



## West Hill, Wadebridge

### Pre-Application Technical Note – Flood Risk and Drainage

Project No.	1573
Revision	Initial Issue
Date	12 <sup>th</sup> January 2023
Client	Wadebridge LVA LLP
Prepared	B Fenton
Checked	L Blackmore
Authorised	C Yalden
File Ref.	<b>P:\1573 West Hill, Wadebridge\C Documents\Reports\ 1573 West Hill, Wadebridge - Flood Risk and Drainage Tech. Note</b>

## 1 Introduction

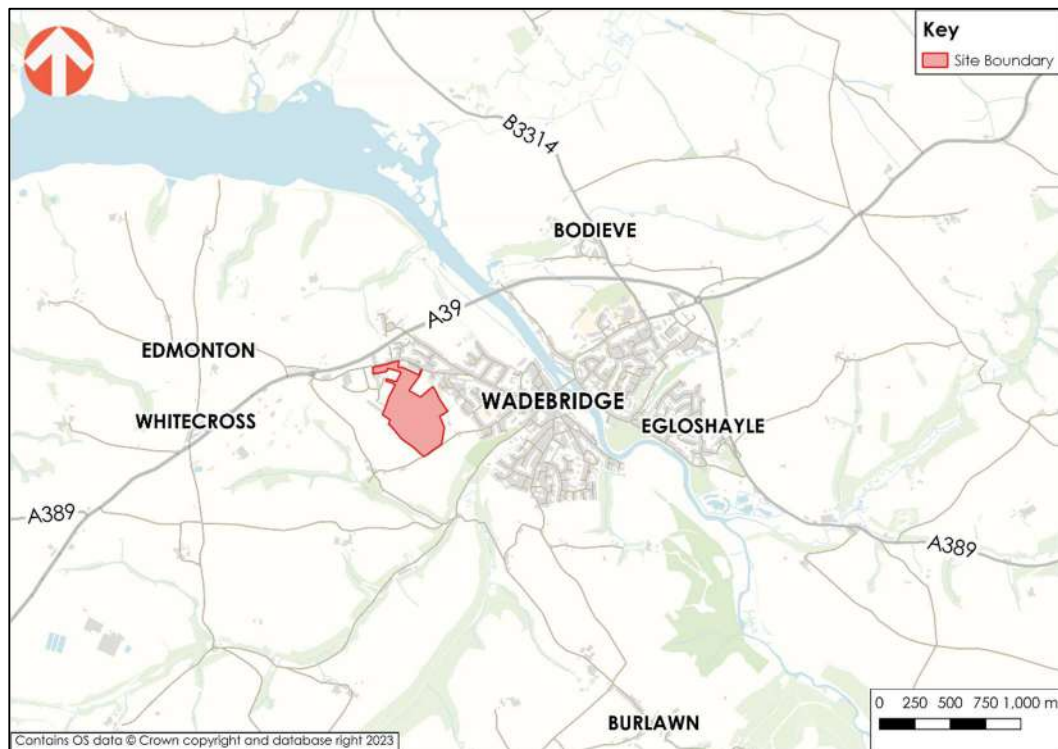
- 1.1 AWP has been commissioned by LVA to prepare a pre-application Flood Risk and Drainage Technical Note in support of the future outline planning application for a residential development comprising up to 325 residential dwellings, on greenfield land at West Hill, Wadebridge, Cornwall, PL27 7ET (grid ref. SW980723).
- 1.2 This technical note aims to provide a summary of existing baseline conditions and flood risk, whilst also providing outline drainage strategies for both surface water runoff and foul flows.

### Existing Site

- 1.3 The proposed 17.30 ha site is located to the west of Wadebridge, Cornwall, and south of the A39. The site comprises greenfield land currently used for agriculture, with fields predominantly used for grazing.

1.4 The proposed site location is identified within Figure 1.1.

**Figure 1.1 – Site Location Plan**



1.5 The site is surrounded by a variety of land uses. The site is predominantly bound by greenfield land with some existing properties east, a country lane to the south, and commercial development to the west.

1.6 The existing site falls from a high point of 88.0mAOD at the western boundary of the site with concentric contours. The high point forms the end of a ridge, and the site slopes downwards from this point toward the River Camel to the north and Polmorla River to the east. Gradients within the site are typically between 1:20 and 1:35.

1.7 A copy of the topographic survey is included in Appendix A.

### **Proposed Development**

1.8 The proposed development site comprises a new residential development with up to 325 new dwellings, associated access, and landscaped areas.

1.9 Areas have been reserved in the lower reaches of the site to accommodate surface water attenuation features. These areas are also expected to provide amenity for residents.

1.10 A copy of the illustrative preliminary site layout has been included in Appendix B.

## 2 Flood Risk & Drainage

### Existing Flood Risk

2.1 A desktop assessment of potential flood risks at the site has been undertaken using the available Environment Agency (EA) online mapping and the Cornwall Council (CC) Interactive Map (online).

#### Fluvial sources (River and Tidal flooding)

2.2 An extract of the 'Flood Map for Planning' has been reproduced as Figure 2.1 and shows the site to be within 'Flood Zone 1', as land assessed as having a 'Low Risk' of flooding, with less than 1 in 1000 or lower annual probability of river or sea flooding (<0.1%).

**Figure 2.1 – EA Flood map for planning**



#### Pluvial sources (surface water flooding)

2.3 An extract of the EA's 'Risk of flooding from Surface Water- Extents' mapping has been reproduced as Figure 2.2. This mapping is based on LiDAR data and estimates the extents of surface water flooding throughout the development's 100 year lifetime (annual probability <1%).

2.4 The site is typically not susceptible to surface water flooding. A very localised area of low risk surface water flooding is shown in the upper reaches of the site, impounded behind an existing hedge bank.

**Figure 2.2 – EA Extent Flooding from Surface Water.**



2.5 During the 1 in 1,000 year event, only very shallow flooding (<150mm) is shown on the country lane to the south of the site, and on West Hill to the north of the site. No surface water flooding is indicated for the 1 in 100 year event. Roads are therefore expected to provide safe access and egress throughout the developments lifetime.

### Groundwater

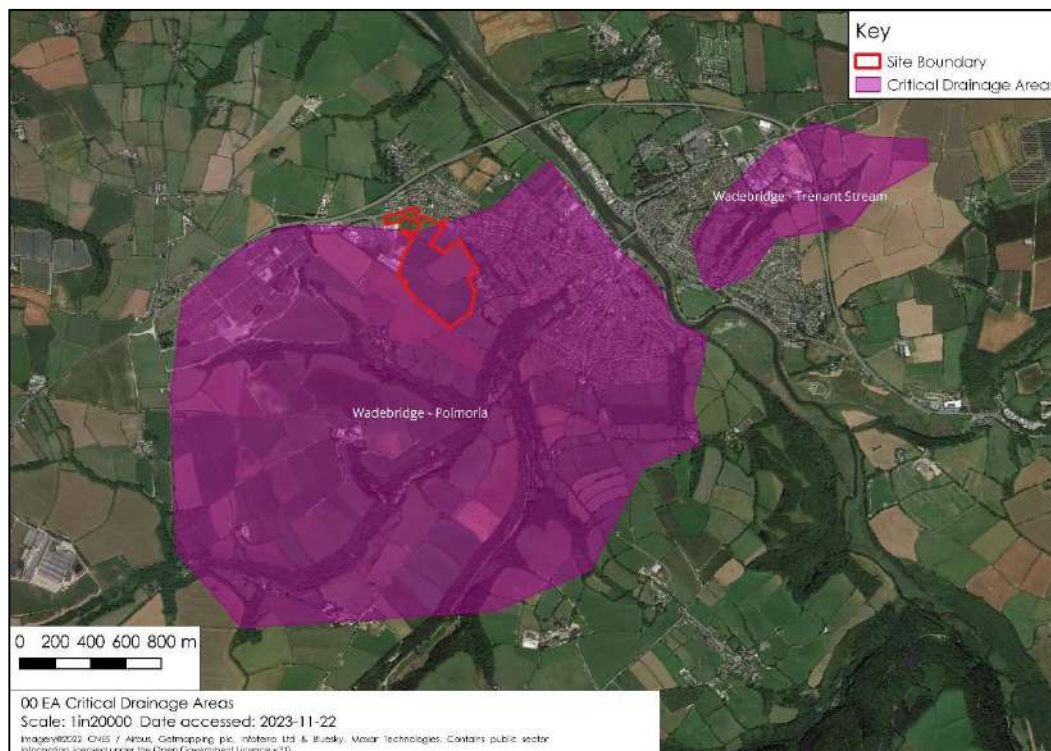
2.6 The CC Interactive Map indicates the east of the site to be part of “Areas susceptible to ground water flooding”. However, there are no known issues or evidence of local groundwater flooding and the geotechnical desk study report (Terra Firma, Consulting Geo-technical & Geo-Environmental Engineers Site Investigation Contractors, September 2023) considers the site to “have negligible risk to groundwater flooding based on the underlying geological conditions.”

