Our Ref: J-12627 01 AG
01st August 2018

Coast 2 Coast Developments Ltd.
Meriden House
6 Great Cornblow
Halesowen
B63 3AB

RE: Flood Risk Assessment and Surface Water Drainage Design– Proposed residential development at Polvellan Manor, The Millpool, West Looe, PL13 2AH.

Introduction

Coast 2 Coast Developments Ltd. are proposing to develop the existing Polvellan Manor resort to include an array of different housing units and parking areas. The site has previously had an FRA undertaken, however as the development is over 1ha in size and as such is classified as a 'major development', Coast 2 Coast Developments Ltd have commissioned Nijhuis Industries to undertake a Flood Risk Assessment (FRA) which includes a Sustainable Drainage Scheme (SuDS) for the site.

This report comprises the FRA for the proposed development, in line with The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG), and guidance provided by Cornwall Council.

Site Description

The proposed development is located within West Looe, close to the West Looe River, with the main vehicular access from the site along Polvellan Road (A387). To the north is a large carpark with the West Looe River directly adjacent, leading to the East Looe River directly East, and to the south of the site are residential developments. The OSGR for the site is SX 25092 53718. The site location is shown in Figure 1. below. Proposed site plans are included in **Annex A.**

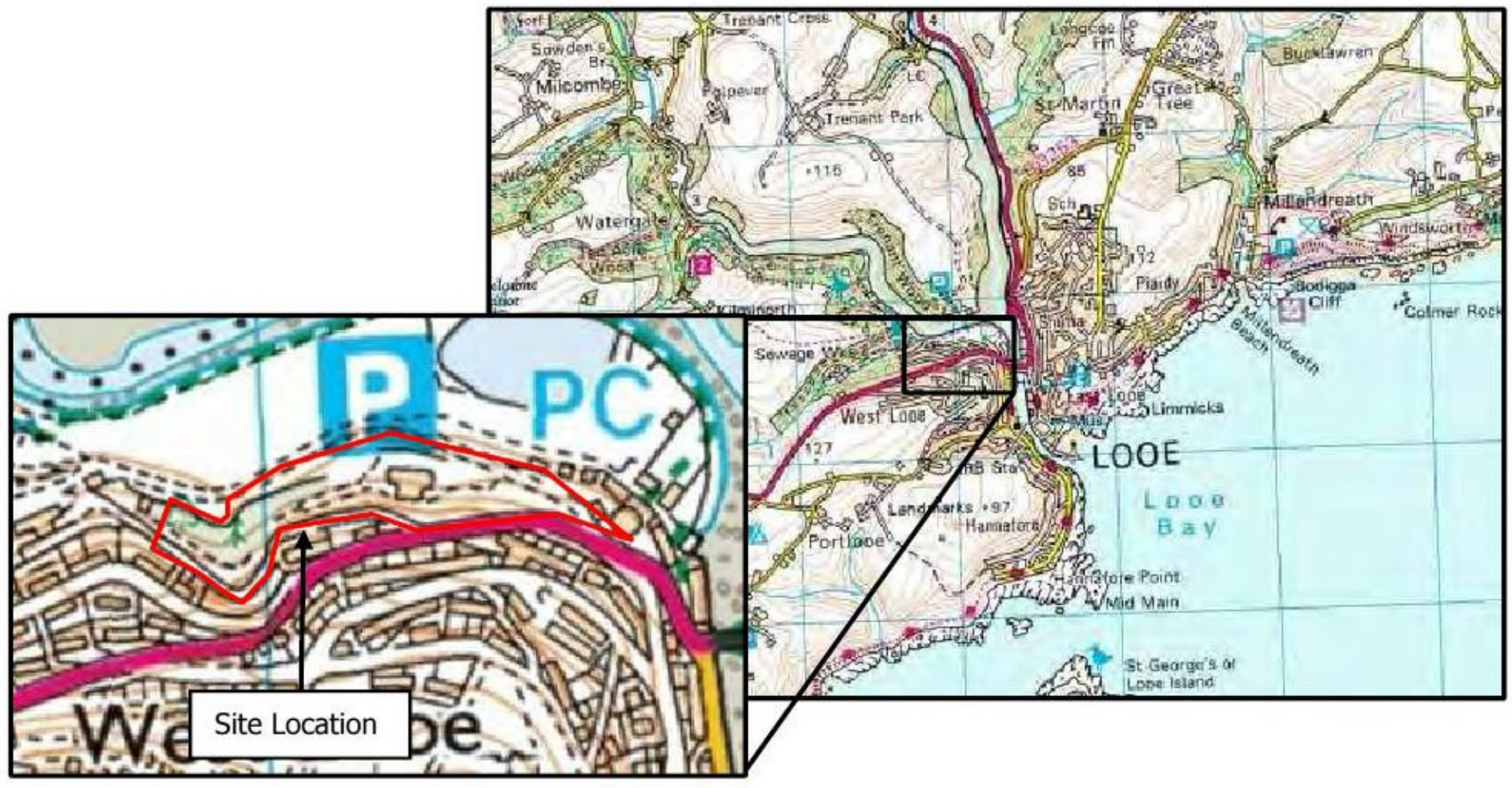


Figure 1. Site Location Plan

Environment Agency Information

An extract from the EA indicative flood map for planning (Rivers and Sea) is shown in Figure 2. below. The site is shown to be within Flood Zone 1 and is therefore at very low risk of flooding.

