4.15	150	UNK	CIRC	2702X	6.958		225	UNK	CIRC	5702X			150	PF	CIRC	9704X			150	UNK	CIRC
0502X	5.61	3.99	150	UNK	CIRC	270DX			225	UNK	CIRC	5703X			150	PF	CIRC						
0503X	5.69	3.84	150	UNK	CIRC	271DX			225	UNK	CIRC	5750X	5.196	4.536	225	UNK	CIRC						
0504X	5.55	3.77	150	UNK	CIRC	2751X	6.938	6.288	225	UNK	CIRC	5751X	5.608	4.308	375	UNK	CIRC						
0505X	5.865	4.565	UNK	UNK	CIRC	2752X	7.156	5.876	150	UNK	CIRC	5752X	5.231		225	UNK	CIRC	*					
0506X	5.785	4.335	UNK	UNK	CIRC	2753X	6.541	5.301	225	UNK	CIRC	5752Y	5.231		150	UNK	CIRC	*					
0507X	5.525	4.205	150	UNK	CIRC	3401X	4.596	1.694	300	UNK	CIRC	5752X			375	UNK	CIRC						
0508X			UNK	UNK	CIRC	3450X			450	UNK	CIRC	6301X	3.529	0.884	300	UNK	CIRC						
0509X			UNK	UNK	CIRC	3451X			450	UNK	CIRC	6401X			UNK	UNK	CIRC						
0550X	5.994		225	UNK	CIRC	3501X	6.489	4.413	225	UNK	CIRC	6402X			UNK	UNK	CIRC						
0551X	5.826	4.816	225	UNK	CIRC	3502X			UNK	VC	CIRC	6403X			UNK	UNK	CIRC						
0552X			150	UNK	CIRC	3503X			225	UNK	CIRC	640DX			UNK	UNK	CIRC						
0601X			UNK	UNK	CIRC	3550X	6.478	4.998	225	UNK	CIRC	6601X			UNK	UNK	CIRC						
0602X			100	VC	CIRC	3551Z	6.56	5.36	225	CO	CIRC	* 6603X			UNK	PF	CIRC						
060DX			100	VC	CIRC	3551Y	6.56	5.36	225	CO	CIRC	* 6604X			UNK	PF	CIRC						
061DX			100	VC	CIRC	3551X	6.56	5.36	300	CO	CIRC	* 6650X	3.474	2.604	225	UNK	CIRC						
063DX			UNK	UNK	CIRC	3552Y	6.564		450	UNK	CIRC	6651X	3.287	2.291	225	UNK	CIRC						
0650X	6.35	5.52	150	UNK	CIRC	3553Y	6.477		225	UNK	CIRC	665ZX			375	UNK	CIRC						
0651X	5.81	5.2	150	UNK	CIRC	3554X	6.693		150	UNK	CIRC	7201X	3.017	1.493	UNK	UNK	CIRC						
0752X	7.642	6.382	225	UNK	CIRC	3555X			375	CO	CIRC	7301X	2.975	0.637	300	UNK	CIRC						
1301X	4.514	2.39	300	UNK	CIRC	3601X	6.431	5.294	150	UNK	CIRC	730LX			150	UNK	CIRC						
1302X	4.803	3.514	225	UNK	CIRC	3650Y	6.546		300	CO	CIRC	7401X	2.929	0.515	300	UNK	CIRC						
1401Y	5.443	2.649	300	PVC	CIRC	3650X	6.546	6.046	300	CO	CIRC	* 7501X	3.011		375	CI	CIRC						
1401Y	5.443		300	UNK	CIRC	3651X	6.364	5.544	225	UNK	CIRC	* 7502X	3.006	0.283	300	UNK	CIRC						
1401X	5.443	3.58	300	PVC	CIRC	3652X			375	CO	CIRC	7503X			UNK	UNK	CIRC						
1450X	5.445	4.195	UNK	UNK	CIRC	3653X	6.529		375	CO	CIRC	7504X			100	VC	CIRC						
1451X	5.095	3.875	225	UNK	CIRC	3654X			375	CO	CIRC	750DX			300	UNK	CIRC						
1501X	6.431	3.222	225	UNK	CIRC	3701X	6.495		225	UNK	CIRC	7601X			UNK	UNK	CIRC						
1502X	6.15		225	UNK	CIRC	3751X	6.517	5.867	150	UNK	CIRC	7602X			UNK	UNK	CIRC						
1503X	6.343	5.083	150	UNK	CIRC	3753X			300	CO	CIRC	7603X			UNK	UNK	CIRC						
1504X	6.047	2.972	300	UNK	CIRC	4301X			UNK	UNK	CIRC	7604X			UNK	UNK	CIRC						
1550X	6.391	5.741	225	UNK	CIRC	430DX			300	UNK	CIRC	7605X			UNK	UNK	CIRC						
1551X	5.993	4.683	225	UNK	CIRC	4401X	4.88	3.612	225	UNK	CIRC	7650X	3.005	2.245	225	UNK	CIRC						
1552X	6.366	5.156	225	UNK	CIRC	4402X			UNK	UNK	CIRC	7651X	3.082	2.182	375	UNK	CIRC						
1601X	6.849		225	UNK	CIRC	4450X	5.677	4.447	225	UNK	CIRC	7701X	3.017	0.384	UNK	UNK	CIRC						
1650X	6.95	6	225	UNK	CIRC	4501X	6.443	5.108	150	UNK	CIRC	8501X	3.02		375	UNK	CIRC						
1702X	7.45		225	UNK	CIRC	4502X	5.806	4.017	225	UNK	CIRC	8502X	3.17		375	UNK	CIRC						
1751X	7.432	6.292	225	UNK	CIRC	4503X			UNK	UNK	CIRC	8601X	3.152	1.079	UNK	UNK	CIRC						
2301X			300	UNK	CIRC	4550X	5.677		225	UNK	CIRC	8703X	6.139	3.944	150	UNK	CIRC						
2302Y	3.304	2.249	UNK	UNK	CIRC	4601X	6.114	4.968	150	UNK	CIRC	8704X	3.17		200	UNK	CIRC						
2302X	3.304	2.249	300	UNK	CIRC	4650X	6.503		225	UNK	CIRC	8705X			UNK	UNK	CIRC						
2303X	4.048	2.35	300	UNK	CIRC	4651Y	5.818		225	UNK	CIRC	8706X			150	UNK	CIRC						