2.7 Any future planning application will give further consideration on the risks of elevated groundwater levels or groundwater flooding, particularly for areas where surface runoff is intended to discharge via soakaways.

### Critical Drainage Area

2.8 A review of the Environment Agency's Critical Drainage Area (CDA) mapping below in Figure 2.3 has confirmed that the development site is located within the EA's 'Wadebridge-Polmorla' Critical Drainage Area.

**Figure 2.3 – Critical Drainage Areas**



- 2.9 The Wadebridge Town Council ‘Wadebridge Catchment Summary Report’ indicates that the Polmorla stream is a rapidly responding watercourse which can result in no warning for surface water and flash flooding for properties adjacent to the stream.
- 2.10 The Environment Agency report on this CDA indicates that to the east of the site:
- “The Polmorla River is controlled at its downstream end by a tidal flap and pumping station. During times of high tide and high river flows the pumping station is used to pump water from the Polmorla River into the River Camel. High flows and tide heights are forecast to increase in frequency associated with climate change, increasing the risk of flooding behind the defences. To help maintain the existing standard of protection, run-off draining from the catchment should be attenuated so that the pumping station can maintain river levels below the flood defence height.”*
- 2.11 Furthermore, it is suggested that SuDS design in the catchment *“should include features to manage water quality, which will help to protect the downstream Shellfishery and designated Bathing Waters.”*
- 2.12 The CDA report states that *“The surface water drainage hierarchy should be followed by using infiltration as far as is practicable.”*

- 2.13 The report then goes on to specify the minimum drainage standards required:

*“All off-site surface water discharges from developments should mimic greenfield performance up to a maximum 1 in 10 year discharge rate. On site all surface water should be safely managed up to the 1 in 100 plus climate change conditions. This will require additional water storage areas to be created thereby contributing to a reduction in flooding downstream.”*

#### Artificial Sources of Flooding

- 2.14 The site does not lie within the maximum extent of flooding from any reservoirs and there are no known on-site flood risks associated with infrastructure failure.

#### Flood Risk Summary

- 2.15 The site is located wholly in Flood Zone 1 and is not at a significant risk of surface water flooding. Ground water flood risk is likely to be negligible although the eastern part of the site falls into land indicated by CC mapping to be at risk of ground water flooding.

- 2.16 The development is within the Wadebridge-Polmorla CDA, which requires run-off quantity and quality to be carefully managed to contribute a betterment and reduced flood risk to the downstream catchment.

#### **Vulnerability**

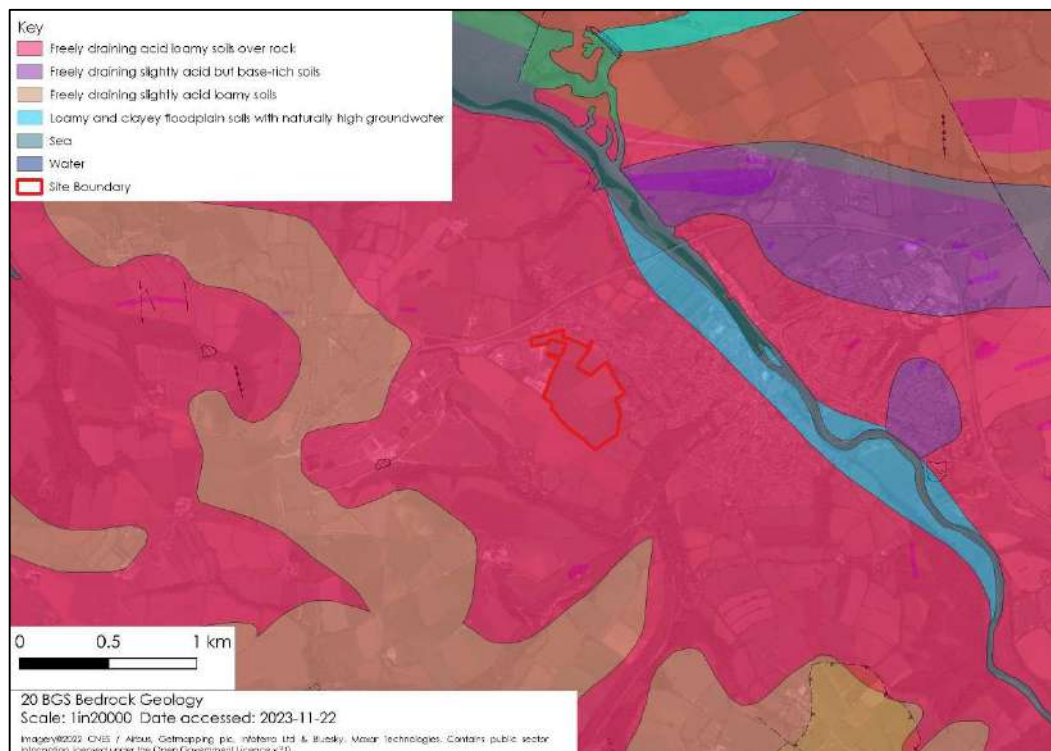
- 2.17 In accordance with the Planning Practice Guidance, residential dwellings are considered to be “More Vulnerable”. The NPPF indicates that “more vulnerable” development is appropriate within Flood Zone 1, and that the site would pass the Sequential Test, which aims to steer development to the lowest category of flooding of Flood Zone 1.

- 2.18 Due to the above, the proposal is classified as an appropriate form of development for the level of flood risk at the site, based on the Flood risk and coastal change guidance Table 2 (Paragraph: 079 Reference ID: 7-079-20220825).

#### **Ground conditions**

- 2.19 The site is located within an area with soils described by the Soilscape dataset as “Freely draining acid loamy soils over rock’ seen in Figure 2.4 below.

**Figure 2.4 – BGS Bedrock Geology**



- 2.20 A soakaway investigation report by Terra Firma (September 2023) found existing ground within the site to be made up of slightly clayey/gravelly sandy silt, underlain by coarse slate gravel.
- 2.21 Soakaway testing in accordance with BRE Digest 365 was conducted by Terra Firma in August 2023 and included six trial pits, located across the site. The results of this testing are summarised within Table 2.1.

**Table 2.1 – BRE Digest 365 Infiltration Rate Test Results**

Trial Pit Ref.	Infiltration Rate, m/s
TP01	3.21E-05
TP02	2.00E-05
TP03	1.13E-05
TP04	1.71E-05
TP05	6.40E-05
TP06	2.51E-05

- 2.22 The Terra Firma report concluded that *“it is considered soakaways will be viable at the site for discharging surface water”* subject to groundwater level. No groundwater was encountered during the investigation.

- 2.23 Extracts from the soakaway investigation report can be found within Appendix C of this report.

### **3 Drainage Proposals**

- 3.1 The principles of the surface water and foul drainage strategies are discussed below.

#### **Surface Water Drainage Strategy**

##### Existing surface water runoff

- 3.2 The existing drainage regime represents that of a typical greenfield site, with some surface water runoff soaking into the underlying strata and some runoff following the natural topography of the site, flowing towards the eastern and northern boundaries.

##### Surface Water Management Plan

- 3.3 To ensure the development will be safe throughout its lifetime and that it does not increase flood risk elsewhere the drainage strategy will include appropriate mitigation measures, so that the pre-development greenfield runoff rates are not increased throughout the developments lifetime, to a maximum 1 in 10 year discharge rate, as required by the EA's CDA guidance for the Wadebridge-Polmorla catchment, with allowances for climate change.
- 3.4 In line with the drainage hierarchy and the guidance of Wadebridge Town Council, soakaways will be prioritised. Initial soakaway testing conducted, across the site, indicates viable infiltration rates with the minimum design rate of  $1 \times 10^{-5} \text{m/s}$  proposed as a conservative rate for initial design purposes in areas away from specific testing locations.
- 3.5 Although the proposed development proposal will be submitted as an outline planning application, CC LLFA have advised that groundwater monitoring should be progressed to support the outline application, due to the scale of the development. Therefore, groundwater monitoring is being undertaken by Terra Firma to establish winter groundwater levels with monitoring started in November 2023. Correspondence with CC LLFA is included in Appendix D.



- 3.6 The surface water drainage strategy will prioritise infiltration across the site, as close to source as possible. Features will include:
- Individual on-plot soakaways where possible,
  - Communal soakaways,
  - Permeable private driveways,
  - Shallow swales, with infiltration to ground, within circa 5m wide green corridors, to serve highway runoff,
  - Infiltration basins within amenity areas at the low points of the site to serve the residual surface water volume.
- 3.7 The strategy of providing infiltration swales within the green corridors along the internal highways have been presented to the LLFA and adoption officer for comment who had no in-principal objection to the approach. Correspondence has been included in Appendix D.
- 3.8 If any further design considerations that would apply to the above strategy, including an infiltration feature along internal highways, can be provided, this could be taken into consideration as the layout is developed further.
- 3.9 Should groundwater elevations preclude the use of soakaways, an alternative strategy will be implemented, utilising on-site attenuation and off-site discharge to surface water. It is anticipated that the areas identified for attenuation storage can support both infiltration and attenuated discharge options. The discharge rate applicable to the CDA would be upheld.

