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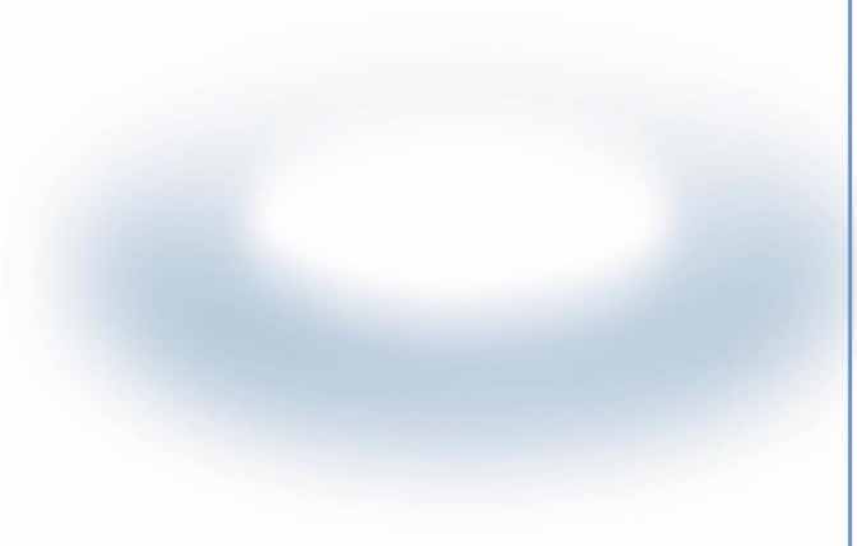
Project: Phase 1 Flood Risk Assessment (FRA)

Prepared for: John Pardey Architects

Reference: 2750

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Site Location: 26 The Kench, Ferry Road, Hayling Island, PO11 0DF

Proposed Development: Demolition of an existing holiday chalet and the construction of a new holiday chalet with an increased built footprint

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1. Summary

- 1.1 Ambiantal Technical Solutions Limited has been appointed by John Pardey Architects to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the demolition of an existing holiday chalet and construction of replacement holiday chalet with a larger footprint at 26 The Kench, Ferry Road, Hayling Island, PO11 0DF.
- 1.2 The proposed development is for the construction of a replacement holiday chalet. The proposed replacement holiday chalet will provide a slight increase in built footprint compared to the existing built footprint (under 250m²).
- 1.3 With reference to the NPPF and the Environment Agency (EA) standing advice on development and flood risk, as well as the low detail, national-scale flood mapping created on behalf of the EA, the proposed site is located within Flood Zone 3a (High Risk; >0.5% chance of annual tidal flooding) and is considered to be a “More Vulnerable” development.
- 1.4 The EA have provided site specific tidal flood data from 2011 base data that has been projected for climate change using estimates for sea level rise presented in Table 3 of the Technical Guidance to the NPPF.
- 1.5 Analysis of topographic levels against the provided extreme sea level flood levels has shown the site to be partially inundated by the 1:200 (3.2mAOD) and 1:1000 (3.4mAOD) year flood events with maximum flood depths on site calculated to be 0.19m and 0.39m respectively. Floor levels should not be set lower than 3.5mAOD to provide betterment and meet the requirements of the site management committee.
- 1.6 The site does benefit from the presence of defences. The existing defences are owned and maintained by private individuals to protect private gardens and a holiday development. As such, the developer has stated that the current sea wall will be raised to match the level of the sea wall at neighbouring 28 The Kench (approx. 3.2mAOD) which completed relatively recently.
- 1.7 The scheme to strengthen the defences in the area is stated in the “North Solent Shoreline Management Plan (2010)”, the management policy for Langstone Harbour entrance to North Shore Road (Policy Unit: 5AH106) is “Hold the Line” - maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It can therefore be assumed the improvements in defences will be maintained and upgraded in the future.
- 1.8 As such, and given that:
 - a) the site lies within an existing developed area and is for the replacement holiday chalet;
 - b) ground floor levels will be raised 350mm above the existing ground floor levels, which is 300mm above the present day 1:200 year flood level respectively, providing a betterment to the existing site; and;
 - c) further betterment can be provided by the formalisation of a flood warning and evacuation plan

following the guidelines contained within the NPPF, the proposed development is considered **to be suitable** assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Development Description	Existing	Proposed
Development Type:	Holiday Chalet	Demolition of existing holiday chalet and construction of a replacement holiday chalet
(Number of Bedrooms):	N/A ¹	N/A ¹
EA Vulnerability Classification:	More Vulnerable	More Vulnerable
External Ground Level:	3.01mAOD and 3.18mAOD	No Change
Level of Sleeping Accommodation:	N/A ¹	3.5mAOD
Impermeable Surface Area:	N/A ¹	Increase in built footprint (under 250m ²)
Surface Water Drainage:	N/A ¹	
Site Size:	N/A ²	Increase in built footprint (under 250m ²)
Risk to Development	Summary	Comment
EA Flood Zone:	3	Proposed development Flood Zone 3
Flood Source:	Tidal	English Channel
1:200 year present day flood level	3.2mAOD	Based on 2011 base data that has been projected for climate change.
1:200 year + climate change flood level (2070)	3.7mAOD	
1:200 year + climate change flood level (2115)	4.4mAOD	
Recorded Flood Events in Area:	Yes	2005 and during the winter storms of 2013/14 Hayling Island
Recorded Flood Events at Site:	No	
SFRA Available:	Yes	Havant District Council Strategic Flood Risk Assessment (2016 Update)
Management Measures	Summary	Comment
Ground floor level above extreme flood levels:	N/A ¹	
Safe Access/Egress Route:	Yes	Sign up to EA Flood Warning Alerts Service
Flood Resilient Design:	Yes	
Site Drainage Plan:	N/A ¹	Discharge to existing drainage infrastructure
Flood Warning & Evacuation Plan:	Yes	EA Flood Warning Service
Offsite Impacts	Summary	Comment
Displacement of floodwater:	N/A ¹	Site lies in area of tidal flood risk
Increase in surface run-off generation:	None	Increase in built footprint (under 250m ²)
Impact on hydraulic performance of channels:	None	

Table 1: Summary of flood risks, impacts and proposed flood mitigation measures.

N/A¹ not required for this assessment; N/A² data not available.