LINE STYLES / COLOURS

Brown

Foul

Foul Syphon Sewer

Foul Vacuum Main

Foul Rising Main

Combined

Combined Syphon Sewer

Combined Rising Main

Lateral Drain

Building Over Agreement Area

Treated Effluent

Sludge

Sewer Catchment

Section 104 Area

Surface Water

Surface Water Rising Main

Private

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. Min-e (SW)

Flushing ch. Min-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

Reflex 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

Tidal storage tank

Blank end

Head of Public Sewer

Micro Pumping Station

SHAPES (S)

A Arched

B Barrel

C Circular

E Egg

H Horseshoe

R Rectangular

S Square

T Trapezoidal

U U Shape

X Other

NODE REFERENCING SYSTEM

1st digit: hundred metre easting identifier

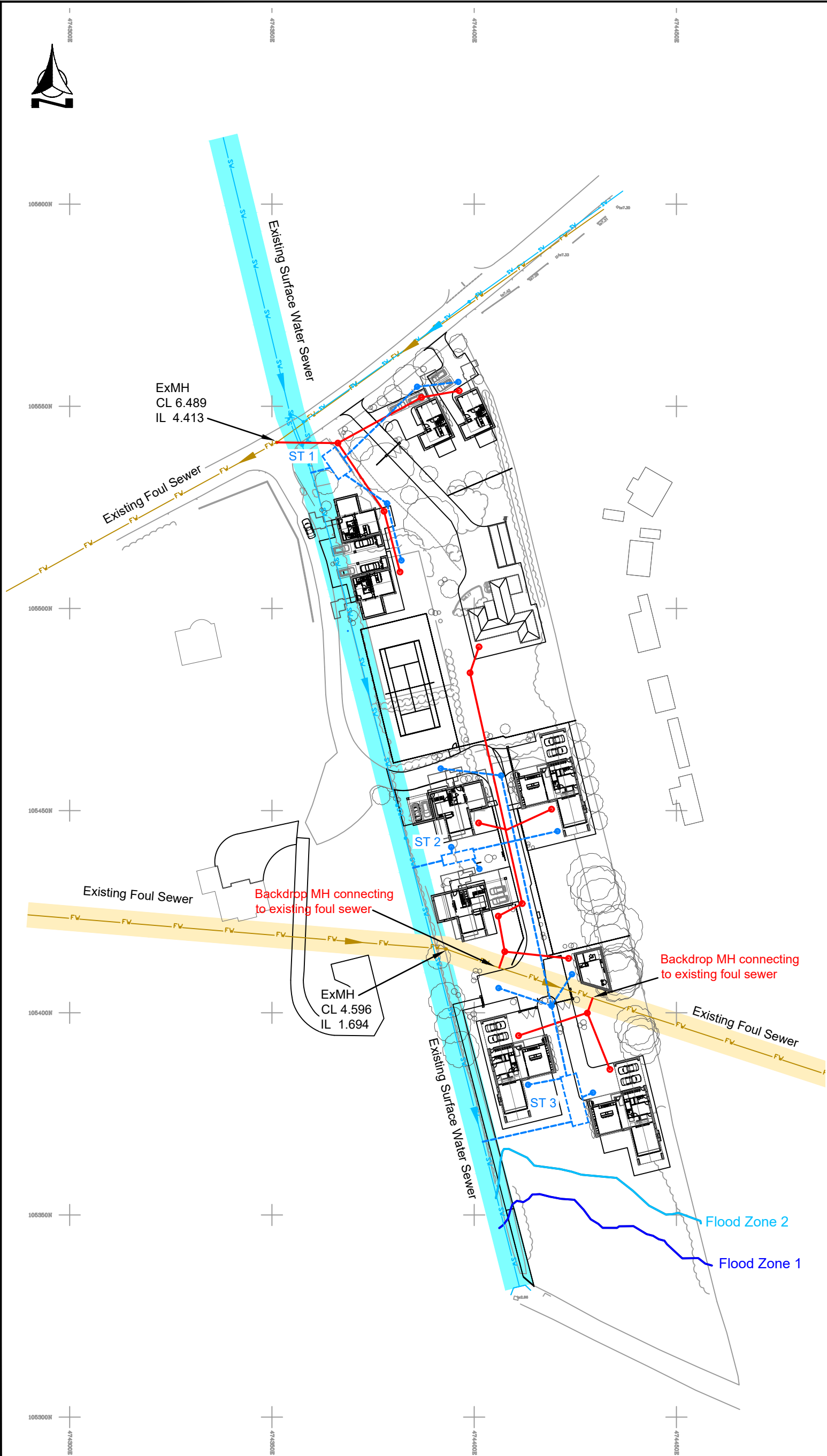
2nd digit: hundred metre northing identifier

3rd digit: sewer type identifier

4th digit: next sequential node

O-4 =

APPENDIX 6



Notes

This drawing shall be read in conjunction with all other relevant Engineering, Architectural, Landscaping details, drawings and specifications and all relevant Highway Authority Plans.

Any works constructed prior to technical approval are at the contractors own risk.

All levels to be checked prior to any works undertaken. Existing surface water sewer along Warblington Road to be identified to ensure new proposed foul sewer doesn't conflict with any existing pipes.

Drainage calculations for soak-aways to Digest 365 have been undertaken by Ground & Water which has indicated that the existing ground make up is unsuitable for any type of infiltration.

Storage tanks for all plots have been calculated using Microdrainage and are designed to 1 in 100 yr storm plus 40% for climate change and discharge into the nearby existing surface water sewer controlled via hydro-brakes, restricted to 10.9l/s as indicated in the Qbar calculations.