#### Water Quality, Amenity and Biodiversity value

- 3.10 All proposed SuDS will be assessed in line with the CIRIA SuDS Manual (C753) Simple Index Approach to ensure the 'SuDS mitigation index' is greater than the 'pollution hazard index'.
- 3.11 The drainage strategy will promote amenity and biodiversity on site through use of at surface features where possible including swales and infiltration basins.

#### Safe Access and Egress

- 3.12 The full extents of the site are within 'Flood Zone 1 – Low Risk'. Similarly, the surrounding road network which provides access and egress to the site is not at risk of pluvial flooding in up to the 100 year return period. In the 1,000

year return period flooding remains shallow and would not prevent vehicular access or egress.

### **Foul Drainage Strategy**

- 3.13 In terms of wastewater connections, the developer is entitled to make a connection to the nearest practical point on the network where the existing sewer is at least the same diameter as the new sewer required to provide capacity for the development.
- 3.14 Under the provisions of the Water Industry Act 1992 (as amended), the developer will need to pay the sewerage undertaker the published sewer connection charges and infrastructure charge per dwelling, and the sewerage undertaker is responsible for any network reinforcement.
- 3.15 The development will be served by a new gravity foul sewer system to collect flows from residential plots. It is anticipated that owing to the adverse topography of the site, various points of connection to the wider foul sewerage network will be required for different areas of the site.
- 3.16 Any areas of the site which are unable to drain via a gravity sewer will be served by a new adoptable pump station in the east of the site.
- 3.17 Further consultation with South West Water will be made to obtain in-principal agreement to the proposed foul connection arrangements.

## 4 Conclusion

4.1 This Technical Note has been prepared to provide commentary on flood risk and principles of the surface water and foul drainage strategies for the proposed development at West Hill, Wadebridge.

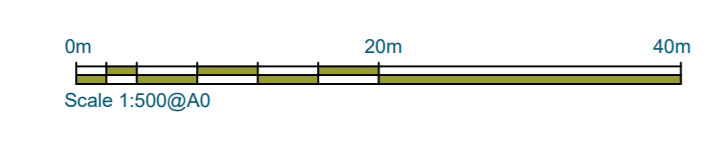
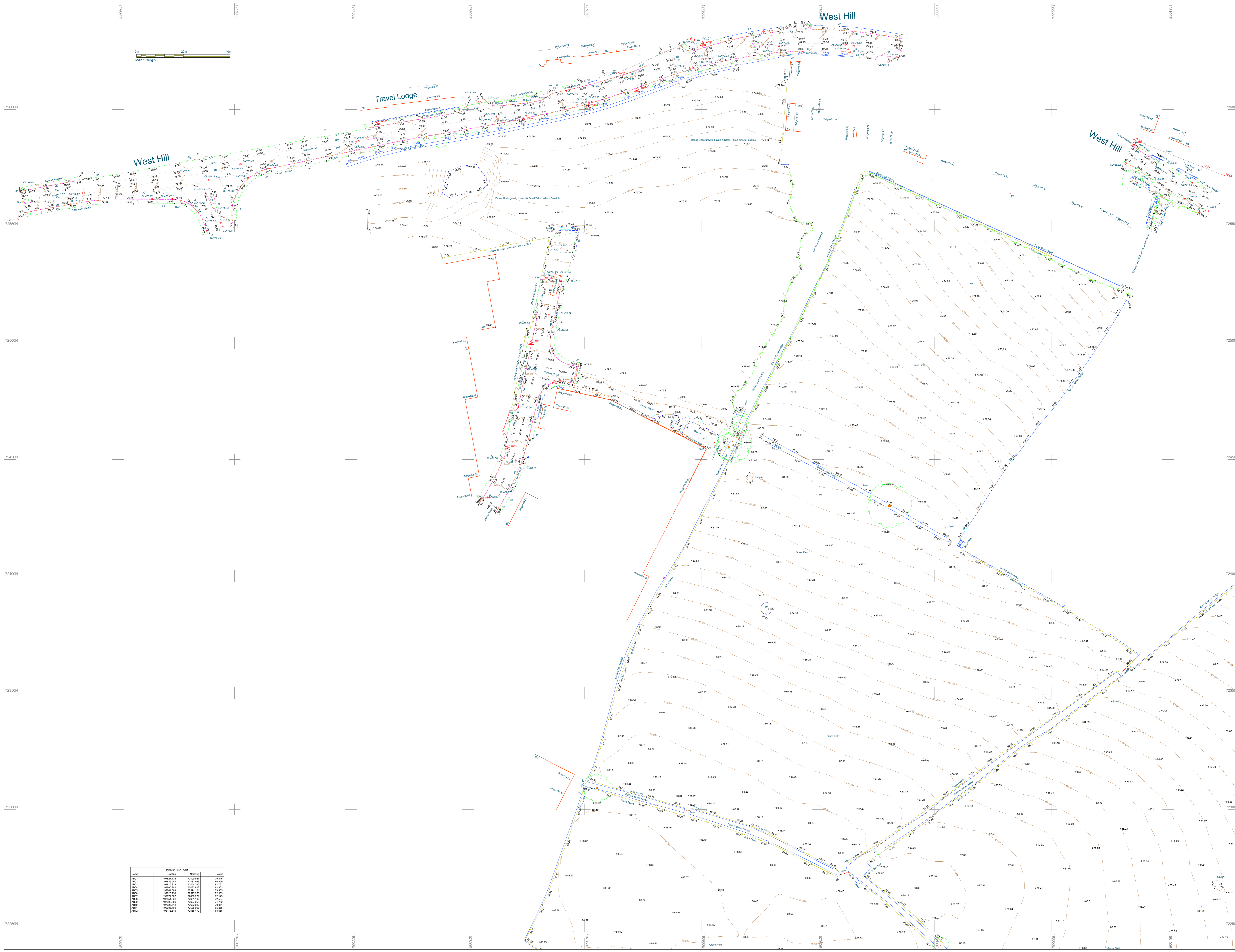
4.2 The summary of key conclusions is as follows:

- The site is shown to be within 'Flood Zone 1', as land assessed as having a 'Low Risk' of flooding, with less than 1 in 1000 or lower annual probability of river or sea flooding (<0.1%).
- The site is not at significant risk of flooding from pluvial or artificial sources. Based on geology, flooding from groundwater is considered unlikely, however groundwater monitoring is being progressed to confirm groundwater levels.
- The development site is located within the EA's 'Wadebridge-Polmorla' Critical Drainage Area, requiring more stringent management of surface water discharge quantity and quality.
- A soakaway investigation report by Terra Firma (September 2023) concluded from initial soakaway testing that soakaways are viable for the discharge of surface water within the site.
- Infiltration will be prioritised as close to source as possible utilising various features including on-plot soakaways, communal soakaways, permeable paving, swales, and infiltration basins.
- The SuDS features will promote biodiversity and amenity whilst also managing runoff quantity and quality.
- The development will require multiple new gravity connections to the South West Water foul sewer network. Any areas of the site which are unable to drain via a gravity connection will be served by a new adoptable pump station in the east of the site.

4.3 The site is considered viable from a flood risk and drainage perspective and can be delivered in line with the principles laid out above. Comments on the above and proposed drainage strategy are welcomed to refine the strategy for the future outline planning application.



## **Appendix A** Topographic Survey



Name	Easting	Northing	Height
AB01	97707.734	72468.847	79.448
AB02	97709.584	72462.883	80.289
AB03	97710.253	72464.261	81.752
AB04	97709.540	72462.413	82.965
AB05	97710.380	72466.144	72.886
AB06	97707.730	72466.249	72.985
AB07	97707.207	72466.271	72.149
AB08	97706.451	72461.162	72.244
AB09	97706.000	72467.668	71.737
AB10	97706.452	72462.882	80.881
AB11	98110.516	72505.472	85.568

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7. ALL UNITS ARE IN METRES.