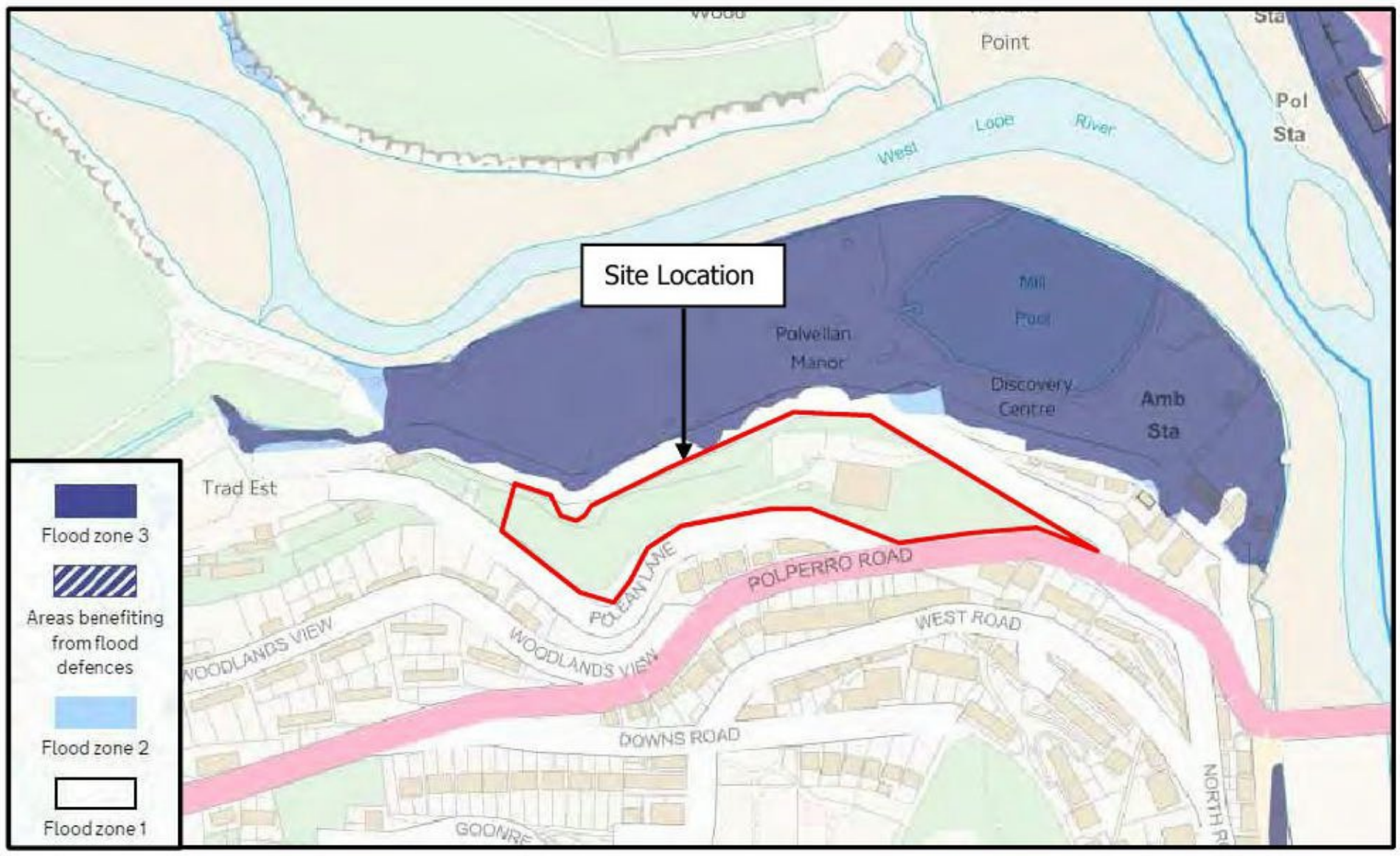


Figure 2. EA flood map extract

Assessment of Flood Risks

A number of flooding mechanisms have been considered, and are discussed below.

Groundwater Flooding

Site investigations have not be undertaken on site to determine groundwater levels.

Given the proximity of the watercourse to the site, it is likely that the river will act as a sump draining any groundwater from the site. Furthermore, an investigation of groundwater flooding undertaken within the Cornwall Strategic Flood Risk Assessment (SFRA) states that:

"Groundwater flooding is linked to the ability of the ground to hold water. Due to its geology Cornwall only has minor aquifers (2) and generally does not experience much groundwater type flooding. The exception to this is found in areas that have extensive mine drainage systems where blockages within drainage tunnels can lead to unexpected breakout of groundwater at the surface."

Assessment of OS mapping shows there are no spring issue points in the vicinity of the site. Given the points above it is considered that ground water flooding does not pose a significant risk to the development site and will not be considered further within this report.

Overland Sheet Flow/Surface Water Flooding

The Cornwall Council Level 1 SFRA indicates that the site predominantly has a low risk of surface water flooding, however, to the west the site has a small area with a high chance of surface water flooding; this is land that has an annual chance of flooding of greater than 1 in 30 (3.3 %). However, the SFRA does not identify any record of surface water flooding at or in the vicinity of the site. This does not imply there is no risk from this source of flooding, as surface water incidents can go unreported.

The EA surface water flood risk map shown below in Figure 3 indicates that flood depths are predominately below 300mm.

It is considered that the site is predominantly at very low risk of surface water flooding and not considered further within the FRA with the exception of the proposed 'Boat House' development and minor increases in impermeable area.