2. Development Description and Site Area

Proposed Development and Location

- 2.1 The proposed development is located at 26 The Kench, Ferry Road, Hayling Island, PO11 0DF (Figures 1 and 2).



Figure 1: Wider Site Location Map-Site outlined in red. (Source: OS)



Figure 2: Site location-outline in red. (Source: Google Earth)

- 2.4 The existing site consists of a single holiday chalet. The proposed development is for the demolition of the existing holiday chalet and construction of a new holiday chalet with a larger footprint.
- 2.5 The existing chalet is one of a row of similar size neighbours all sharing a similar FFL (approx. 3.0mAOD). 28 The Kench, the westernmost chalet on the Langstone Harbour side, was rebuilt and completed relatively recently and has a FFL of approx. 3.60mAOD and a sea wall of approx. 3.2m. The developer has stated that the proposed development will raise the sea wall to match that of no. 28.
- 2.6 Topographic levels derived from an onsite topographic survey (Drawing Number: 1878_16_07_01) shows the site to be relatively flat, with levels across the red-line application boundary between approximately 3.01mAOD and 3.18mAOD.

Vulnerability Classification

- 2.7 According to the NPPF and the Environment Agency (EA) standing advice on development and flood risk, as well as the low detail, national-scale flood mapping created on behalf of the EA the site is located in Flood Zone 3 (High risk; greater than 1:200 (>0.5%) chance of annual tidal flooding).
- 2.8 In accordance with the NPPF guidance, the existing residential dwelling is classified as “More Vulnerable”. The proposed development is for the construction of a replacement holiday chalet with a larger footprint. Post development the proposed holiday chalet will remain classified as a “More Vulnerable” development, under the NPPF guidance.

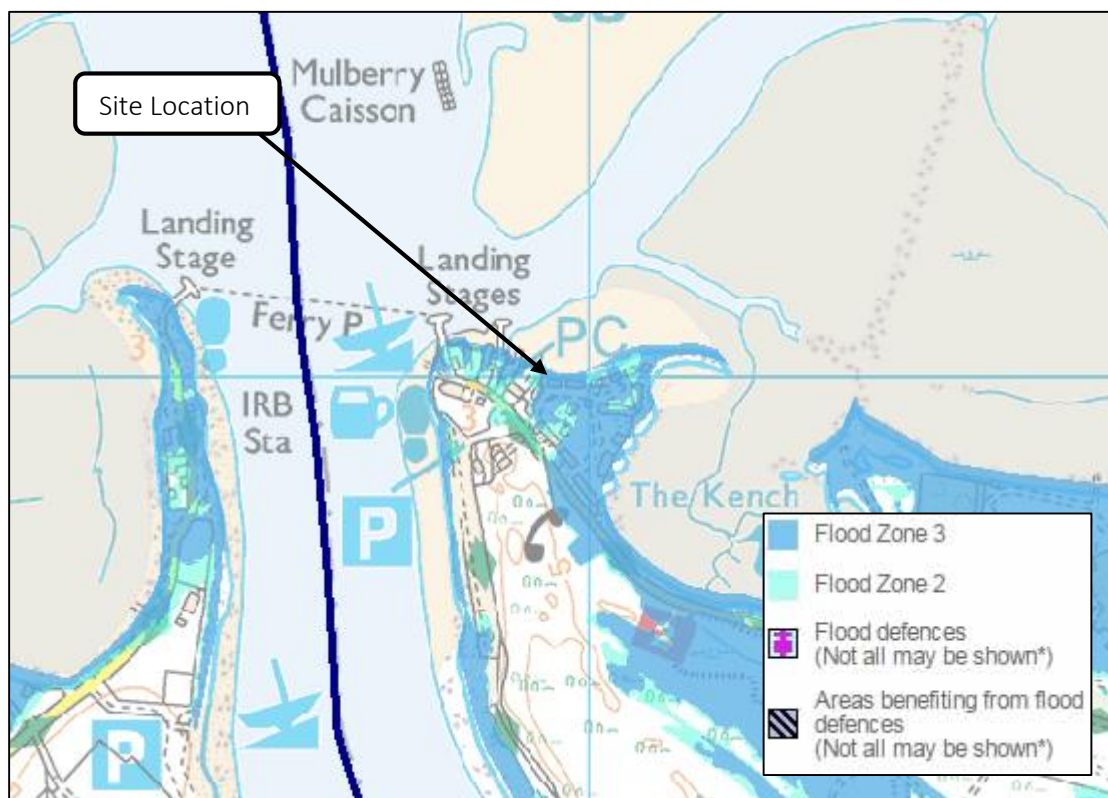


Figure 3: EA Flood Zone Map (Source: EA Online)

Geology

- 2.9 According to the British Geological Survey (BGS) the bedrock of the site is the London Clay Formation formed of clay, silt and sand. Storm Beach deposits have been identified as the superficial geology of the site formed of gravel (BGS).

3. Sequential Test/Exception Test

- 3.1 Under the NPPF, all new planning applications must undergo a *Sequential Test*. This test must be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.
- 3.2 The test refers to the EA Flood Zones described in Table 2. For reference, the NPPF *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below.
- 3.3 In accordance with the NPPF guidance, the existing holiday chalet is classified as “More Vulnerable”. The proposed development is for the construction of a replacement holiday chalet with a larger footprint. Post development the proposed residential dwelling will remain classified as a “More Vulnerable” development, under the NPPF guidance.

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Zone 3b <i>Functional Floodplain</i>	Exception Test Required	✓	✗	✗	✗

Table 2: The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; ✗ means the development should not be permitted.

- 3.4 Using the principles of the Sequential Test outlined above, the proposed development is 'More Vulnerable' and is located within Flood Zone 3. As such, under the NPPF, this development would require implementation of the Exception Test further to passing the Sequential Test.
- 3.5 For reference purposes, in order for the Exception Test to be passed, the proposed development must meet the following criteria:

“it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and a site-specific flood risk assessment must demonstrate that the

development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.”

(Source: the NPPF)

- 3.6 As such, and in order to address these requirements, the planning application is required to be accompanied by a FRA which shows that the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and surrounding area.

4. Site Flood Hazards

Sources of Flooding

- 4.1 As outlined in Figure 3, the proposed development is located within Flood Zone 3 (High Risk of flooding), and is considered to be “More” Vulnerable under the NPPF. Communication with the Environment Agency (EA) has identified the following potential sources of flooding to the site:

Source	Description
Fluvial	N/A
Tidal	English Channel
Surface	N/A
Groundwater	N/A
Sewer	N/A

Table 3: Summary of flood sources.