KEY:

- TS Top of Bank/Batter
- DK Driveway Kerb Line
- SB Bottom of Bank/Batter
- BD Building
- CBF Close boarded fence
- CS Change of Surface
- J&E Earth & Stone Hedge
- MB Main Line
- CHBG Overhead Building
- CH/E/T Overhead Line
- PROF Ridge Height
- ROW Retaining Wall
- STP Storm Line
- TRK Track
- WLP Wall Parallel
- W/F Wall Face
- G Gully
- Gate
- MKR Service Marker
- SV Stop tap/Valve
- Tree
- FT Fir Tree
- EP Electric Pole
- FH Fire Hydrant
- CL Manhole Cover
- RP Rainwater Pipe
- SVP Soil vent pipe
- BT Telecoms Cover
- TP Telephone Pole
- SF Square Foot
- AV Air Valve
- GAS Gas Valve
- CATV Cable TV
- LP Lamp Post
- CM Circular Manhole
- Sign

Amendments:

Rev	Date	Description

Bennett Surveys  
Richmond House, 37 Edward St  
Truro, Cornwall, TR1 3AJ  
www.abennettsurveys.com

Client: Land Value Alliances LLP

Title / Location: Land at West Hill, Wadebridge Cornwall PL27 7ET

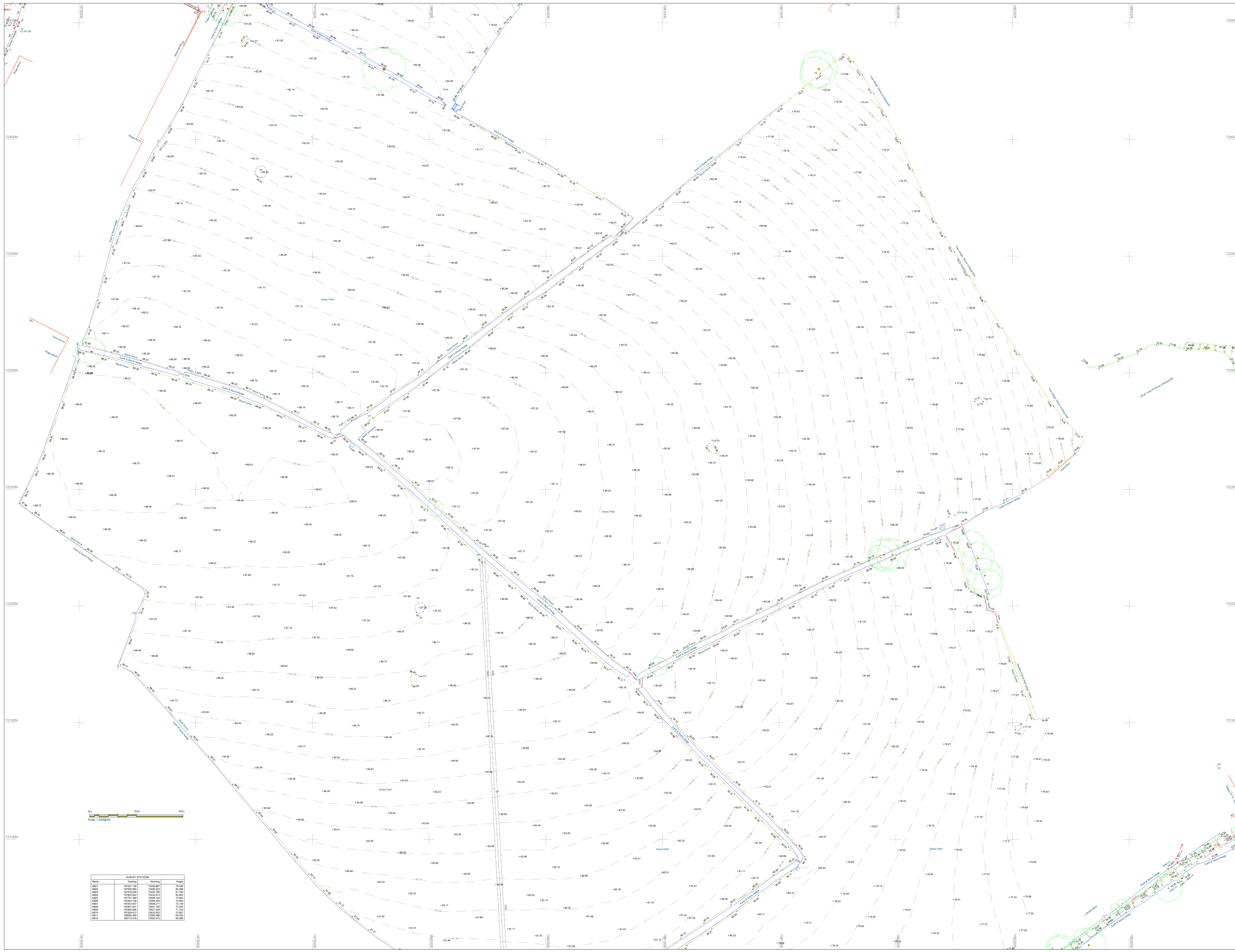
Description: Topographical Survey

Scale: 1:500 @ A0

Drawn: AB Checked: KB

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Dwg No: AB23105-1



Name	Easting	Northing	Height
AB01	180100.000	72100.000	78.000
AB02	180100.000	72100.000	78.000
AB03	180100.000	72100.000	78.000
AB04	180100.000	72100.000	78.000
AB05	180100.000	72100.000	78.000
AB06	180100.000	72100.000	78.000
AB07	180100.000	72100.000	78.000
AB08	180100.000	72100.000	78.000
AB09	180100.000	72100.000	78.000
AB10	180100.000	72100.000	78.000
AB11	180100.000	72100.000	78.000
AB12	180100.000	72100.000	78.000

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KEY:

TS	Top of Bank/Batter
OK	Dropped Kerb Line
BB	Bottom of Bank/Batter
SL	Building
CS	Close boarded fence
CSF	Change of Surface
CS	Change of Surface
JE	Earth & Stone Hedge
MB	Kerb Line
CHBG	Overhead Building
CH/ET	Overhead Line
PFWS	Post and wire fence
Ridge	Ridge Height
ROW	Retaining Wall
SCR	Scrub
STP	Scrub Line
TRK	Track
WLP	Wall Face
WLP	Wall Parallel
G	Gully
MKR	Service Marker
SV	Stop tap/valve
FT	Fire Tree
EP	Electric Pole
PH	Fire Hydrant
CL	Manhole Cover
Rep	Rainwater Pipe
SVP	Soil vent pipe
BT	Telecoms Cover
TP	Telephone Pole
SqP	Square Post
AV	Air Valve
GAS	Gas Valve
CATV	Cable TV
LP	Lamp Post
Sign	Circular Manhole Sign

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Description: Topographical Survey

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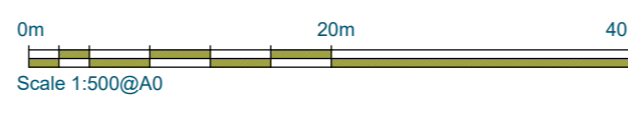
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SURVEY STATIONS			
Name	Code	Height	Height
AB01	10767.136	72489.867	75.448
AB02	10768.084	72489.867	81.792
AB03	10769.628	72489.867	81.792
AB04	10770.662	72489.867	81.792
AB05	10771.696	72489.867	81.792
AB06	10772.730	72489.867	81.792
AB07	10773.764	72489.867	81.792
AB08	10774.798	72489.867	81.792
AB09	10775.832	72489.867	81.792
AB10	10776.866	72489.867	81.792
AB11	10777.900	72489.867	81.792
AB12	10778.934	72489.867	81.792
AB13	10779.968	72489.867	81.792





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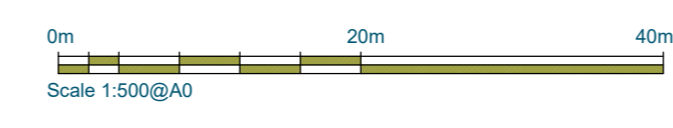
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WLP	Wall Parallel
G	Gully
Gate	Gateway
MKR	Service Marker
SV	Stop Tap/Valve
Tree	Tree
EP	Electric Pole
PH	Fire Hydrant
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RP	Rainwater Pipe
SVP	Soil vent pipe
BT	Telecoms Cover
TP	Telephone Pole
SP	Square Post
AV	Air Valve
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LP	Lamp Post
CM	Circular Manhole
Sign	Sign

Amendments:

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AB03	10758.094	72402.003	81.202
AB04	10760.042	72432.013	82.963
AB05	10761.088	72504.044	77.903
AB06	10762.207	72666.211	72.949
AB07	10765.004	72667.062	72.949
AB08	10766.005	72667.060	71.262
AB09	10766.002	72667.062	70.861
AB10	10766.002	72667.062	69.861
AB11	10766.002	72667.062	69.861
AB12	10613.016	72666.472	69.998



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 Cornwall PL27 7ET**

Description:  
**Topographical Survey**

Scale: 1:500 @ A0

Drawn: AB      Checked: KB

Date: 10/09/2023

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## **Appendix B** Preliminary Site Layout

# Illustrative layout

## Land at West Hill, Wadebridge



- a Recently constructed employment units
  - b Approved development currently under construction
  - c Play park
  - d Coronation Park
  - e Supermarkets
- 1 Vehicular access from West Hill
  - 2 Entrance and arrival space
  - 3 Residential development with frontage onto West Hill
  - 4 Primary vehicular route and access to proposal
  - 5 Higher density development
  - 6 Lower density development
  - 7 Retained hedgerow and trees
  - 8 Landscape breaks and wildlife connections - including retained existing hedgerows, proposed tree planting and incidental green space
  - 9 Proposed footpath and cycle routes
  - 10 Ecology area - open space and attenuation drainage
  - 11 Barn form and reduced height development
  - 12 Incidental green space including opportunities for play
  - 13 Footpath connection to St Breck Primary School
  - 14 Community area for orchard / allotments/ ecological mitigation
  - 15 Parkland open space and ecology mitigation
  - 16 Attenuation features
- Cycle / ped route
  - SUDs
  - Tree lined streets
  - Food production
  - Play
  - Potential for self/custom build plots