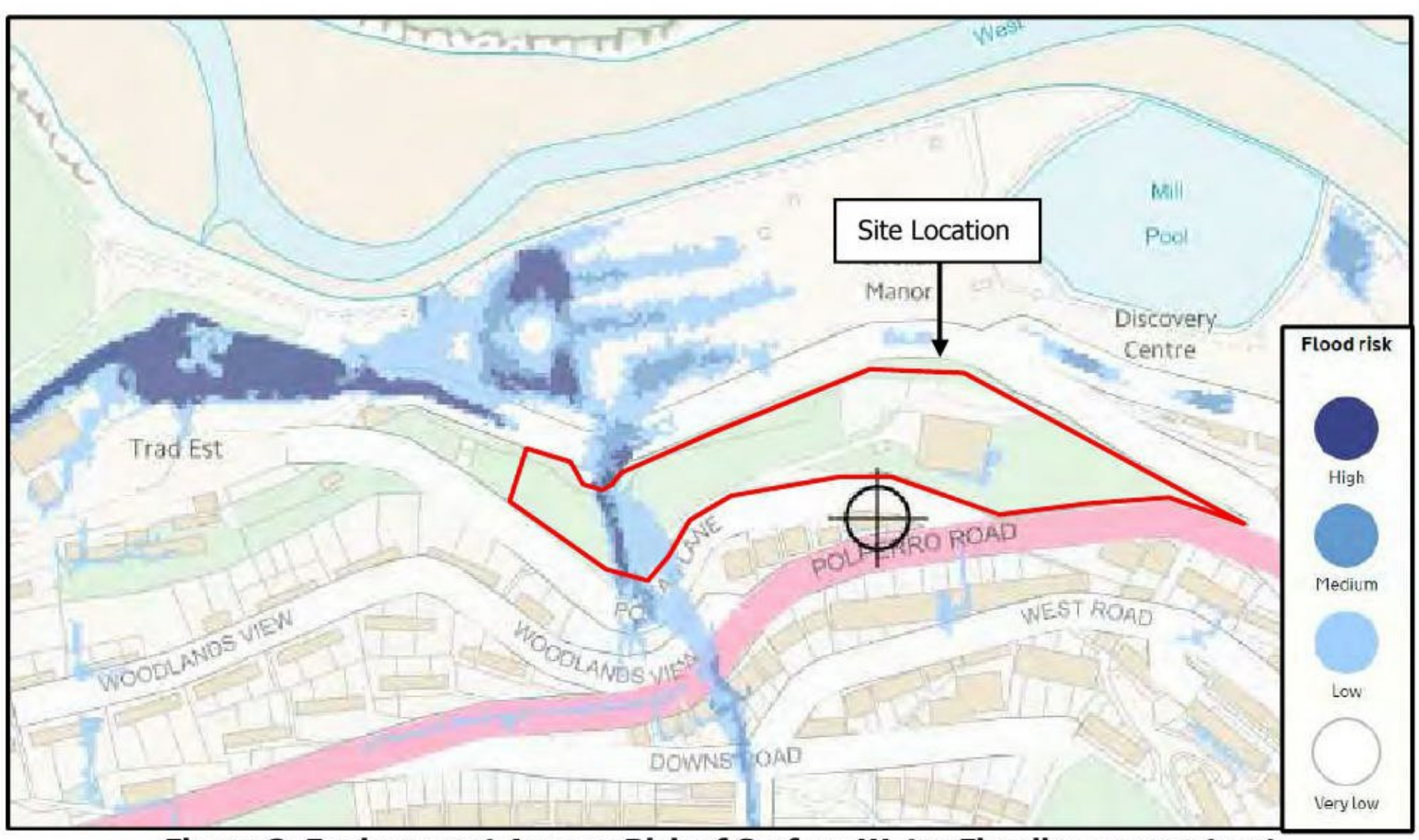


Figure 3. Environment Agency Risk of Surface Water Flooding map extract

Fluvial/Tidal Flooding

The West Looe River is tidally influenced in the proximity of the site and tidal flooding is considered the predominant source of flooding.

Within the current day 1 in 200 year tidal flood event, the site is considered to be at very low risk of fluvial and tidal flooding and is considered to lie entirely within Flood Zone 1.

However, whilst the site is currently located within Flood Zone 1, an assessment of future tidal flood levels with climate change should be considered.

Flooding as a result of Development

The proposed development comprises of developing the existing Polvellan Manor resort to include an array of different housing units and parking areas. It is likely that there will be an increase in the impermeable area of the site and as such there will be a change in surface water runoff from the site. Therefore, it is proposed to provide a Sustainable Drainage System for the disposal of the surface water from the proposed development. Details of the SuDS are outlined further within the report. Once the surface water drainage has been implemented there will be no additional risk of flooding as a result of the development to third parties downstream of the site.

Tidal Flooding

The previous FRA for the development used data found within the Environment Agency's' document 'Coastal flood boundary conditions for UK mainland and islands – Project: SC060064/TR2: Design sea levels'. As such, the current day 1 in 200 year tidal flood event has been taken from the Devonport model, considered to be the most appropriate representation for tidal levels at Polvellan Manor.

Still tidal levels are outlined below as:

- 1 in 200 year : **3.48m AOD**
- 1 in 1000 year: **3.60m AOD**

The EA tidal flood levels do not include an allowance for climate change. An allowance for sea level rise due to climate change over the lifetime of the development should be considered. Information on climate change allowances has been outlined by the Environment Agency. It is estimated that the sea level rise for a residential property in south-west England is 1.18m over 100 years.

- 1 in 200 year plus climate change: **4.66m AOD**

It is considered that the main house, pavilion houses (details yet to be finalised) and central site will be above any tidal flooding during a current day 1 in 200 year tidal flood event, the 1 in 1000 year flood event and the 1 in 200 year flood event including climate change.

Details for the Woodland houses are yet to be finalised, however there is the potential given their current proposed location that they could be at risk of flooding (see plans in **Annex A**).

It is therefore proposed that the Finished Floor Level for habitable areas within the Woodland houses should be **4.96m AOD** (the design flood level plus 300mm freeboard). Any development beneath this level should be fitted with flood resilient fixtures and fittings to a level of **4.66m AOD**.

Flood risk Summary

The majority of the site is located above the tidal flood levels for the present day 1 in 200 year tidal flood event, the 1 in 1000 year tidal flood event and the 1 in 200 year tidal flood event including climate change.

The Woodland houses are yet to be finalised, the area currently specified for them to be situated in has the potential to be at risk of tidal flooding during all tidal flood events considered - with the ground floor garages sat at a potential level of approximately 3.30m AOD. However details for these are yet to be finalised.