Mechanisms and History of Flooding

- 4.2 According to the low detail, national-scale flood mapping created on behalf of the EA the proposed development is located within Flood Zone 3 with a great than 1:200 (>0.5%) annual chance of tidal flooding each year.
- 4.3 Figure 3 outlines only the potential floodplain; and the mitigating effects of flood defences currently in place are not considered.

Tidal

- 4.4 The EA Flood Map for Planning (Figure 3) confirms that the site lies within Flood Zone 3 tidal (High Risk), with a 0.5% annual chance of tidal flooding from the English Channel.
- 4.5 The mean high water line of the English Channel is located on the lower topographical land to the north of the site.
- 4.6 Site specific data supplied by the EA has provided an in sea node based on 2011 base data, that has been projected for climate change using estimates for sea level rise. Sea levels for the 0.5% (1:200) and 0.1% (1:1000) annual exceedance probabilities for present day (2011) and the 2070 and 2115 epoch.
- 4.7 The scheme to strengthen the defences in the area is stated in the “North Solent Shoreline Management Plan (2010)”, the management policy for Langstone Harbour entrance to North Shore Road (Policy Unit: 5AH106) is “Hold the Line” - maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It can therefore be assumed the improvements in defences will be maintained and upgraded in the future.
- 4.8 The data provided shows a flood level for the present day 1:200 year flood event of 3.2mAOD, and a flood level of 3.2mAOD for the 1:1000 year flood event.
- 4.9 The data provided by the EA has also given a climate change flood level for the 2070 and 2115 epoch. The 1:200 year flood event and 1:1000 year flood event for the 2070 epoch is estimated to be 3.7mAOD and 3.9mAOD respectively.
- 4.10 The 1:200 year flood event and 1:1000 year flood event for the 2115 epoch is estimated to be 4.4mAOD and 4.5mAOD respectively.
- 4.11 Topographic levels vary between approximately 3.01mAOD and 3.18mAOD across the site (Source: Topographic Survey). Comparison of topographic site levels with modelled flood levels confirms that the site resides within the extreme tidal flood extent for the present day 1:200 year event (3.2mAOD) and 1:1000 year flood event (3.4mAOD).
- 4.12 Possible maximum flood depth, based on the minimum topographic level on site, for the 1:200 year flood event when taking into account climate change for the 2070 and 2115 epoch are 0.69m and 1.39m, respectively. The possible maximum flood depth for the 1:1000 year flood event for the 2070 and 2115 epoch are 0.89m and 1.49m, respectively (See table 4).

Possible Maximum Flood Depth on Site (m)			
	Present day (2011)	2070 Epoch	2115 Epoch
1:200 year Flood Event	0.19	0.69	1.39
1:1000 year Flood Event	0.39	0.89	1.49

Table 4: Possible Maximum Flood Depths on Site

- 4.1 The site does benefit from the presence of defences. The existing defences are owned and maintained by private individuals to protect private gardens and a holiday development. As

such, the developer has stated that the current sea wall will be raised to match the level of the defence crest level at neighbouring 28 The Kench (approx. 3.2mAOD) which completed relatively recently.

- 4.2 It is important to note that tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before such an event strikes. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.
- 4.3 The Hampshire County Council (2010), Havant District Council SFRA (2016) and EA have not provided historic records of tidal flooding events at the site.
- 4.4 However the southern frontage of Hayling Island has suffered from flooding caused by extreme wave overtopping, most recently in November 2005 and during the winter storms of 2013/14 which caused some highway flooding. During the 2005 event, properties which are classified in Flood Zone 1 were flooded, as indicated on the historical information layer.
- 4.5 As such the risk from this source is considered to be **moderate to high** due to the proximity of the development to the coast.

Surface Water (Pluvial)

- 4.6 The EA Risk from Surface Water Flooding Map has identified the site to be located in an area that is of "Very Low" risk of surface water flooding (Figure 4). The entire site is located within a "Very Low" risk of surface water flooding area. This means that each year, the site and surrounding area has a chance of flooding of less 1 in 1000 (0.1%).
- 4.7 The EA Surface Water Depth Map shows the majority of the site and surrounding area would be unaffected by any flood depths during an event with a High, Medium or Low Chance of occurring (Figure 5 shows Low Chance of Occurring map).
- 4.8 Further analysis of the access road to the site (Ferry Road) has shown the road would not experience greater than 300mm of surface water flood depth during a High, Medium and Low Chance of occurring scenarios.



Figure 4: EA Surface Flood Risk Map. (Source: EA Online)

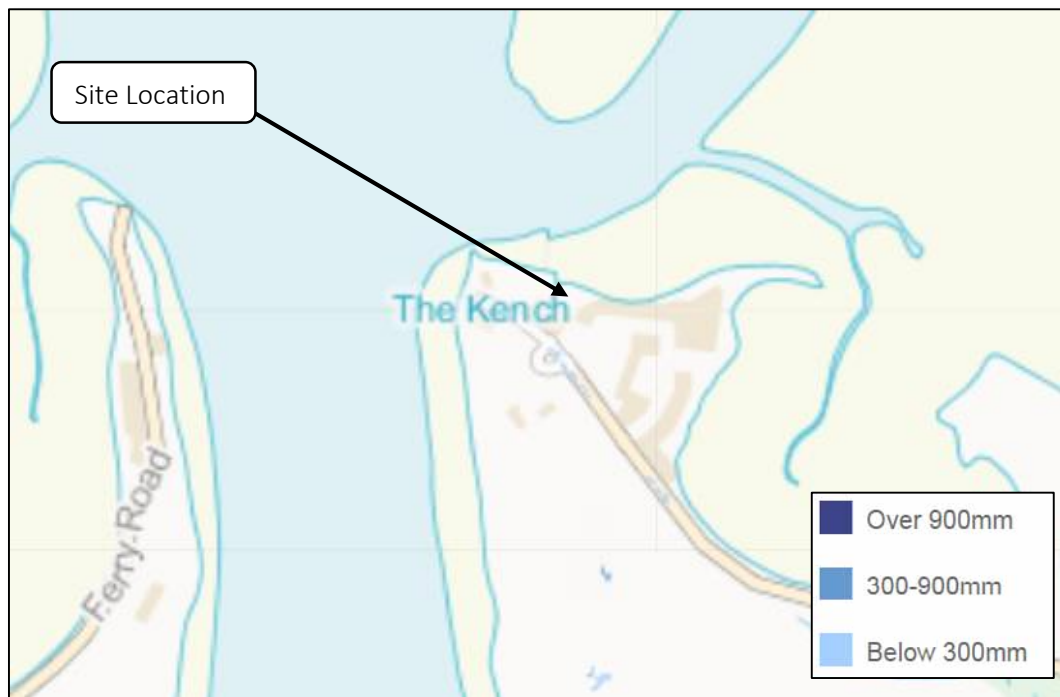


Figure 5: Surface Water Depth – Low Chance of Occurring (Source: EA Online)