### Illustrative schedule

Type	Size (m2)	No.	%
1 bed apt	50 -60	35	11
2 bed apt	61 - 70	26	8
2 bed house	79	40	12
3 bed house	84 - 130	132	45
4 bed house	115 - 140	70	24

Total 325 dwellings

230604 - L 02 02 A 13th December 2023





## **Appendix C** Soakaway Investigation Report (extracts)

# SOAKAWAY INVESTIGATION REPORT

Proposed Residential Development  
West Hill, Wadebridge

Prepared for: Wadebridge LVA LLP

Date: September 2023

Report No: EX-23-068-SIR



Consulting Geo-Technical &  
Geo-Environmental Engineers  
Site Investigation Contractors

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**Document Control Sheet**

**Project Name** : **Proposed Residential Development**

**Site Location** : **West Hill, Wadebridge**

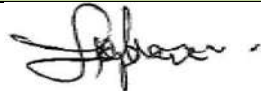
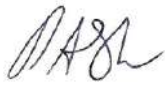

**Project Ref** : **EX-23-068**

**Report Title** : **SOAKAWAY INVESTIGATION REPORT**

**Report Ref** : **EX-23-068-SIR**

**Revision** : **00**

**Date** : **September 2023**

	<b>Name</b>	<b>Position</b>	<b>Signature</b>
<b>Prepared by:</b>	Jonathan Ikpere B.Sc.SLT., MSc., PhD., FGS	Engineering Geologist	
<b>Reviewed by:</b>	Paul Standish B.Sc.(Hons), CGeol, EurGeol, FGS	Associate Director	
<b>Approved by:</b>	Steven Hill B.Sc.(Hons), M.Sc., CGeol, EurGeol, FGS	Director	

<b>Revision</b>	<b>Date</b>	<b>Description</b>	<b>Prepared</b>	<b>Reviewed</b>	<b>Approved</b>
00	14/09/2023	For Draft Issue	Jl	PS	SH

## EXECUTIVE SUMMARY

<b>Proposals</b>	Wadebridge LVA LLP is proposing the construction of a new residential development within land at West Hill, Wadebridge. The proposed development is not finalised but is assumed to comprise of mixed style housing and associated infrastructure.
<b>Geology</b>	<p>The Geological Map of the area shows the site to be underlain by the Trevoze Slate Formation and Rosenum Formation, which the BGS describes as slate with subsidiary siltstone and trace limestone and sandstone.</p> <p>No Superficial Deposits are shown to overlie the bedrock geology of the area.</p>
<b>Field Investigation</b>	<p>The site works including the schedule for in-situ testing were scoped by AWP and comprised the following:</p> <ul style="list-style-type: none"> <li>• 6no. machine excavated trial pits (TP01-TP06), and             <ul style="list-style-type: none"> <li>○ In-situ soakaway tests conducted in TP01-TP06.</li> </ul> </li> </ul> <p>The site works were carried out at the site on the 22<sup>nd</sup> and 23<sup>rd</sup> of August 2023.</p> <p>The encountered ground conditions comprised Topsoil to a depth of between 0.30m and 0.40m underlain by Weathered Slate Bedrock to a maximum investigated depth of 2.50m.</p> <p>No groundwater was encountered within any of the exploratory hole locations.</p>
<b>Storm Drainage</b>	<p>In-situ soakaway tests were undertaken at TP01 to TP06 broadly in accordance with the requirements of BRE 365.</p> <p>In TP01-TP05, three complete soakage tests were completed in accordance with the requirements of BRE 365 with 3<sup>rd</sup> fill cycle infiltration rates ranging between <math>1.13 \times 10^{-5}</math> and <math>6.40 \times 10^{-5}</math> m/s.</p> <p>TP06 completed two tests and with additional time it is likely this locality could complete three complete fills in accordance with BRE365.</p> <p>Therefore, based on the above it is considered soakaways will be viable at the site for discharging surface waters.</p> <p>It should be noted proposed soakaways would only be effective above the level of groundwater. No groundwater was encountered during this investigation but higher groundwater may be encountered during winter months. In order to confirm this, it is recommended that groundwater monitoring is undertaken.</p> <p>Any planned soakaways should be at least 5m away from building foundations, roads or unstable ground in accordance with recommendations within guidelines.</p>

## SECTION 3 Field Investigation

### 3.1 General

The site works including the schedule for in-situ testing were scoped by AWP and comprised the following:

- 6no. machine excavated trial pits (TP01-TP06), and
  - In-situ soakaway tests conducted in TP01-TP06.

The site works were carried out at the site on the 22<sup>nd</sup> and 23<sup>rd</sup> of August 2023.

Prior to the site works, the following Health and Safety measures were undertaken:

- Risk Assessment & Method Statement (RAMS) was issued and approved beforehand,
- Underground Utility Plans were obtained from the relevant Statutory Undertakers, and
- Before any excavation, all exploratory hole locations were scanned using a Cable Avoidance Tool (CAT).

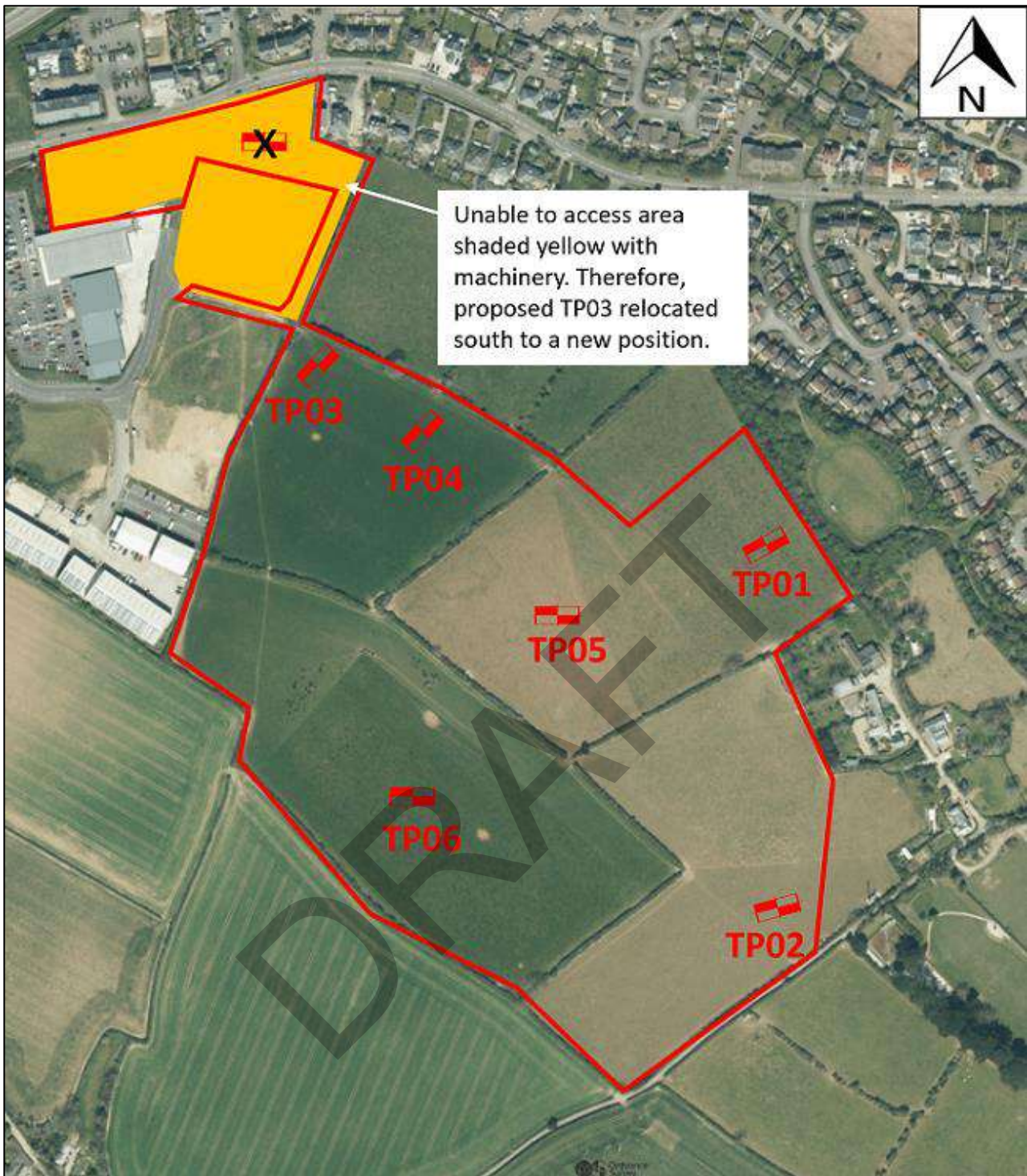
The exploratory holes were set out at locations provided by AWP and adjusted where necessary to take account of the site constraints detailed in Section 1.1.