All driveways to be permeable paving blocks

Storage tank ST1 requires 28m² x 1.0m deep
Storage tank ST2 requires 20m² x 1.0m deep
Storage tank ST3 requires 50m² x 1.0m deep

Key	
	3.5m stand-off distance for surface water system
	3m stand-off distance for foul water system
	Surface water sewer
	Surface water storage tank
	Foul water sewer

REVISION	DESCRIPTION	DATE	CHK	MT
E	Site layout revised, drainage strategy amended to suit new number of units and road layout	14/07/20	JCB	MT
D	Site layout revised, drainage strategy amended to suit new number of units and road layout	14/07/20	JCB	MT
C	For Discussion Purposes	21/08/19	ARM	MT
B	FFLs updated	19/08/19	ARM	MT
A	Drawing updated following ground and water investigation report	04/08/19	JCB	MT
AMENDMENT		DRN	DATE	CHK



Clover House
Western Lane
Odiham
Hampshire, RG29 1TU

Tel: 01256 703355
Email: info@bellamyroberts.co.uk

CLIENT
Premier Coastal Properties Ltd.

PROJECT
Warblington Road, Emsworth

TITLE
Foul and Surface Water Drainage Strategy

DRAWN BY JCB	DESIGN BY JCB	CHK BY MT
DATE 30/05/19	DRAWING No. 5042 / 004	REV No. E
SCALE 1:1000 @ A3		

APPENDIX 7

Bellamy Roberts				Page 1		
Clover House Western Lane Odiham Hants RG29 1TU			Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 1			
Date 23/04/2020 File 100YRS ST1 REV B.SRCX			Designed by JCB Checked by MT			
XP Solutions			Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	5.054	0.554	2.7	15.5	O K
	30 min Summer	5.200	0.700	3.0	19.6	O K
	60 min Summer	5.298	0.798	3.2	22.3	O K
	120 min Summer	5.339	0.839	3.2	23.5	O K
	180 min Summer	5.326	0.826	3.2	23.1	O K
	240 min Summer	5.295	0.795	3.1	22.3	O K
	360 min Summer	5.226	0.726	3.0	20.3	O K
	480 min Summer	5.163	0.663	2.9	18.6	O K
	600 min Summer	5.106	0.606	2.8	17.0	O K
	720 min Summer	5.055	0.555	2.7	15.5	O K
	960 min Summer	4.970	0.470	2.5	13.1	O K
	1440 min Summer	4.847	0.347	2.2	9.7	O K
	2160 min Summer	4.734	0.234	1.8	6.6	O K
	2880 min Summer	4.667	0.167	1.6	4.7	O K
	4320 min Summer	4.595	0.095	1.2	2.7	O K
	5760 min Summer	4.565	0.065	1.0	1.8	O K
	7200 min Summer	4.555	0.055	0.9	1.5	O K
	8640 min Summer	4.548	0.048	0.7	1.3	O K
	10080 min Summer	4.544	0.044	0.7	1.2	O K
	15 min Winter	5.125	0.625	2.8	17.5	O K
	30 min Winter	5.295	0.795	3.1	22.3	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
	15 min Summer	126.074	0.0	17.2	17	
	30 min Summer	84.745	0.0	23.2	31	
	60 min Summer	54.368	0.0	29.8	54	
	120 min Summer	33.674	0.0	36.9	88	
	180 min Summer	25.065	0.0	41.2	122	