- 4.9 At the time of writing the EA have not provided any historic evidence of surface water flooding at the site or within close proximity to the site.
- 4.10 As such the risk from surface water flooding to the site can be considered **moderate to low**.

Groundwater

- 4.11 The EA and Havant District Council SFRA (2016 Update) have not provided records of groundwater flooding in the vicinity of the proposed development site. Given the site has no history of flooding from this source, and that the proposed developments for the construction of a replacement dwelling, the risk of groundwater flooding in the vicinity of the site is therefore considered to **relatively low**.

Sewer

- 4.12 The SFRA's Historic Flood Incidents Map shows no records of sewer flooding on site, or within the surrounding area. The Havant Strategic Flood Risk Assessment (2016 update) states that the key risks to new development in the Havant Borough come from increases in flows in the Lavant Stream as a result of high groundwater levels emerging in East Hampshire District.
- 4.13 The proposed development is for the construction of a replacement holiday chalet with a larger footprint. As such the risk of sewer flooding to the site post development is deemed to be **relatively low**.

Surface Water Drainage Strategy

- 4.14 The existing site is developed. The proposed development is for the construction of a replacement holiday chalet with a larger footprint. As such post development there will be an increase of impermeable surfaces at the site.
- 4.15 It is recommended that the runoff from the proposed residential dwellings will discharge to the existing drainage network associated with the existing development.

Records of Historical Flooding

- 4.38 Havant Borough Council SFRA (2016 Update) have not provided records of historical flood from any source in the vicinity of the proposed development site. However the southern frontage of Hayling Island has suffered from flooding caused by extreme wave overtopping, most recently in November 2005 and during the winter storms of 2013/14 which caused some highway flooding. During the 2005 event, properties which are classified in Flood Zone 1 were flooded, as indicated on the historical information layer.
- 4.39 The EA has not provided any records of historical flooding occurring at the site or surrounding area.

5. Probability of Flooding

- 5.1 According to the low detail, national-scale flood mapping created on behalf of the EA the probability of tidal flooding at the site is 0.5% or greater (or 1 in 200 years or greater annual probability of tidal flooding).
- 5.2 Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before such an event strikes. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.
- 5.3 This information is supported by the EA Flood Map for Planning (Figure 3) which has been produced in part using JFLOW/HYDRO-F – a relatively coarse, national scale flood modelling strategy and in part using detailed flood models. These maps indicate the potential spatial extent of a tidal flood event which has a magnitude that is, on average, likely to occur once in every two hundred years (i.e. the 1:200 year tidal floodplain). It is important to note that only the *potential* floodplain is shown; ***the mitigating effects of any flood defences currently in place are not considered***. For reference, the definition of the NPPF flood risk zones is included in Table 5 below.

Zone	Description
1	Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium Probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	High Probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 5: Definition of the NPPF Flood Zones. Shaded cells denote the proposed development. (Source: EA)

Climate Change on Site

- 5.4 Climate change is likely to increase the flow in rivers, and raise sea levels and storm intensity.
- 5.5 The EA have recently updated the peak river flow allowances to use for different types of development. Communication with the EA, Flood and Coastal Risk Management Officer has

confirmed that the changes are only focused to river flow and rainfall allowances. Tidal allowances are detailed in table 3 of the new changes (<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>). As a result of this dialogue it has been confirmed that the EA detailed data sets provided are relevant for the purposes of this assessment given that the dominant source of flooding is tidal.

- 5.6 The EA have also stated that the climate change will increase the peak rainfall intensity allowance in small and urban catchments.

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

- 5.7 Topographic levels vary between approximately 3.01mAOD and 3.18mAOD across the site (Source: Topographic Survey). Comparison of topographic site levels with modelled flood levels confirms that the site resides within the extreme tidal flood extent for the present day 1:200 year event (3.2mAOD) and 1:1000 year flood event (3.4mAOD).
- 5.8 Possible maximum flood depth, based on the minimum topographic level on site, for the 1:200 year flood event when taking into account climate change for the 2070 and 2115 epoch are 0.69m and 1.39m, respectively. The possible maximum flood depth for the 1:1000 year flood event for the 2070 and 2115 epoch are 0.89m and 1.49m, respectively (See table 4).

Possible Maximum Flood Depth on Site (m)			
	Present day (2011)	2070 Epoch	2115 Epoch
1:200 year Flood Event	0.19	0.69	1.39
1:1000 year Flood Event	0.39	0.89	1.49

Table 5 (replicated): Possible Maximum Flood Depths on Site

- 5.9 The scheme to strengthen the defences in the area is stated in the “North Solent Shoreline Management Plan (2010)”, the management policy for Langstone Harbour entrance to North Shore Road (Policy Unit: 5AH106) is “Hold the Line” - maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It can therefore be assumed the improvements in defences will be maintained and upgraded in the future.
- 5.10 The North Solent Shoreline Management Plan (2010) indicates the site and surrounding area to be located in the 2115 1:200 year indicative floodplain.

6. Residual Risks

- 6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:
- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
 - failure of a reservoir, or;
 - a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.
- 6.2 The EA Risk of Flooding from Reservoir Flood Map shows the site to be located outside of any maximum extent of flooding from reservoir failure. As such the risk of flooding from this source is deemed to be negligible.
- 6.3 Given that the proposed development is for the replacement of a holiday chalet on land previously developed, and as such sewerage infrastructure will be located on site already. As such the risk of sewer flooding shall be addressed at the development stage.
- 6.4 The existing defences in the area are owned and maintained by private individuals to protect private gardens and a holiday development. The developer has stated that they plan to raise the existing sea wall to 3.2m to match the current height of the defence crest height at the neighbouring 28 The Kench. As such there is likely to be a residual risk of failure in the future.
- 6.5 The controlling residual flood risk mechanism on site is tidal. Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before a tidal flood event occurs. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.
- 6.6 Given the nature of the tidal cycle flood waters on site will likely recede as tidal water levels fall.
- 6.7 As such the only remaining residual risk to the site is that of drainage failure. A limited history of flooding due to sewers has been found as part of this flood risk assessment.