Approximate exploratory hole co-ordinates were picked up post-investigation using a hand-held Global Positioning System (GPS) receiver and presented in the table below:

Table 3.1: Exploratory Hole Co-ordinates		
Exploratory Hole	Easting	Northing
TP01	198221	072291
TP02	198234	072073
TP03	197919	072443
TP04	198003	072401
TP05	198081	072257
TP06	197979	072157

The site works were supervised by Terra Firma, who also logged the exploratory holes to the requirements of BS5930:2015 + A1: 2020.

The exploratory hole logs and in-situ test results are presented in **Annex A** and **Annex B** respectively, and their locations shown on **Drawing 3.1** below.



Drawing 3.1: Exploratory Hole Location Plan

## 3.2 Exploratory Holes

### 3.2.1 Machine Excavated Trial Pits

The trial pits were excavated using an 8 Tonne Wheeled JCB Excavator.

Following completion of soil logging, in-situ testing and sampling, the trial pits were backfilled using arisings and re-compacted as best as practicably possible using the excavator backhoe. If necessary, the trial pit was left slightly proud in order to allow for short-term settlement.



### 3.3 In-situ Testing

#### 3.3.1 Permeability Testing

The in-situ permeability tests were undertaken within the excavated trial pits in order to provide a soil infiltration rate to be used in soakaway design. A 2000 litre 4x4-towed bowser was used to rapidly fill the pit with water. Due to the quantity of water required, 6no. bowser refills were required.

During the site investigation, in-situ permeability tests were undertaken within TP01-TP06 and where possible were carried out to the requirements of BRE Digest 365 or BS 5930:2015+A1:2020 (Section 7).

The appropriate calculation sheets are presented in **Annex B** and the results given in the table below.

Table 3.2: Infiltration Test Results				
Soak away Test	Depth (m)	Type	Soil Type	Infiltration Rate (m/s)
TP01	2.00	Storm Drainage	Slightly clayey, sandy Slate GRAVEL	T1 – $5.49 \times 10^{-5}$
				T2 – $4.26 \times 10^{-5}$
				<b>T3 – <math>3.21 \times 10^{-5}</math></b>
TP02	2.20		Sandy Slate GRAVEL	T1 – $4.10 \times 10^{-5}$
				T2 – $2.61 \times 10^{-5}$
				<b>T3 – <math>2.00 \times 10^{-5}</math></b>
TP03	2.00	Slightly clayey, sandy Slate GRAVEL	T1 – $1.51 \times 10^{-5}$	
			T2 – $1.32 \times 10^{-5}$	
			<b>T3 – <math>1.13 \times 10^{-5}</math></b>	
TP04	1.80	Slightly clayey, sandy Slate GRAVEL	T1 – $1.93 \times 10^{-5}$	
			T2 – $1.80 \times 10^{-5}$	
			<b>T3 – <math>1.71 \times 10^{-5}</math></b>	
TP05	2.30	Sandy Slate GRAVEL	T1 – $8.63 \times 10^{-5}$	
			T2 – $6.83 \times 10^{-5}$	
			<b>T3 – <math>6.40 \times 10^{-5}</math></b>	
TP06	2.40	Slightly clayey, sandy Slate GRAVEL	T1 – $3.57 \times 10^{-5}$	
			T2 – $2.51 \times 10^{-5}$	

Due to time constraint, a 3rd test was not undertaken in TP03, however, with additional time it is likely this locality could complete three complete fills in accordance with BRE365.

## SECTION 5 Engineering Recommendations

### 5.1 Storm Drainage Potential

In-situ soakaway tests were undertaken at TP01 to TP06 broadly in accordance with the requirements of BRE 365.

In TP01-TP05, three complete soakage tests were completed in accordance with the requirements of BRE 365 with 3<sup>rd</sup> fill cycle infiltration rates ranging between  $1.13 \times 10^{-5}$  and  $6.40 \times 10^{-5}$  m/s.

TP06 completed two tests and with additional time it is likely this locality could complete three complete fills in accordance with BRE365.

Therefore, based on the above it is considered soakaways will be viable at the site for discharging surface waters.

It should be noted proposed soakaways would only be effective above the level of groundwater. No groundwater was encountered during this investigation but higher groundwater may be encountered during winter months. In order to confirm this, it is recommended that groundwater monitoring is undertaken.

Any planned soakaways should be at least 5m away from building foundations, roads or unstable ground in accordance with recommendations within guidelines.

DRAFT



## **Appendix D** Correspondence

## Letisha Blackmore

---

**From:** Jackie Smith (jackiesmith@cornwall.gov.uk) <Jackie.Smith@cornwall.gov.uk>  
**Sent:** 24 October 2023 11:57  
**To:** Letisha Blackmore  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

For a site of this scale, which is partially within a CDA, we will require 12 months groundwater monitoring. With Outline Applications we review the site to establish if the site can be developed for the proposed purpose, in other words we try to establish the principle of development. Wadebridge can be tricky from a surface water drainage perspective, and so without some groundwater monitoring and percolation test results I would be reluctant to support an application for housing. I suggest that you start monitoring now, so that you have some indication of the groundwater levels by the time that the Outline Application is submitted.

If based on this things look favourable, we can apply a two part planning condition which will require that the groundwater monitoring results are provided at the reserved matters stage, but we would still need a full 12 months results.

Kind regards

Jackie Smith  
Principal Sustainable Drainage Officer  
Cornwall Council  
Environment and Connectivity

e-mail: [Jackie.smith@cornwall.gov.uk](mailto:Jackie.smith@cornwall.gov.uk)  
tel: 01872 322222 (*ask for me by name*)  
mobile: 07484 036299

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---

**From:** Letisha Blackmore <Letisha.blackmore@awpexeter.com>  
**Sent:** 23 October 2023 10:23  
**To:** Jackie Smith (jackiesmith@cornwall.gov.uk) <Jackie.Smith@cornwall.gov.uk>  
**Cc:** Chris Yalden <Chris.Yalden@awpexeter.com>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

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Hi Jackie,

Thank you for getting back to me.

Please can you clarify the extent of monitoring you would require – i.e. would the 6 month winter period be acceptable? As this is an outline application, would it be possible to submit monitoring data at the reserved matters stage as indicated in the guidance?

Kind regards

**Letisha Blackmore**  
Engineer



Ada House, Pynes Hill, Exeter EX2 5TU

**office:** 01392 409007  
**direct dial:** 01392 325007  
**email:** [letisha.blackmore@awpexeter.com](mailto:letisha.blackmore@awpexeter.com)  
**web:** [www.awpexeter.com](http://www.awpexeter.com)  
**Working days:** Monday to Thursday

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---

**From:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Sent:** Tuesday, October 17, 2023 4:02 PM  
**To:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Cc:** Chris Yalden <[Chris.Yalden@awpexeter.com](mailto:Chris.Yalden@awpexeter.com)>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

Apologies for not getting back to you sooner.

Groundwater monitoring will be required. I have attached our groundwater monitoring guidance for information.

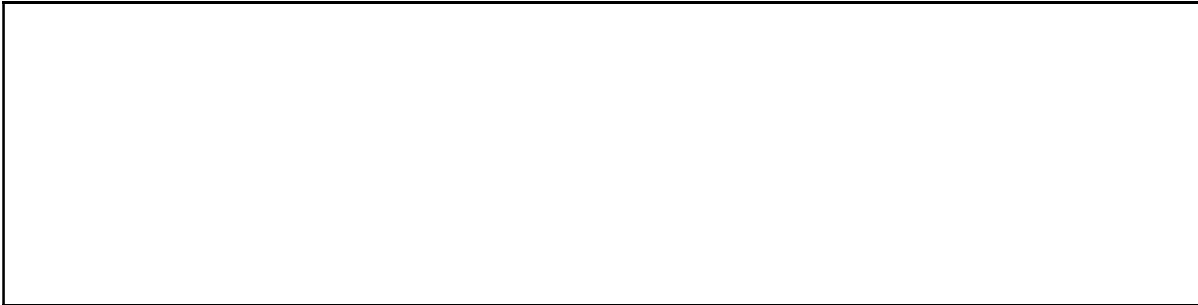
Kind regards

Jackie Smith

Principal Sustainable Drainage Officer  
Cornwall Council  
Environment and Connectivity

e-mail: [Jackie.smith@cornwall.gov.uk](mailto:Jackie.smith@cornwall.gov.uk)  
tel: 01872 322222 (*ask for me by name*)  
mobile: 07484 036299

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---

**From:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Sent:** 05 October 2023 12:42  
**To:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Cc:** Chris Yalden <[Chris.Yalden@awpexeter.com](mailto:Chris.Yalden@awpexeter.com)>  
**Subject:** Outline Application drainage approach - Wadebridge

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Hi Jackie,

Hope you are still doing well.