Access/egress

Comparison of the current and future 1 in 200 tidal flood depths with surrounding ground levels demonstrates that a dry, safe means of access and egress is achievable both in the present day and inclusive of climate change for the main house, pavilion houses (details yet to be finalised) and the central site.

Current plans for the woodland houses indicate that the main access and egress from the properties is via the carpark below, which is set at approximately 3.30m AOD. If this is to be continued with within the final design it is considered that there would be no safe dry access and egress for residents of these properties. During the finalization of designs, safe dry pedestrian access and egress should be considered through the rear of the properties onto land leading up to Polvellan Manor.

Flood Risk Planning Policy

The majority of proposed development has been shown to be located within Flood Zone 1. In accordance with the Planning Practice Guidance (PPG) Table 2, a development of this type *"Buildings used for dwelling houses"* is classified as 'More Vulnerable'.

Referring to Table 3 of PPG a 'More Vulnerable' development within Flood Zone 1 is deemed to be entirely appropriate (Figure 4). This applies to the main house, pavilion houses (to be finalised), and central site.

The woodland houses would be deemed to be within Flood Zone 3 if they are to be sited within their preliminary positions. A 'more vulnerable' development within Flood Zone 3 would be subject to the exception test.

If the woodland houses can be set further back within the red line boundary, where the level climbs to 5.00m AOD, it would be considered that the entire site would be situated in Flood Zone 1 and therefore deemed entirely appropriate.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 4.0 Extract from PPG Table 3

Surface Water Drainage

The development is to renovate the existing manor house, and to provide an array of housing units and parking areas. Therefore, the site is increasing the overall impermeable area and as such surface water runoff will be increased by the proposed development.

The overall positions of the woodland houses and pavilion houses are yet to be finalised, however impermeable areas have been provided. Therefore, these areas have been included within the surface water drainage calculations.

It is deemed that an infiltration based drainage system is not viable in this situation, due to the steep topography of the site. Additionally, the only area on site which could potentially have been used for soakaway placement comprises of 'made ground' and therefore it has been deemed unacceptable for infiltration drainage.

It is proposed that surface water drainage from the development would be discharged into the tidally influenced West Looe River approximately 100m away.

An email was sent to Cornwall's LLFA in June 2017 under a previous planning application reference: PA16/02408/PREAPP, whereby the proposal to discharge into the estuary unattenuated was deemed appropriate.

A further email was sent to the LLFA to clarify whether this still applied for the new application. The LLFA responded as follows:

"Yes, but you must provide evidence that the resulting surface water drainage scheme will not have a negative impact and that there is no feasible alternatives."

Therefore the proposal is still deemed appropriate. Correspondence with the LLFA can be found in **Annex C** of this letter report.

The new impermeable areas are as follows; the main house and parking (676.5m²), the Woodland houses (400m²), the Central site (1000m²), the Pavilion houses (250m²) which is a total increase of 2327m² of impermeable area.

The brownfield runoff for the proposed new impermeable areas on site is calculated using Building Regulations Part H, whereby the paved area of the site is multiplied by 0.014. Therefore 2327m² x 0.014 = 32.5l/s.

The majority of the surface water runoff will be from the residential patio areas and roof space and as such will have very limited pollutants to adversely affect the watercourse.

However, as there are a number of parking spaces and new roadway, there is a small potential for petroleum and oils to enter the surface water system if an unnoticed spillage occurs.

Therefore it is proposed to install a bypass oil interceptor to prevent pollution to the estuary – a Klargester NSBP004 or similar would suffice. This bypass separator is effective for over 99% of all rainfall events and is deemed more than suitable to prevent pollution for this type of development.

An indicative layout showing the drainage system discussed above is included in **Annex B**. Comments provided by the LLFA as mentioned above, are included within **Annex C.**

Environmental Considerations

The use of heavy plant during construction may cause the topsoil to be disrupted which in turn can pose a pollution risk to local watercourses. An intense rainfall event may result in silt laden runoff being discharged from the site, potentially polluting local watercourses. The proposed drainage designs will incorporate silt traps located upstream of the interceptor to ensure silt does not enter the watercourse. During construction, it is advised that silt fences are installed to intercept silt laden runoff if construction traffic or adverse weather is likely to cause disruption to the topsoil.

Slope stability

In order to prevent slope instability and erosion if the site is to discharge unattenuated, then it is recommended that the following measures are followed wherever practicable to remain in line with the requests and suggestion of the LLFA.

Any excavations carried out within the sloped areas of site should not be excavated to a gradient steeper than 30 degrees.

Wherever possible, good levels of vegetation should be planted on the slopes to allow roots to hold soil in place and prevent rain 'washout'.

If preferred, a semipermeable geotextile membrane can be laid at an angle to the slope to prevent soil being washed away.

Conclusion

- At present, the main house, central site and pavilion houses (yet to be finalised) currently fall within Flood Zone 1 (low risk of flooding from tidal and fluvial flooding). In addition, the site is considered to predominantly have a very low risk of flooding from other sources.

- The current 1 in 200 year tidal flood level for Polvellan Manor is estimated at 3.48m AOD, the future 1 in 200 year (2115) tidal flood level is predicted to rise to 4.66m AOD inclusive of climate change. It is considered that the main house, central site and pavilion houses (yet to be finalised) are free from flooding throughout all considered flood events.

- The position of the woodland houses is yet to be finalised, however within preliminary plans, the site is deemed to be at risk of flooding throughout all flood event scenarios. Therefore a minimum finished floor level of 4.96m AOD for habitable areas is recommended.

- Safe access/egress is achievable for the main house, central site and pavilion houses (yet to be finalised) being significantly above the 1 in 200 year tidal level inclusive of climate change.

- The current proposals and location of the woodland houses suggests that safe access and egress would not be possible. It is recommended that pedestrian access is provided to the rear of the dwellings up into the grounds of Polvellan House.