Coastal Erosion

- 6.1 The Shoreline Management Plan has determined the indicative erosion zones based on the current policy. These erosion zones are split into 3 epochs, 2025, 2055 and 2105.
- 6.2 Analysis of the map provided (Figure 6) has shown the development site to be not located within any of the indicative erosion zones. As such the development site is not located within an area at risk of erosion from coastal process.

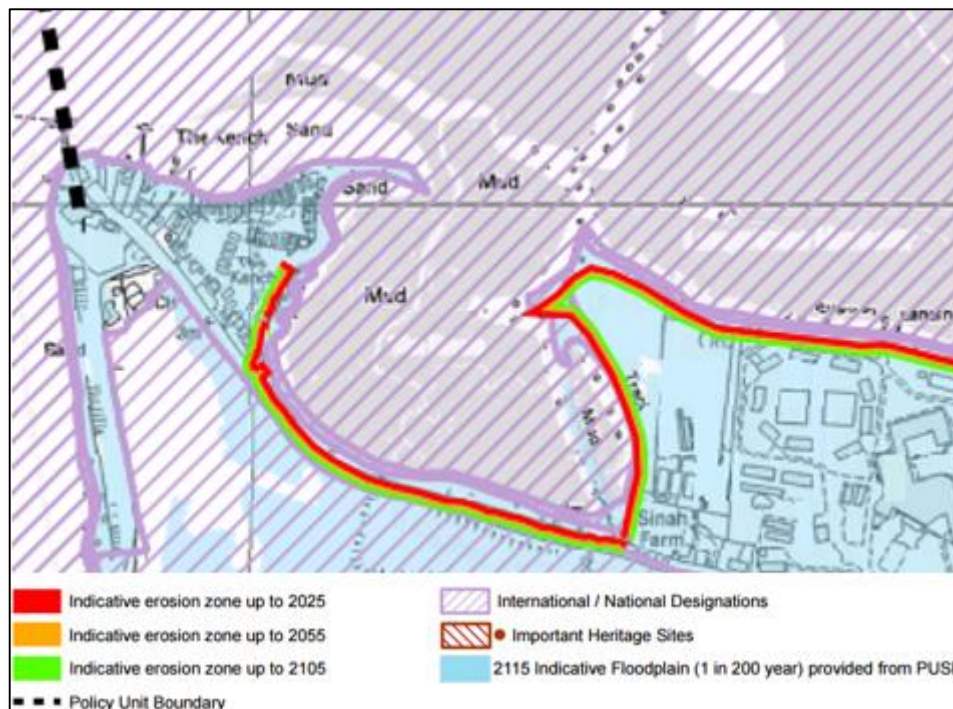


Figure 6: Extract of Policy Unit 5AH106: Langstone Harbour Entrance to North Shore Road (See Appendix A, Figure 7)

- 6.3 The scheme to strengthen the defences in the area is stated in the “North Solent Shoreline Management Plan (2010)”, the management policy for Langstone Harbour entrance to North Shore Road (Policy Unit: 5AH106) is “Hold the Line” - maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It can therefore be assumed the improvements in defences will be maintained and upgraded in the future.

Defence Failure

- 6.1 The existing defences are owned and maintained by private individuals to protect private gardens and a holiday development. As such, the developer has stated that the current sea wall will be raised to match the level of the defence crest height at No. 28 The Kench (approx. 3.2mAOD) which completed relatively recently.
- 6.2 The EA have not provided modelled flood extents for breach failure of the defences, nor overtopping of defences flood levels.

Overtopping

- 6.1 At the time of writing Havant Borough Council SFRA (2016 Update) or the EA have not provided overtopping flood levels and flood depths. However, given the distance from the site to the coastline, it can be assumed that during an overtopping flood extent the proposed development site would be inundated.
- 6.2 The Havant Borough Council SFRA states that historically, the southern frontage of Hayling Island has suffered from flooding caused by extreme wave overtopping, most recently in November 2005 and during the winter storms of 2013/14 which caused some highway

flooding. During the 2005 event, properties which are classified in Flood Zone 1 on were flooded, as indicated the historical information layer.

- 6.3 The extreme sea level values, provided by the EA, are for still water sea levels only. Extreme sea level values include the effect of storm surge but do not account for any local increase in sea level that may be induced by onshore wave action. Wave set-up would need to be considered separately.

7. Flood Risk Management Measures

- 7.1 The existing site is located in Flood Zone 3 (High Risk of flooding as defined in the NPPF) according to the EA Floodmap, as such the proposed development will require flood mitigation measures.
- 7.2 The proposed development is for the construction of a replacement holiday chalet. As such the following mitigation measures are proposed;
- Finished ground floor levels to be raised to 3.5mAOD, 300mm above the present day 1:200 year flood level
 - Floor levels should not be set lower than 3.5mAOD. This is to ensure the property is protected up to the present day event
 - Bringing down electrical services from ceilings, where possible;
 - Raised wiring and power outlets on ground level;
 - All plumbing insulation to be of closed-cell design;
 - Solid (i.e. concrete floors) where possible,
 - Subscribe to the EA Flood Warning Service and ensure that this service is made available to all site users, future owners and residents, and;
 - Formulate a household evacuation plan to be implemented in the event of severe flood or weather warnings.

Access / Egress

- 7.3 The site resides within Flood Zone 3a (tidal) and is located within an EA Flood Warning Service Area (Figure 7).
- 7.4 It is recommended that all site users sign up to the EA flood warning service if they have not done so already in order to provide betterment to the site.
- 7.5 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-agency.gov.uk/floodline. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager. The site is within the tidal areas at West Hayling, the quick dial number for this area is 0122145.