**Re. Initial drainage strategy for outline application coming forward in Wadebridge, request for comment**

We are looking at a large scheme in Wadebridge being prepared for an outline planning application by the end of the year (grid reference SW9804172492). The indicative application outline is attached.

Soakaway testing has been conducted across the site to obtain indicative infiltration rates, and soakaways are deemed viable with the lowest rate around 1.0x10E-5m/s. Test locations and rates are attached for reference.

As the site is partly within the Wadebridge CDA, we will propose infiltration as the main discharge option in line with the drainage hierarchy.

The site is partly within the area indicated on the CC interactive map as being susceptible to ground water flooding. However, we are conscious this is a low resolution layer and the proposed development site is at a relatively high elevation and therefore we would not anticipate ground

water to be of concern. Are you comfortable that we do not need to progress any winter monitoring, or would you still require monitoring to be undertaken, or perhaps conditioned?

Please let me know if you have any comments on the above proposed, or other aspects you might be concerned about.

Kind regards

**Letisha Blackmore**  
Engineer



Ada House, Pynes Hill, Exeter EX2 5TU

**office:** 01392 409007  
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## Letisha Blackmore

---

**From:** Sharon Bundy <sharon.bundy@cornwall.gov.uk>  
**Sent:** 23 November 2023 08:28  
**To:** Letisha Blackmore  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

In principle I have no objection however approval will be subject to a suitable design being put forward. We have had issues on other sites where the final swales have not been as designed and have become more like ditches. I would also want to see a flat area adjacent to footpaths so that there is adequate support for the path and the risk of people stepping off into the swale is minimised. If you want to forward a cross section of the swale I can have a look and let you know if there are any issues.

Kind regards

**Sharon Bundy IEng FIHE** | Strategic Development Lead  
Cornwall Council | Environment and Connectivity Service

[sharon.bundy@cornwall.gov.uk](mailto:sharon.bundy@cornwall.gov.uk) | Tel: 0300 1234 222

---

**From:** Letisha Blackmore <Letisha.blackmore@awpexeter.com>  
**Sent:** 22 November 2023 12:29  
**To:** Sharon Bundy <sharon.bundy@cornwall.gov.uk>  
**Subject:** FW: Outline Application drainage approach - Wadebridge

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Dear Sharon,

I have been in communication with Jackie Smith (LLFA officer) regarding a preliminary surface water strategy for a site in Wadebridge that will be submitted as an outline planning application in due course. She suggested I pass this initial query by you for comment.

Although it is at pre-planning stage, it would be appreciated if you could comment on any adoption factors we need to consider if we are looking to provide a under-drained swale, with infiltration, along the highway as discussed below.

Your comments will be gratefully received.

Kind regards  
**Letisha Blackmore**  
Engineer





Ada House, Pynes Hill, Exeter EX2 5TU

**office:** 01392 409007  
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**email:** [letisha.blackmore@awpexeter.com](mailto:letisha.blackmore@awpexeter.com)  
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Registered in England: Company No. 8230346

---

**From:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Sent:** Wednesday, November 22, 2023 11:31 AM  
**To:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

I would support your proposals below, but I strongly recommend that you consult with Sharon Bundy (Cornwall Council Infrastructure Adoptions Manager) and obtain her views too.

Kind regards

Jackie Smith  
Principal Sustainable Drainage Officer  
Cornwall Council  
Environment and Connectivity

e-mail: [Jackie.smith@cornwall.gov.uk](mailto:Jackie.smith@cornwall.gov.uk)  
tel: 01872 322222 (*ask for me by name*)  
mobile: 07484 036299

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---

**From:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>

**Sent:** 22 November 2023 10:26

**To:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>

**Subject:** Outline Application drainage approach - Wadebridge

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Hi Jackie,

We have commissioned groundwater monitoring, thank you for your input. I have a further query relating to the drainage strategy – as we are busy reviewing the options.

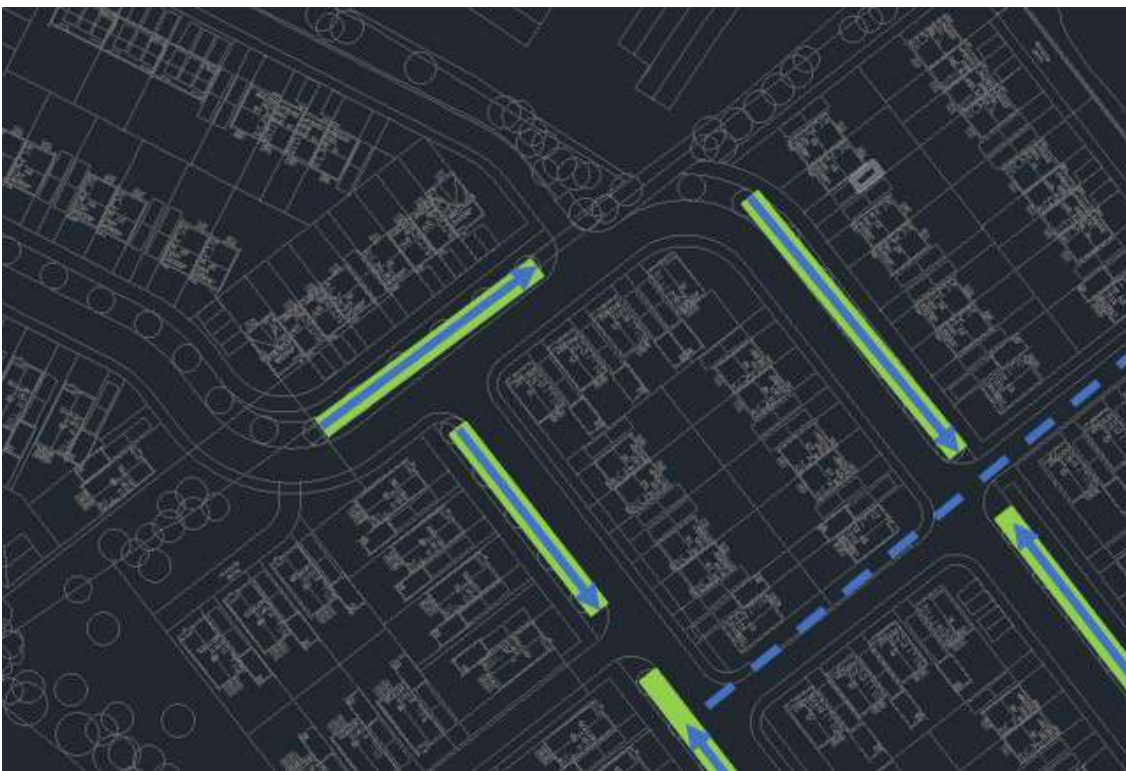
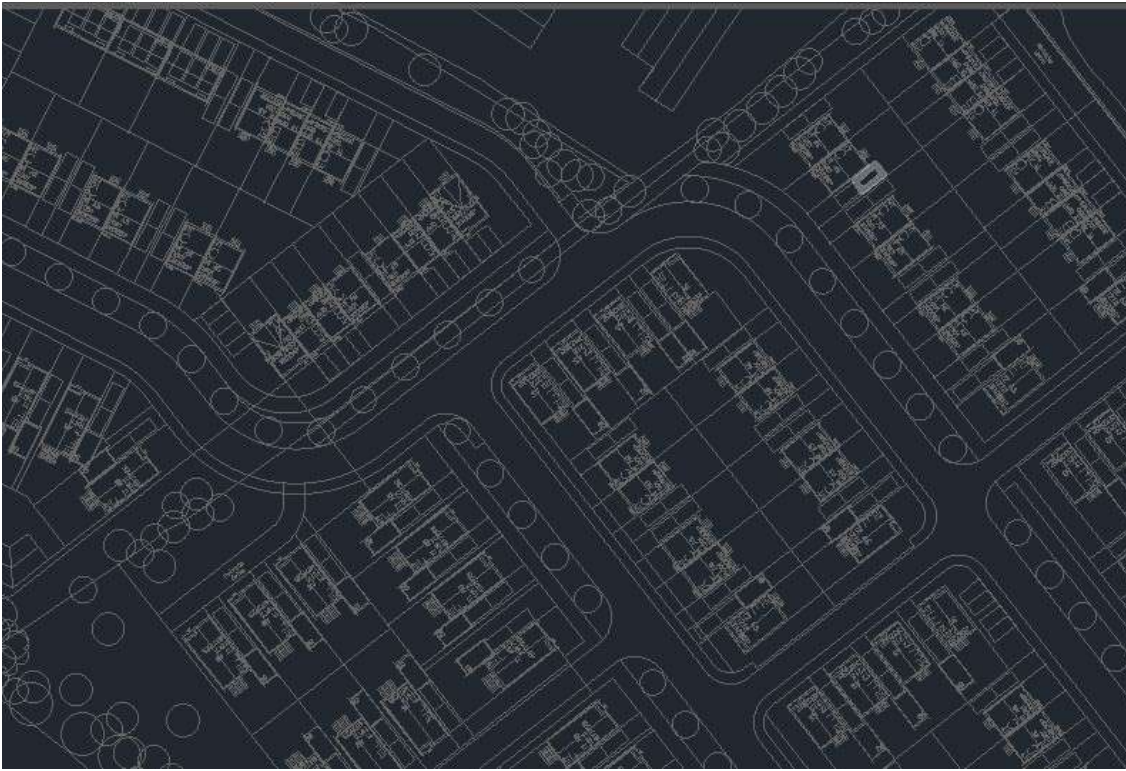
**Re. Initial drainage strategy for outline application coming forward in Wadebridge, request for comment**

With the landscape team, we are trying to integrate SUDS within green 'belts' along roads within the site.