- The development of this property is considered to be "more vulnerable" in line with PPG. But the main house, central site and pavilion house (yet to be finalised) elements are above the outlined flood levels.

- The woodland houses in the preliminary plans are shown to be situated within Flood Zone 3 and in line with PPG, are subject to the exception test. It is recommended that these properties are set further back within the grounds of Polvellan manor to fall within Flood Zone 1, therefore deemed free from flooding.

- It is proposed that the surface water from the development will drain unattenuated into the estuary as per conversations with the Lead Local Flood Authority for Cornwall Council. This is considered to be wholly appropriate as the development is not increasing surface water runoff.

- An oil interceptor collecting surface water from trafficked areas is recommended to ensure that the water quality of the estuary is not compromised.

- Slope stability measures are recommended to minimise slope instability and erosion from the increased runoff from the development.

- Provided the recommendations outlined in this report are adopted in the development proposal then there is the capacity to manage the surface water and flood risks for the development onsite. With regard to the criteria outlined in both the NPPF and Cornwall Council guidance, the development is appropriate on this site from a flood risk perspective.

Yours sincerely
For and on behalf of Nijhuis H2oK Ltd

[redacted]
Abi Gallacher
Assistant Engineer
Enc.

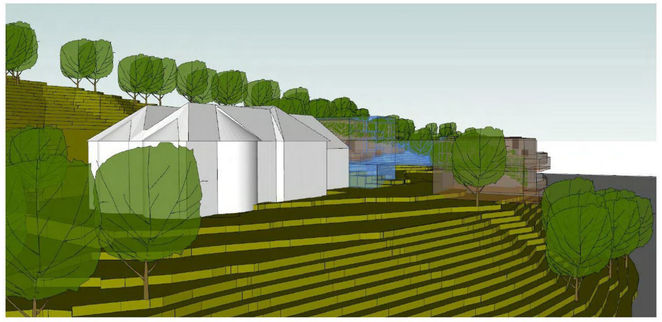
Annex A	Site Location, Existing and Proposed Plans
Annex B	Conceptual surface water drainage drawing
Annex C	LLFA correspondence

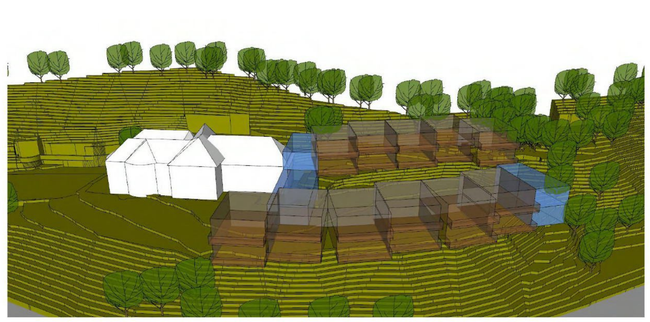
ANNEX A SITE LOCATION PLAN AND PROPOSED PLAN