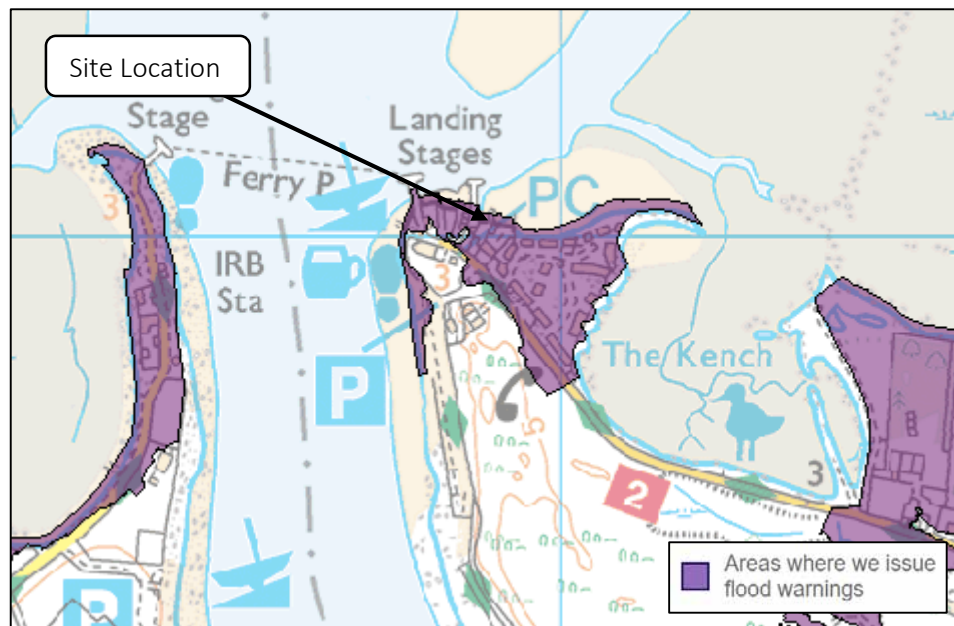


Figure 7: EA Flood Warning Area (Source: EA Online)

- On receipt of a **FLOOD ALERT**, the owners/occupiers of the property should:
 - Monitor the situation via local media;
 - Make themselves aware of forecast local weather conditions;
 - Alert others resident in the property of the situation;
 - Prepare to evacuate if necessary.
- On receipt of a **FLOOD WARNING**, the owners/occupiers of the property should:
 - Follow advice to “go in, stay in, and tune in”;
 - Be prepared to follow instruction form the Emergency Services.
- On receipt of a **SEVERE FLOOD WARNING**, the owners/occupiers of the properties should:
 - Follow advice to “go in, stay in, and tune in”;
 - Remain attentive to local media forecasts and news bulletins;
 - Do not evacuate unless instructed to do so by the Emergency Services;
 - Only when instructed to evacuate by the Emergency Services, leave the property and follow the agreed evacuation route – detailed previously.

7.6 Given that the site resides within Flood Zone 3, as a precautionary measure a route of escape shall be communicated to all residents so as to enable evacuation from the site in the event

of a flood warning. Should local authorities, or emergency services advice site users to evacuate advice should always be followed.

- 7.7 Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before a tidal flood event occurs. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.
- 7.8 Should the decision be made to evacuate the site, site users should exit the site via the access road onto Ferry Road. Site users should travel south east on Ferry Road for approximately 1.5km. At this point site users will be located in the West Town of Hayling Island, which is located outside of Flood Zones 2 and 3 and outside the tidal flood extents (Figure 8).
- 7.9 In the event of a flood occurring on site without prior warning, or if flood waters are evident on site or the surrounding area prior to evacuation taking place. It is the responsibility of the site owner(s) to keep the evacuation route and areas of safe refuge known to all site users and visitors.

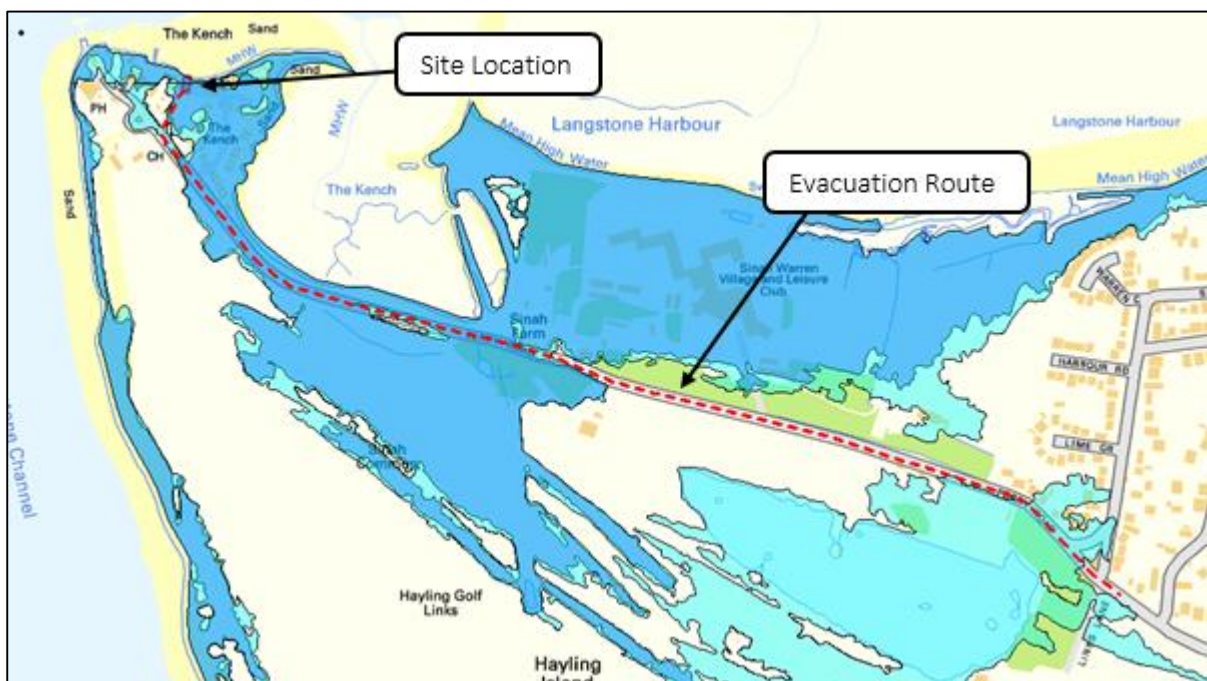


Figure 8: Proposed evacuation route into area of Flood Zone 1 (Source: EA & OS)

8. Off Site Impacts

Impact to Flood Risk Elsewhere

- 8.1 The site is located in Flood Zone 3, (tidal flood risk) and under the NPPF:

“unless the development is located in an area which is subject to tidal flooding and which serves no conveyance function, land raising must be accompanied by compensatory provision of flood storage either on- or off-site”

as such there is no requirement for compensatory flood storage.