	240 min Summer	20.180	0.0	44.2	156	
	360 min Summer	14.839	0.0	48.7	224	
	480 min Summer	11.923	0.0	52.2	290	
	600 min Summer	10.054	0.0	55.0	356	
	720 min Summer	8.741	0.0	57.4	420	
	960 min Summer	7.003	0.0	61.3	542	
	1440 min Summer	5.114	0.0	67.2	782	
	2160 min Summer	3.727	0.0	73.4	1144	
	2880 min Summer	2.973	0.0	78.1	1500	
	4320 min Summer	2.159	0.0	85.1	2208	
	5760 min Summer	1.718	0.0	90.3	2936	
	7200 min Summer	1.438	0.0	94.5	3672	
	8640 min Summer	1.245	0.0	98.1	4400	
	10080 min Summer	1.102	0.0	101.4	5112	
	15 min Winter	126.074	0.0	19.3	17	
	30 min Winter	84.745	0.0	26.0	31	
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Clover House Western Lane Odiham Hants RG29 1TU		Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 1			
Date 23/04/2020 File 100YRS ST1 REV B.SRCX		Designed by JCB Checked by MT			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	5.414	0.914	3.4	25.6	O K
120 min Winter	5.451	0.951	3.4	26.6	O K
180 min Winter	5.426	0.926	3.4	25.9	O K
240 min Winter	5.376	0.876	3.3	24.5	O K
360 min Winter	5.272	0.772	3.1	21.6	O K
480 min Winter	5.178	0.678	2.9	19.0	O K
600 min Winter	5.097	0.597	2.8	16.7	O K
720 min Winter	5.028	0.528	2.6	14.8	O K
960 min Winter	4.916	0.416	2.3	11.7	O K
1440 min Winter	4.772	0.272	1.9	7.6	O K
2160 min Winter	4.658	0.158	1.5	4.4	O K
2880 min Winter	4.600	0.100	1.2	2.8	O K
4320 min Winter	4.559	0.059	0.9	1.7	O K
5760 min Winter	4.548	0.048	0.7	1.3	O K
7200 min Winter	4.542	0.042	0.6	1.2	O K
8640 min Winter	4.539	0.039	0.5	1.1	O K
10080 min Winter	4.536	0.036	0.5	1.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	54.368	0.0	33.3	58	
120 min Winter	33.674	0.0	41.3	92	
180 min Winter	25.065	0.0	46.1	132	
240 min Winter	20.180	0.0	49.5	168	
360 min Winter	14.839	0.0	54.6	240	
480 min Winter	11.923	0.0	58.5	308	
600 min Winter	10.054	0.0	61.6	374	
720 min Winter	8.741	0.0	64.3	440	
960 min Winter	7.003	0.0	68.7	566	
1440 min Winter	5.114	0.0	75.3	808	
2160 min Winter	3.727	0.0	82.3	1164	
2880 min Winter	2.973	0.0	87.5	1524	
4320 min Winter	2.159	0.0	95.3	2184	
5760 min Winter	1.718	0.0	101.1	2872	
7200 min Winter	1.438	0.0	105.8	3672	
8640 min Winter	1.245	0.0	109.9	4344	
10080 min Winter	1.102	0.0	113.5	4984	
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Clover House Western Lane Odiham Hants RG29 1TU	Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 1	
Date 23/04/2020 File 100YRS ST1 REV B.SRCX	Designed by JCB Checked by MT	
XP Solutions	Source Control 2017.1	