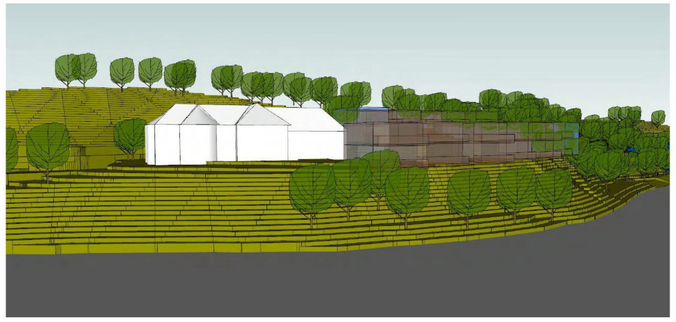
KEY POINTS

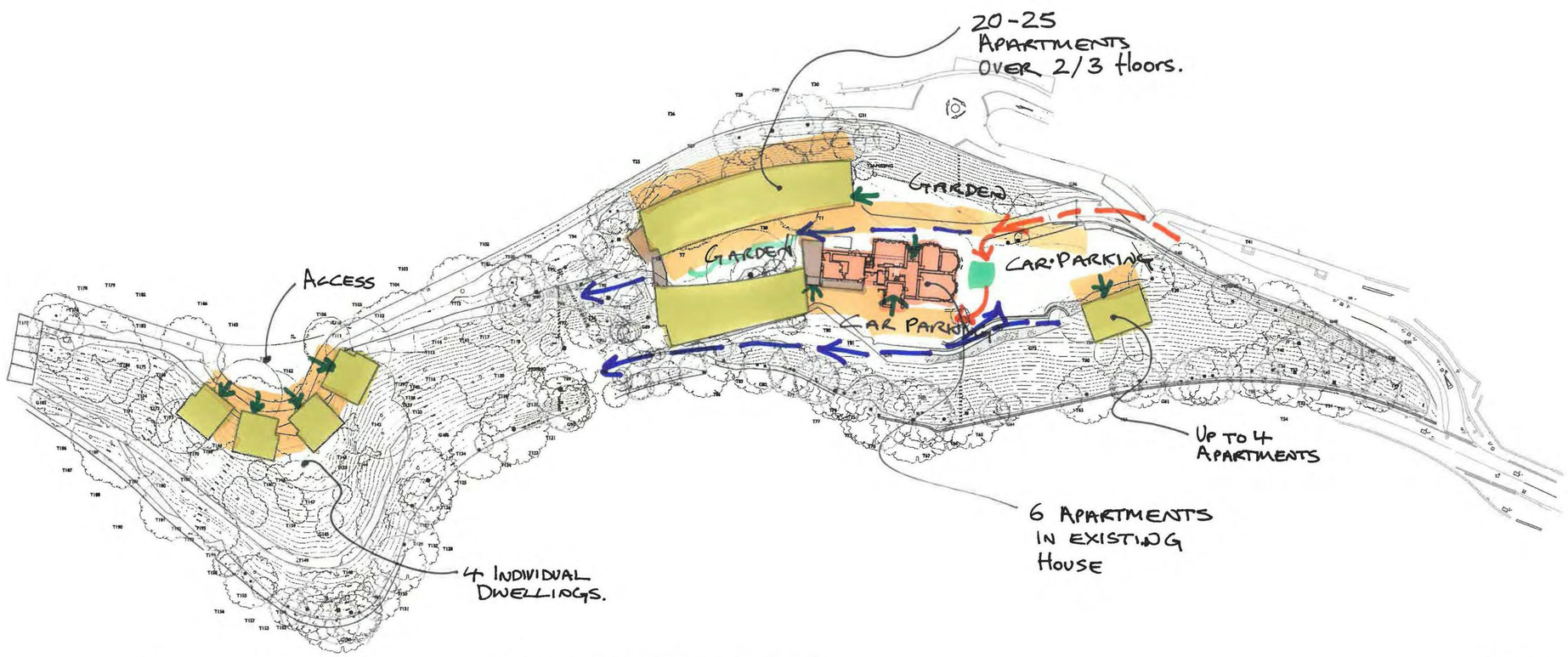
BRIEF/ CONCEPTS

- Create 6 apartments in the existing Polvellan House
- Potential for between 20 -25 Two Bedroom apartments on the centre of the site
- Up to 4 Mews, dwellings/ apartments
- 4 Woodland Houses
- An organic, creative design
- Integrate architecture within Landscape by stepping form down the slope
- Architectural forms to respond to wooded landscape
- Make best use of views out from the site.
- Retain view of existing house as an individual enity from key points outside of site
- Retain key tree clusters and allow key views of the syvanian scape to retain that essence
- Allow views of proposed from specific managed points
- Use of natural materials, granite, timber, slate, and glazed elements to allow for visual connectivity
- Allow formal landscaping to the front of the existing house and between the proposed scheme.
- Distinct permeable routes
- Create appropriate permeability through the site for user group without compromising natural land forms and inert natural qualities









TREE REMOVAL SIMILAR AS ON PREVIOUS PRE-APP SCHEME.
PEDESTRIAN PERMEABILITY
VECHICULAR ROUTES
ENTRANES.

Evolving Concept Site Plan & model views

rlt architects

NOTES:
1. This drawing is the copyright of the Architects and may not be reproduced without licence.
2. Title drawing should not be scaled for construction purposes, only figured dimensions marked thus.
3. All dimensions are to be checked on site and not on site before the commencement of any work and the respective approval to the Architects.
4. This drawing is for Design and Planning only

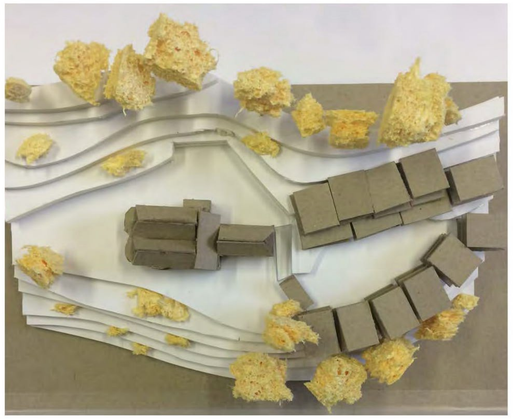
Stage:
Client.
Project. Polvellan Site development
Title. Concept drawing
Site

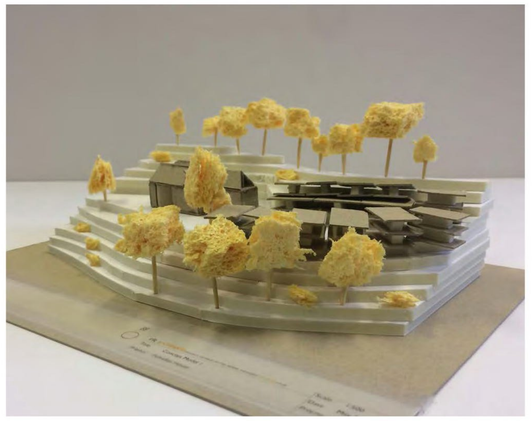
revisions
No
date
detail

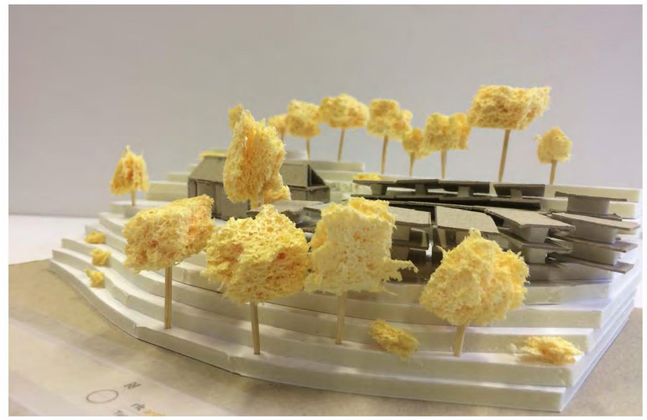
Scale/s. 1:200
Date. Feb 2018
Drawn. HKB
Checked. RLT