Generation of Runoff

- 8.2 The existing site is developed. The proposed development is for the replacement of a holiday chalet with a larger footprint. As such post development there will be a minor increase of impermeable surfaces at the site.
- 8.3 It is recommended that the runoff from the proposed residential dwellings will discharge to the existing drainage network associated with the existing development

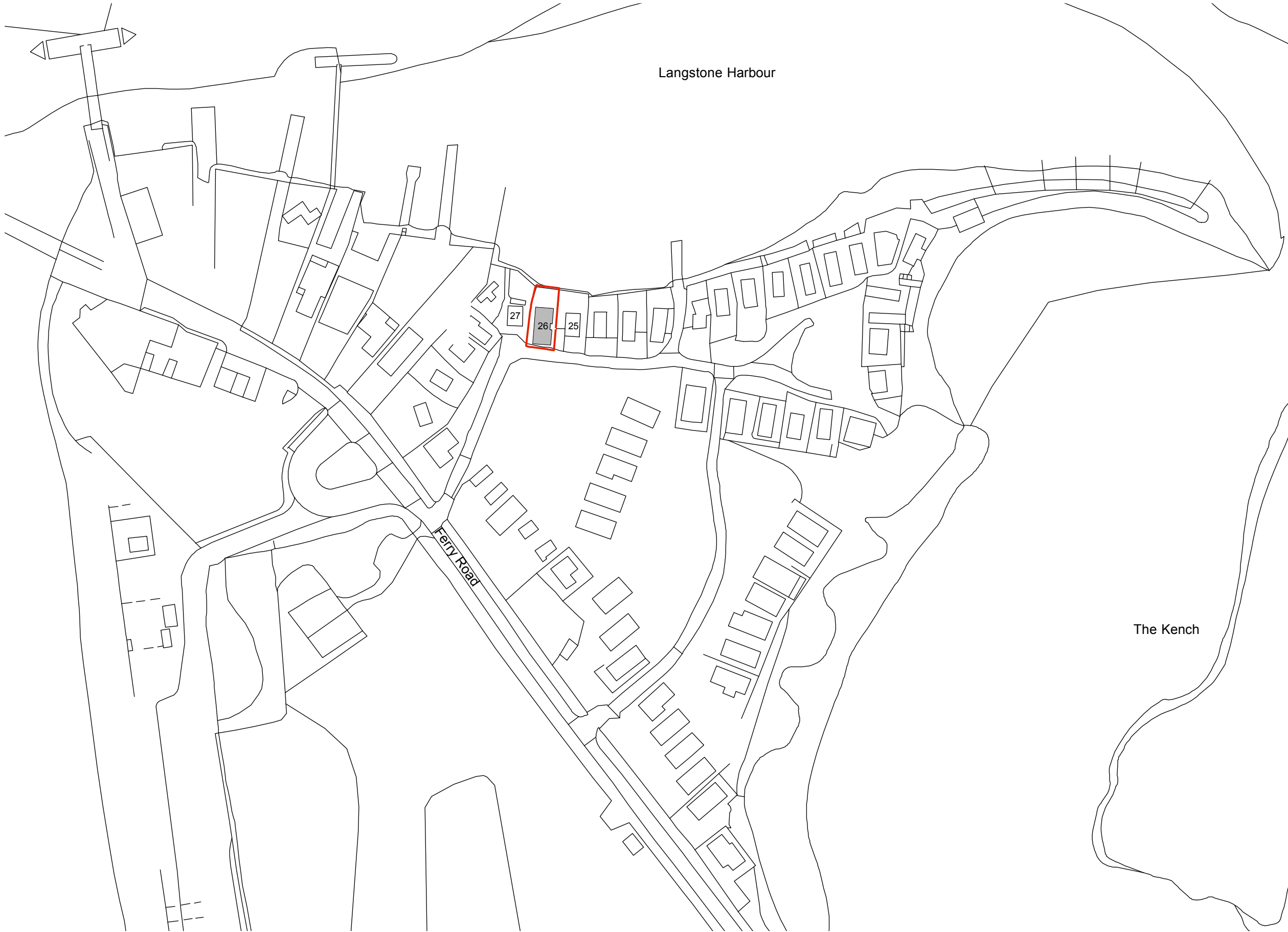
9. Conclusion

- 9.1 Ambiantal Technical Solutions Limited has been appointed by John Pardey Architects to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the demolition of an existing holiday chalet and construction of replacement holiday chalet with a larger footprint at 26 The Kench, Ferry Road, Hayling Island, PO11 0DF.
- 9.2 The proposed development is for the construction of a replacement holiday chalet. The proposed replacement holiday chalet will provide a slight increase in built footprint compared to the existing built footprint (under 250m²).
- 9.3 With reference to the NPPF and the Environment Agency (EA) standing advice on development and flood risk, as well as the low detail, national-scale flood mapping created on behalf of the EA, the proposed site is located within Flood Zone 3a (High Risk; >0.5% chance of annual tidal flooding) and is considered to be a “More Vulnerable” development.
- 9.4 The EA have provided site specific tidal flood data from 2011 base data that has been projected for climate change using estimates for sea level rise presented in Table 3 of the Technical Guidance to the NPPF.
- 9.5 Analysis of topographic levels against the provided extreme sea level flood levels has shown the site to be partially inundated by the 1:200 (3.2mAOD) and 1:1000 (3.4mAOD) year flood events with maximum flood depths on site calculated to be 0.19m and 0.39m respectively. Floor levels should not be set lower than 3.5mAOD. This is to ensure the property is protected up to the present day event and mitigation for the 2065 epoch.
- 9.6 The site does benefit from the presence of defences. The existing defences are owned and maintained by private individuals to protect private gardens and a holiday development. As such, the developer has stated that the current sea wall will be raised to match the level of the sea wall at neighbouring 28 The Kench (approx. 3.2mAOD) which completed relatively recently.
- 9.7 The scheme to strengthen the defences in the area is stated in the “North Solent Shoreline Management Plan (2010)”, the management policy for Langstone Harbour entrance to North Shore Road (Policy Unit: 5AH106) is “Hold the Line” - maintain or upgrade the level of protection provided by defences. The management policy will continue to apply at present day and across the medium (2025 to 2055) to long term (2105). It can therefore be assumed the improvements in defences will be maintained and upgraded in the future.
- 9.8 As such, and given that:
- a) the site lies within an existing developed area and is for the replacement holiday chalet;
 - b) ground floor levels will be raised 350mm above the existing ground floor levels, which is 300mm above the present day 1:200 year flood level respectively, providing a betterment to the existing site; and;
 - c) further betterment can be provided by the formalisation of a flood warning and evacuation plan

following the guidelines contained within the NPPF, the proposed development is considered **to be suitable** assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Appendix A – Supporting Information