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)	19.200	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.073

Time (mins)	Area
From:	To: (ha)

0	4 0.073
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Clover House Western Lane Odiham Hants RG29 1TU	Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 1	
Date 23/04/2020 File 100YRS ST1 REV B.SRCX	Designed by JCB Checked by MT	
XP Solutions Source Control 2017.1		

Model Details

Storage is Online Cover Level (m) 6.500

Tank or Pond Structure

Invert Level (m) 4.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	28.0	1.000	28.0	1.100	0.0	2.000	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0058-3500-1000-3500
Design Head (m)	1.000
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	4.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.5
Flush-Flo™	0.078	1.2
Kick-Flo®	0.086	1.2
Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	1.200	3.8	3.000	5.9	7.000	8.8
0.200	1.7	1.400	4.1	3.500	6.3	7.500	9.1
0.300	2.0	1.600	4.4	4.000	6.7	8.000	9.3
0.400	2.3	1.800	4.6	4.500	7.1	8.500	9.6
0.500	2.5	2.000	4.8	5.000	7.5	9.000	9.9
0.600	2.8	2.200	5.1	5.500	7.8	9.500	10.1
0.800	3.2	2.400	5.3	6.000	8.1		
1.000	3.5	2.600	5.5	6.500	8.5		

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Clover House Western Lane Odiham Hants RG29 1TU		Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 2			
Date 23/04/2020 File 100YRS ST2 REV B.SRCX		Designed by JCB Checked by MT			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	3.419	0.619	2.8	12.4	O K
30 min Summer	3.568	0.768	3.1	15.4	O K
60 min Summer	3.656	0.856	3.3	17.1	O K
120 min Summer	3.680	0.880	3.3	17.6	O K
180 min Summer	3.647	0.847	3.2	16.9	O K
240 min Summer	3.598	0.798	3.2	16.0	O K
360 min Summer	3.506	0.706	3.0	14.1	O K
480 min Summer	3.427	0.627	2.8	12.5	O K
600 min Summer	3.359	0.559	2.7	11.2	O K
720 min Summer	3.301	0.501	2.5	10.0	O K
960 min Summer	3.208	0.408	2.3	8.2	O K
1440 min Summer	3.083	0.283	2.0	5.7	O K
2160 min Summer	2.979	0.179	1.6	3.6	O K
2880 min Summer	2.922	0.122	1.3	2.4	O K
4320 min Summer	2.868	0.068	1.1	1.4	O K
5760 min Summer	2.854	0.054	0.8	1.1	O K
7200 min Summer	2.846	0.046	0.7	0.9	O K
8640 min Summer	2.842	0.042	0.6	0.8	O K
10080 min Summer	2.839	0.039	0.5	0.8	O K
15 min Winter	3.500	0.700	3.0	14.0	O K
30 min Winter	3.674	0.874	3.3	17.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	126.074	0.0	14.2	17	
30 min Summer	84.745	0.0	19.1	31	
60 min Summer	54.368	0.0	24.5	50	
120 min Summer	33.674	0.0	30.3	84	