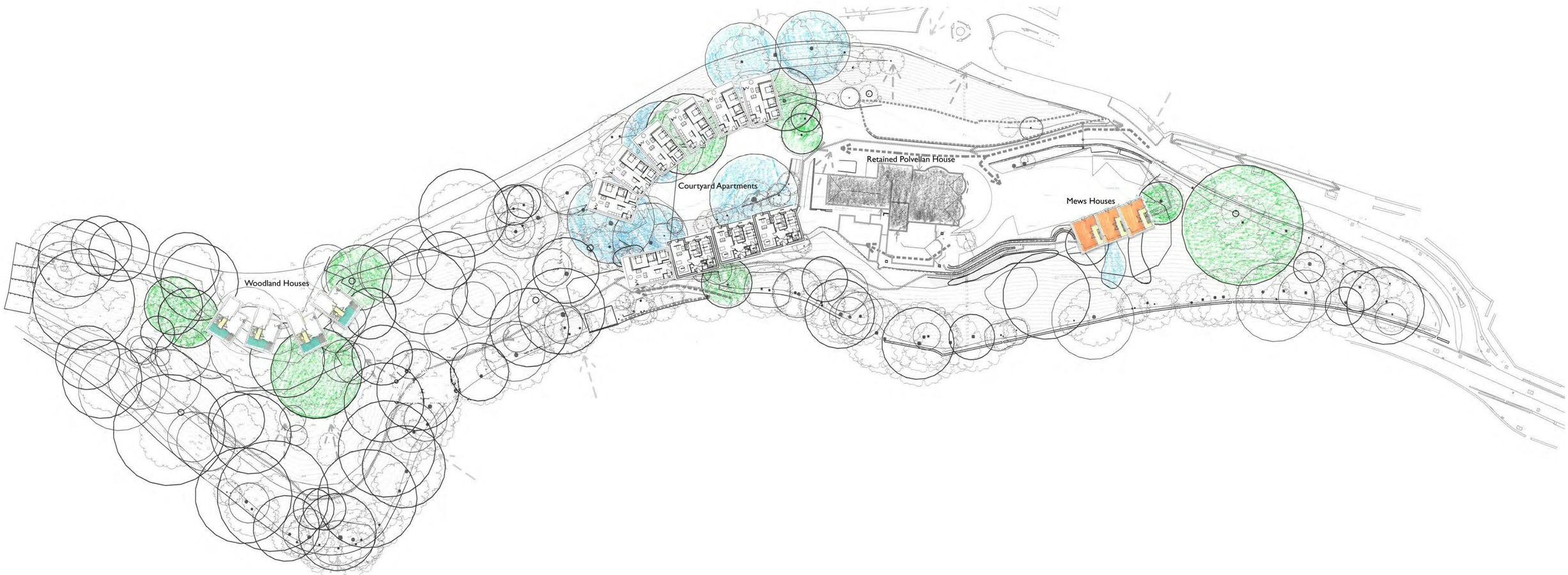
Project No. 2017/2566
Drawing No. 2566/AB05
Rev.