Would you be happy for us to progress with circa 2m wide, shallow, underdrained swales within these 5m wide 'belts' along the roads? The swale will be a minimum 1m offset from the carriageway. This will predominantly serve as highway drainage and planting will need to be assessed depending on adoption requirements.

We are looking to infiltrate to ground along these swales, across the site, to reduce the size of large soakaways in the lower areas of the site. Side drainage will be prevented along the carriageway edge to protect the substructure as per CIRIA C753 guidance. This approach is hoped to have more biodiversity benefit and infiltrate as close to source as possible.

Please see extracts of a preliminary layout below, showing the green 'belts' along the roads.



Please let me know if you have any comments/ initial concerns with this approach that you would like us to consider.

Kind regards  
**Letisha Blackmore**  
Engineer



Ada House, Pynes Hill, Exeter EX2 5TU

**office:** 01392 409007  
**direct dial:** 01392 325007  
**email:** [letisha.blackmore@awpexeter.com](mailto:letisha.blackmore@awpexeter.com)  
**web:** [www.awpexeter.com](http://www.awpexeter.com)  
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---

**From:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Sent:** Tuesday, October 24, 2023 11:57 AM  
**To:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

For a site of this scale, which is partially within a CDA, we will require 12 months groundwater monitoring. With Outline Applications we review the site to establish if the site can be developed for the proposed purpose, in other words we try to establish the principle of development. Wadebridge can be tricky from a surface water drainage perspective, and so without some groundwater monitoring and percolation test results I would be reluctant to support an application for housing. I suggest that you start monitoring now, so that you have some indication of the groundwater levels by the time that the Outline Application is submitted.

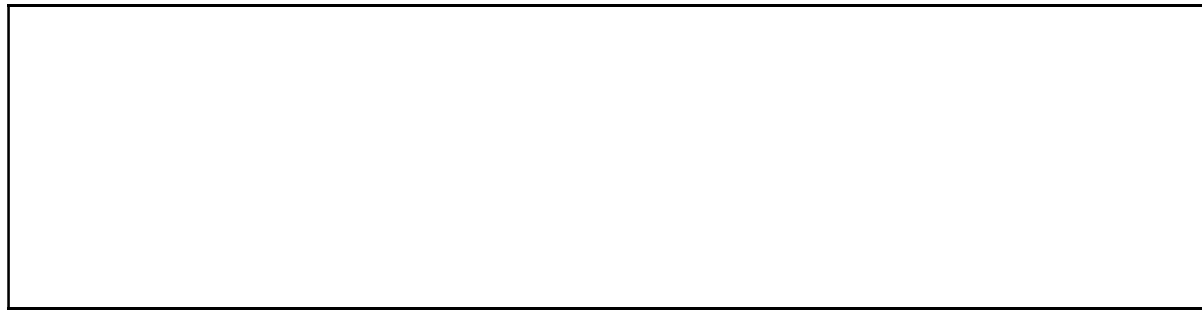
If based on this things look favourable, we can apply a two part planning condition which will require that the groundwater monitoring results are provided at the reserved matters stage, but we would still need a full 12 months results.

Kind regards

Jackie Smith  
Principal Sustainable Drainage Officer  
Cornwall Council  
Environment and Connectivity

e-mail: [Jackie.smith@cornwall.gov.uk](mailto:Jackie.smith@cornwall.gov.uk)  
tel: 01872 322222 (*ask for me by name*)  
mobile: 07484 036299

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---

**From:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Sent:** 23 October 2023 10:23  
**To:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Cc:** Chris Yalden <[Chris.Yalden@awpexeter.com](mailto:Chris.Yalden@awpexeter.com)>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

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Hi Jackie,

Thank you for getting back to me.

Please can you clarify the extent of monitoring you would require – i.e. would the 6 month winter period be acceptable? As this is an outline application, would it be possible to submit monitoring data at the reserved matters stage as indicated in the guidance?

Kind regards  
**Letisha Blackmore**  
Engineer



Ada House, Pynes Hill, Exeter EX2 5TU

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**Working days:** Monday to Thursday

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Awcock Ward Partnership Consulting Limited  
Registered Office: Ada House, Pynes Hill, Exeter. Devon, EX2 5TU

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**From:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Sent:** Tuesday, October 17, 2023 4:02 PM  
**To:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Cc:** Chris Yalden <[Chris.Yalden@awpexeter.com](mailto:Chris.Yalden@awpexeter.com)>  
**Subject:** RE: Outline Application drainage approach - Wadebridge

Information Classification: CONTROLLED

Hi Letisha,

Apologies for not getting back to you sooner.

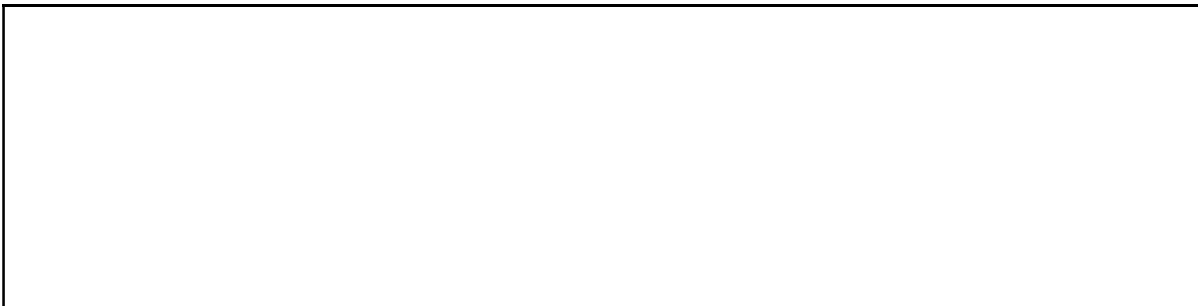
Groundwater monitoring will be required. I have attached our groundwater monitoring guidance for information.

Kind regards

Jackie Smith  
Principal Sustainable Drainage Officer  
Cornwall Council  
Environment and Connectivity

e-mail: [Jackie.smith@cornwall.gov.uk](mailto:Jackie.smith@cornwall.gov.uk)  
tel: 01872 322222 (*ask for me by name*)  
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[www.cornwall.gov.uk](http://www.cornwall.gov.uk) | 'Onen hag oll'



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**From:** Letisha Blackmore <[Letisha.blackmore@awpexeter.com](mailto:Letisha.blackmore@awpexeter.com)>  
**Sent:** 05 October 2023 12:42  
**To:** Jackie Smith ([jackiesmith@cornwall.gov.uk](mailto:jackiesmith@cornwall.gov.uk)) <[Jackie.Smith@cornwall.gov.uk](mailto:Jackie.Smith@cornwall.gov.uk)>  
**Cc:** Chris Yalden <[Chris.Yalden@awpexeter.com](mailto:Chris.Yalden@awpexeter.com)>  
**Subject:** Outline Application drainage approach - Wadebridge

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Hi Jackie,

Hope you are still doing well.

**Re. Initial drainage strategy for outline application coming forward in Wadebridge, request for comment**

We are looking at a large scheme in Wadebridge being prepared for an outline planning application by the end of the year (grid reference SW9804172492). The indicative application outline is attached.

Soakaway testing has been conducted across the site to obtain indicative infiltration rates, and soakaways are deemed viable with the lowest rate around 1.0x10E-5m/s. Test locations and rates are attached for reference.

As the site is partly within the Wadebridge CDA, we will propose infiltration as the main discharge option in line with the drainage hierarchy.

The site is partly within the area indicated on the CC interactive map as being susceptible to ground water flooding. However, we are conscious this is a low resolution layer and the proposed development site is at a relatively high elevation and therefore we would not anticipate ground water to be of concern. Are you comfortable that we do not need to progress any winter monitoring, or would you still require monitoring to be undertaken, or perhaps conditioned?

Please let me know if you have any comments on the above proposed, or other aspects you might be concerned about.

Kind regards

**Letisha Blackmore**  
Engineer



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