180 min Summer	25.065	0.0	33.8	118	
240 min Summer	20.180	0.0	36.3	152	
360 min Summer	14.839	0.0	40.1	218	
480 min Summer	11.923	0.0	42.9	282	
600 min Summer	10.054	0.0	45.2	346	
720 min Summer	8.741	0.0	47.2	406	
960 min Summer	7.003	0.0	50.4	530	
1440 min Summer	5.114	0.0	55.2	766	
2160 min Summer	3.727	0.0	60.4	1124	
2880 min Summer	2.973	0.0	64.2	1472	
4320 min Summer	2.159	0.0	69.9	2200	
5760 min Summer	1.718	0.0	74.2	2896	
7200 min Summer	1.438	0.0	77.6	3672	
8640 min Summer	1.245	0.0	80.7	4384	
10080 min Summer	1.102	0.0	83.3	5064	
15 min Winter	126.074	0.0	15.9	17	
30 min Winter	84.745	0.0	21.3	31	
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Clover House Western Lane Odiham Hants RG29 1TU			Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 2		
Date 23/04/2020 File 100YRS ST2 REV B.SRCX			Designed by JCB Checked by MT		
XP Solutions			Source Control 2017.1		
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	3.775	0.975	3.5	19.5	O K
120 min Winter	3.790	0.990	3.5	19.8	O K
180 min Winter	3.733	0.933	3.4	18.7	O K
240 min Winter	3.658	0.858	3.3	17.2	O K
360 min Winter	3.522	0.722	3.0	14.4	O K
480 min Winter	3.410	0.610	2.8	12.2	O K
600 min Winter	3.318	0.518	2.6	10.4	O K
720 min Winter	3.243	0.443	2.4	8.9	O K
960 min Winter	3.131	0.331	2.1	6.6	O K
1440 min Winter	3.000	0.200	1.7	4.0	O K
2160 min Winter	2.908	0.108	1.3	2.2	O K
2880 min Winter	2.867	0.067	1.0	1.3	O K
4320 min Winter	2.849	0.049	0.8	1.0	O K
5760 min Winter	2.842	0.042	0.6	0.8	O K
7200 min Winter	2.837	0.037	0.5	0.7	O K
8640 min Winter	2.834	0.034	0.4	0.7	O K
10080 min Winter	2.832	0.032	0.4	0.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	54.368	0.0	27.4	52	
120 min Winter	33.674	0.0	33.9	90	
180 min Winter	25.065	0.0	37.9	126	
240 min Winter	20.180	0.0	40.7	162	
360 min Winter	14.839	0.0	44.9	232	
480 min Winter	11.923	0.0	48.1	298	
600 min Winter	10.054	0.0	50.7	362	
720 min Winter	8.741	0.0	52.9	424	
960 min Winter	7.003	0.0	56.5	546	
1440 min Winter	5.114	0.0	61.9	780	
2160 min Winter	3.727	0.0	67.6	1128	
2880 min Winter	2.973	0.0	71.9	1468	
4320 min Winter	2.159	0.0	78.3	2204	
5760 min Winter	1.718	0.0	83.1	2936	
7200 min Winter	1.438	0.0	87.0	3544	
8640 min Winter	1.245	0.0	90.3	4392	
10080 min Winter	1.102	0.0	93.3	5096	
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Clover House Western Lane Odiham Hants RG29 1TU	Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 2	
Date 23/04/2020 File 100YRS ST2 REV B.SRCX	Designed by JCB Checked by MT	
XP Solutions	Source Control 2017.1	