Indicative Site Plan

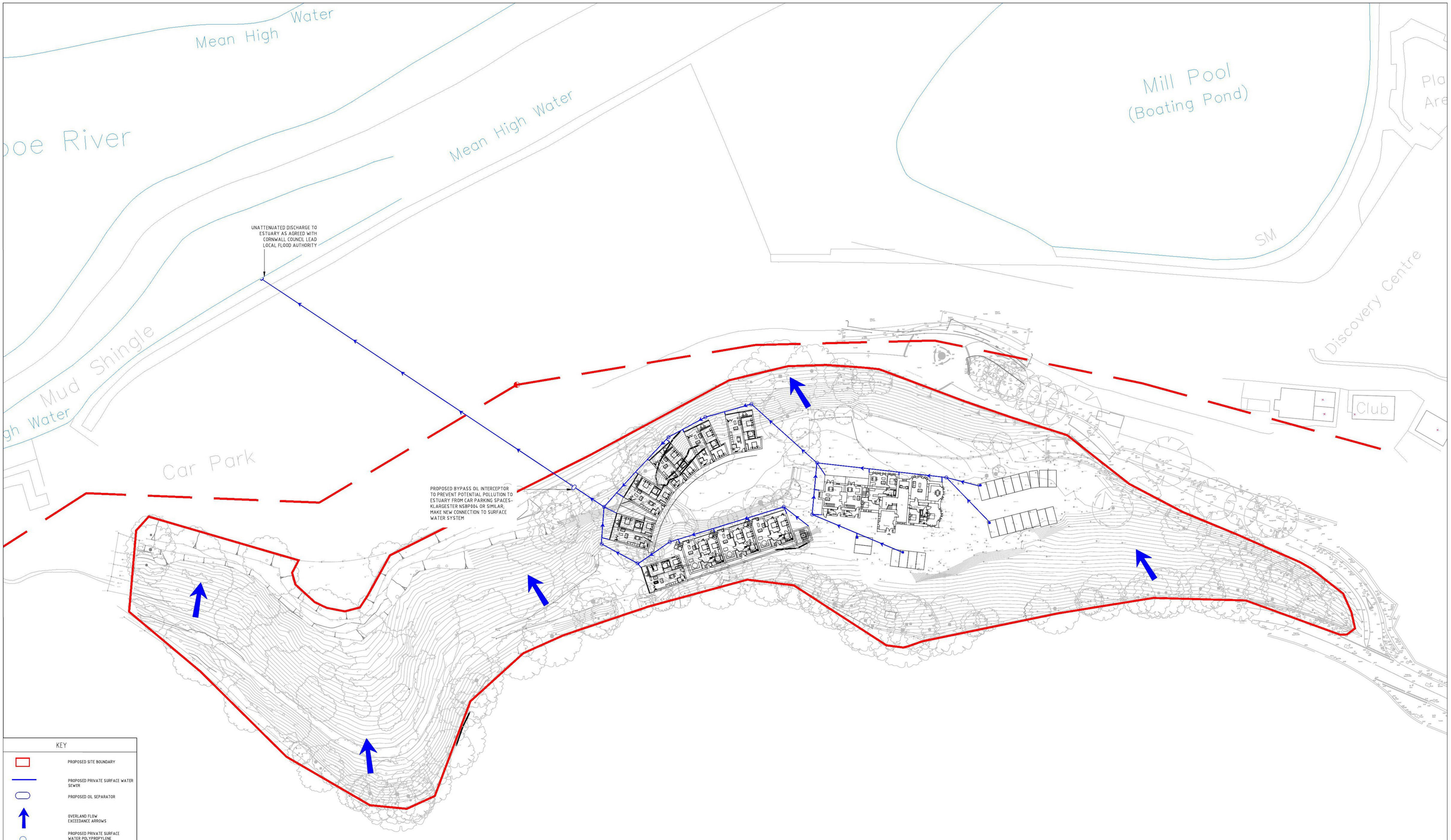








ANNEX B CONCEPTUAL SURFACE WATER DRAINAGE DRAWING



NOTES

1. THIS DRAWING IS COPYRIGHT. REFER TO DETAILS ABOVE.
2. THIS DRAWING IS ONLY TO BE USED FOR THE PURPOSES DESCRIBED IN THE STATUS BOX BELOW. WORK TO FIGURED DIMENSIONS ONLY, DO NOT SCALE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS, DETAILS AND SPECIFICATIONS PERTAINING TO THE WORK DESCRIBED.
4. MATERIALS AND WORKMANSHIP SHALL COMPLY TO THE APPROPRIATE BRITISH STANDARDS AND CODES OF PRACTICE UNLESS OTHERWISE STATED.
5. THE ACTIVITIES REQUIRED TO CONSTRUCT THE WORK, SHOWN ON DRAWINGS CLEARLY MARKED FOR CONSTRUCTION, MAY BE SUBJECT TO THE PROVISIONS OF THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015 THE CONTRACTOR AND CLIENT MUST ENSURE THAT THEY ARE ADEQUATELY CONVERSANT WITH THESE REGULATIONS AND THAT THE APPROPRIATE PROCEDURES REQUIRED UNDER THE REGULATIONS ARE OBSERVED AT ALL TIMES.
6. DESIGN RISK ASSESSMENT

   A RISK ASSESSMENT RELATING TO POTENTIAL HAZARDS ASSOCIATED WITH THE CONSTRUCTION, OPERATION AND DEMOLITION OF THE WORK DESCRIBED WITHIN THIS DRAWING, IN SO FAR AS IT HAS BEEN DESIGNED BY NIJHUIS H2OK LTD, HAS BEEN UNDERTAKEN. RISKS SO IDENTIFIED HAVE BEEN ELIMINATED BY DESIGN WHEREVER PRACTICABLE. THE SITUATION WITH REGARD TO RESIDUAL RISKS IS AS FOLLOWS:

THE WORK IS AT AN EARLY PLANNING STAGE AND IS NOT SUFFICIENTLY ADVANCED TO ALLOW A MEANINGFUL ASSESSMENT OF RISKS TO BE UNDERTAKEN AT THIS TIME.

DATE.	DRWN.	CHKD.	APPR.	REV.	NOTES.
01.08.18	AG	HG	-	A	PRELIMINARY ISSUE

PROJECT MANAGER:-	HANNAH GRAHAM
ASSISTANT:-	ABIGAIL GALLACHER
DRAWN DATE:-	AUGUST 2018
SCALE & SHEET SIZE:-	1:500 @ A1

PRELIMINARY

CLIENT

COAST2COAST DEVELOPMENTS LTD

PROJECT

NEW DEVELOPMENT AT POLVELLAN MANOR

DRAWING TITLE

SURFACE WATER DRAINAGE STRATEGY

nijhuis INDUSTRIES i-CONSULT

- Waste to Value (AD/Biogas)
- Industrial Effluent Treatment
- Sewage Treatment
- Flood Risk Management/SUDS
- Design Consultancy
- Service and Maintenance

Nijhuis H2OK Ltd. : info.uk@nijhuisindustries.com : www.nijhuisindustries.com/consultancy
Head Office: +44 (0)333 7000 007

Truro Office : Nanjemick Court, Allet : Truro, Cornwall : TR4 9DJ : United Kingdom
Bristol Office : Unit 4 : Blenheim Court : Beaufort Office Park : Bristol : BS32 4NE : United Kingdom

PROJECT No.	DRAWING No.	REV.
J-12627	3001	A

ANNEX C LLFA CORRESPONDENCE

Abigail Gallacher

From: Smith Jackie [redacted]
Sent: 20 July 2018 08:34
To: Abigail Gallacher
Subject: RE: Polvellan Manor, Looe

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Abi,

Yes, but you must provide evidence that the resulting surface water drainage scheme will not have a negative impact and that there is no feasible alternatives.

Kind regards

Jackie Smith
Sustainable Drainage Lead Officer
Transport and Infrastructure
West Building
Central Group Centre
Castle Canyke Road
Bodmin
Cornwall PL31 1DZ

[redacted]

From: Abigail Gallacher [redacted]
Sent: 18 July 2018 14:47
To: Smith Jackie
Subject: Polvellan Manor, Looe

Hi Jackie,

I hope you are well.

I previously contacted you in June last year regarding a site - Polvellan Manor, Looe.

We had asked whether it would be acceptable to connect to the neighbouring estuary unattenuated given the fact that soakaways were unsuitable because of the steep sloping nature of the site.

The site has now been bought by a new owner who is proposing a new development - the new development is to have less impermeable area than the original proposal.

Would this still be an acceptable approach? I have attached the original emails above.

Kind regards,
Abi Gallacher
Assistant Engineer

Nijhuis Industries UK & Ireland | info.uk@nijhuisindustries.com | www.nijhuisindustries.com/uk/consultancy
Head Office: +44 (0)333 7000 007
Truro Office: 01872 542100

Truro Office | Nanjerrick Court, Allet | Truro, Cornwall | TR4 9DJ | United Kingdom
Bristol Office | Unit 4, Blenheim Court | Beaufort Office Park, Bristol | BS32 4NE | United Kingdom

SOLID SOLUTIONS IN A FLUID WORLD