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)	19.200	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.060

Time (mins)		Area
From:	To:	(ha)
0	4	0.060

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Clover House Western Lane Odiham Hants RG29 1TU	Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 2	
Date 23/04/2020 File 100YRS ST2 REV B.SRCX	Designed by JCB Checked by MT	
XP Solutions	Source Control 2017.1	

Model Details

Storage is Online Cover Level (m) 4.800

Tank or Pond Structure

Invert Level (m) 2.800

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	20.0	1.000	20.0	1.100	0.0	2.000	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0058-3500-1000-3500
Design Head (m)	1.000
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	58
Invert Level (m)	2.800
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.5
Flush-Flo™	0.078	1.2
Kick-Flo®	0.086	1.2
Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	1.200	3.8	3.000	5.9	7.000	8.8
0.200	1.7	1.400	4.1	3.500	6.3	7.500	9.1
0.300	2.0	1.600	4.4	4.000	6.7	8.000	9.3
0.400	2.3	1.800	4.6	4.500	7.1	8.500	9.6
0.500	2.5	2.000	4.8	5.000	7.5	9.000	9.9
0.600	2.8	2.200	5.1	5.500	7.8	9.500	10.1
0.800	3.2	2.400	5.3	6.000	8.1		
1.000	3.5	2.600	5.5	6.500	8.5		

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Clover House Western Lane Odiham Hants RG29 1TU		Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 3			
Date 23/04/2020 File 100YRS ST3.SRCX		Designed by JCB Checked by MT			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	2.528	0.528	3.0	26.4	O K
30 min Summer	2.681	0.681	3.3	34.1	O K
60 min Summer	2.806	0.806	3.6	40.3	O K
120 min Summer	2.870	0.870	3.7	43.5	O K
180 min Summer	2.878	0.878	3.8	43.9	O K
240 min Summer	2.867	0.867	3.7	43.3	O K
360 min Summer	2.827	0.827	3.7	41.3	O K
480 min Summer	2.781	0.781	3.6	39.1	O K
600 min Summer	2.736	0.736	3.5	36.8	O K
720 min Summer	2.694	0.694	3.4	34.7	O K
960 min Summer	2.618	0.618	3.2	30.9	O K
1440 min Summer	2.496	0.496	2.9	24.8	O K
2160 min Summer	2.369	0.369	2.5	18.4	O K
2880 min Summer	2.283	0.283	2.2	14.2	O K
4320 min Summer	2.180	0.180	1.8	9.0	O K
5760 min Summer	2.122	0.122	1.5	6.1	O K
7200 min Summer	2.084	0.084	1.4	4.2	O K
8640 min Summer	2.070	0.070	1.2	3.5	O K
10080 min Summer	2.062	0.062	1.1	3.1	O K
15 min Winter	2.594	0.594	3.1	29.7	O K
30 min Winter	2.770	0.770	3.5	38.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	126.074	0.0	28.3	18	
30 min Summer	84.745	0.0	38.1	32	
60 min Summer	54.368	0.0	48.9	60	
120 min Summer	33.674	0.0	60.6	100	
180 min Summer	25.065	0.0	67.6	132	
240 min Summer	20.180	0.0	72.6	166	
360 min Summer	14.839	0.0	80.1	234	
480 min Summer	11.923	0.0	85.8	304	
600 min Summer	10.054	0.0	90.4	370	
720 min Summer	8.741	0.0	94.4	436	
960 min Summer	7.003	0.0	100.8	568	
1440 min Summer	5.114	0.0	110.4	820	
2160 min Summer	3.727	0.0	120.7	1188	
2880 min Summer	2.973	0.0	128.4	1532	
4320 min Summer	2.159	0.0	139.8	2248	
5760 min Summer	1.718	0.0	148.4	2952	
7200 min Summer	1.438	0.0	155.3	3672	
8640 min Summer	1.245	0.0	161.3	4400	
10080 min Summer	1.102	0.0	166.6	5136	
15 min Winter	126.074	0.0	31.7	18	
30 min Winter	84.745	0.0	42.6	32	
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Clover House Western Lane Odiham Hants RG29 1TU		Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 3			
Date 23/04/2020 File 100YRS ST3.SRCX		Designed by JCB Checked by MT			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	2.918	0.918	3.8	45.9	O K
120 min Winter	2.992	0.992	4.0	49.6	O K
180 min Winter	2.997	0.997	4.0	49.9	O K
240 min Winter	2.977	0.977	4.0	48.9	O K
360 min Winter	2.915	0.915	3.8	45.7	O K
480 min Winter	2.845	0.845	3.7	42.3	O K
600 min Winter	2.778	0.778	3.6	38.9	O K
720 min Winter	2.716	0.716	3.4	35.8	O K
960 min Winter	2.608	0.608	3.2	30.4	O K
1440 min Winter	2.446	0.446	2.8	22.3	O K
2160 min Winter	2.294	0.294	2.3	14.7	O K
2880 min Winter	2.204	0.204	1.9	10.2	O K
4320 min Winter	2.111	0.111	1.5	5.5	O K
5760 min Winter	2.070	0.070	1.2	3.5	O K
7200 min Winter	2.058	0.058	1.0	2.9	O K
8640 min Winter	2.052	0.052	0.9	2.6	O K
10080 min Winter	2.047	0.047	0.8	2.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	54.368	0.0	54.8	60	
120 min Winter	33.674	0.0	67.9	112	
180 min Winter	25.065	0.0	75.8	140	
240 min Winter	20.180	0.0	81.3	178	
360 min Winter	14.839	0.0	89.7	254	
480 min Winter	11.923	0.0	96.1	326	
600 min Winter	10.054	0.0	101.3	398	
720 min Winter	8.741	0.0	105.7	464	
960 min Winter	7.003	0.0	112.9	598	
1440 min Winter	5.114	0.0	123.7	852	
2160 min Winter	3.727	0.0	135.2	1212	
2880 min Winter	2.973	0.0	143.8	1560	
4320 min Winter	2.159	0.0	156.6	2288	
5760 min Winter	1.718	0.0	166.2	2936	
7200 min Winter	1.438	0.0	173.9	3672	
8640 min Winter	1.245	0.0	180.7	4368	
10080 min Winter	1.102	0.0	186.6	5056	
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Clover House Western Lane Odiham Hants RG29 1TU	Premier Coastal Properties Ltd Warblington Road, Emsworth Storage Tank 3	
Date 23/04/2020 File 100YRS ST3.SRCX	Designed by JCB Checked by MT	
XP Solutions Source Control 2017.1		

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)	19.200	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.120

Time (mins)	Area
From:	To: (ha)
0	4 0.120

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Model Details

Storage is Online Cover Level (m) 4.000

Tank or Pond Structure

Invert Level (m) 2.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	1.000	50.0	1.100	0.0	2.000	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0062-4000-1000-4000
Design Head (m)	1.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	2.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.0
Flush-Flo™	0.089	1.4
Kick-Flo®	0.093	1.4
Mean Flow over Head Range	-	2.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	4.4	3.000	6.7	7.000	10.0
0.200	1.9	1.400	4.7	3.500	7.2	7.500	10.4
0.300	2.3	1.600	5.0	4.000	7.7	8.000	10.7
0.400	2.6	1.800	5.3	4.500	8.1	8.500	11.0
0.500	2.9	2.000	5.5	5.000	8.5	9.000	11.3
0.600	3.2	2.200	5.8	5.500	8.9	9.500	11.6
0.800	3.6	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

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