- Figure 1 – Site Location Plan
- Figure 2 – Existing Site Layout and FFL
- Figure 3 – Existing Elevations
- Figure 4 – Proposed Site Layout and FFL
- Figure 5 – Proposed Elevations
- Figure 6 – Policy Unit 5AH106 Langstone Harbour entrance to North Shore Road (Source: North Solent Shoreline Management Plan)



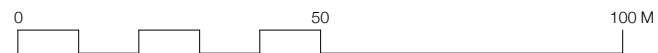
Data provider : Ordnance Survey
Data provider copyright : © Crown Copyright 2016.
All rights reserved. Licence Number 100031961
Approximate last update of dataset : May 2016
Approximate update frequency of dataset : 6-8 weeks
Coordinate reference system : British National Grid (OSGB36/E)
Map units : Metres
Extract created on 05 August 2016 14:32
Extract extent coordinates are min x, min y (468771.05,99654.69) to max x, max y (469221.05,100104.69)
Order ID : 1716954
Project Ref : JPA
Sub Ref : PO11 0DF
Name : perrie perrie
Organisation : Xerocad
Data Format : DWG
Area : 20.2Ha

01 LOCATION PLAN

02 OS PLAN LICENCE DETAILS



SITE OWNERSHIP BOUNDARY.
OS PLAN LICENCE NUMBER 100031961. DATA PROVIDER COPYRIGHT: CROWN COPYRIGHT 2016. VENDOR: XEROCAD. REPRODUCTION IN WHOLE OR IN PART STRICTLY PROHIBITED WITHOUT THE PRIOR CONSENT OF ORDNANCE SURVEY.



STATUS: PLANNING
SCALE: 1:1250 @ A3
DATE: SEPTEMBER 2016

DRAWING NO: 1604-P1-100
TITLE: LOCATION PLAN
PROJECT: MADDISON CHALET

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lymington . hampshire . SO41 5SR
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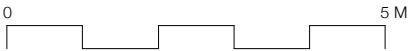


01 GROUND FLOOR / SITE PLAN - EXISTING



SITE OWNERSHIP BOUNDARY.

- 1. Living / Kitchen / Dining
- 2. Bunk Room
- 3. Bedroom
- 4. Bath / WC
- 5. Cupboard
- 6. External Locker



STATUS: PLANNING
SCALE: 1:100 @ A3
DATE: SEPTEMBER 2016

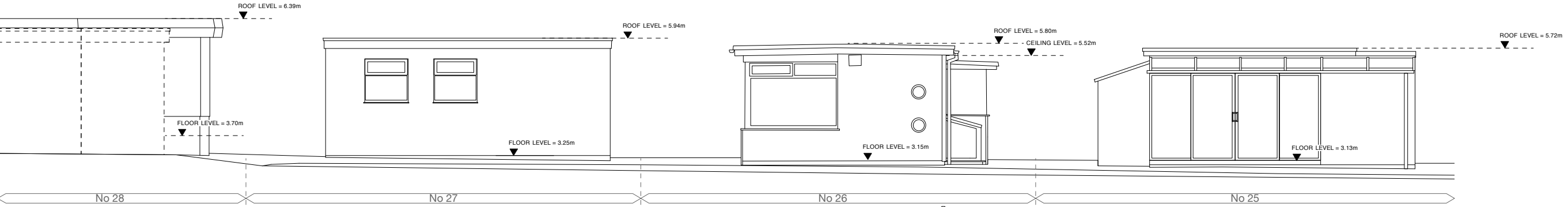
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TITLE: GROUND FLOOR / SITE PLAN - EXISTING
PROJECT: MADDISON CHALET



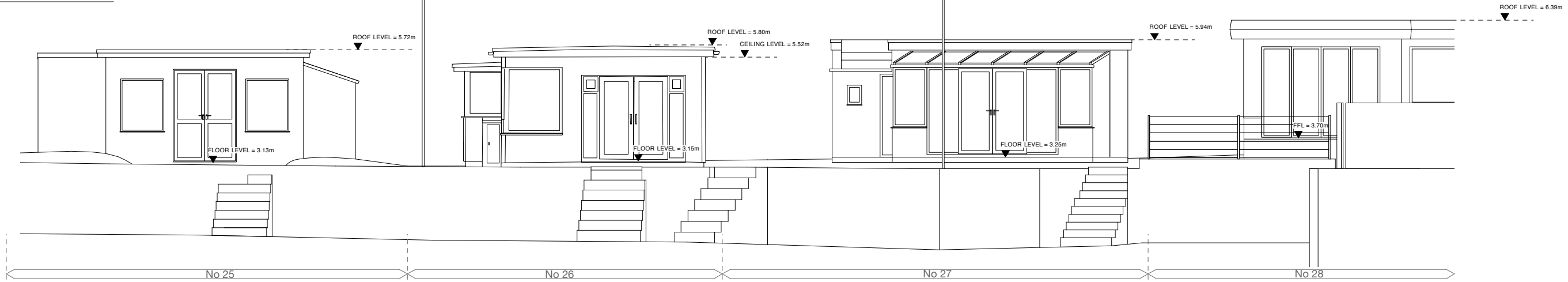
01 VIEW FROM SOUTH

LANGSTONE HARBOUR

02 WEST ELEVATION



03 SOUTH ELEVATION



04 NORTH ELEVATION



05 EAST ELEVATION



06 VIEW FROM NORTH

LANGSTONE HARBOUR

USE FIGURED DIMENSIONS ONLY. LEVELS IN METRES ABOVE ORDNANCE SURVEY DATUM.



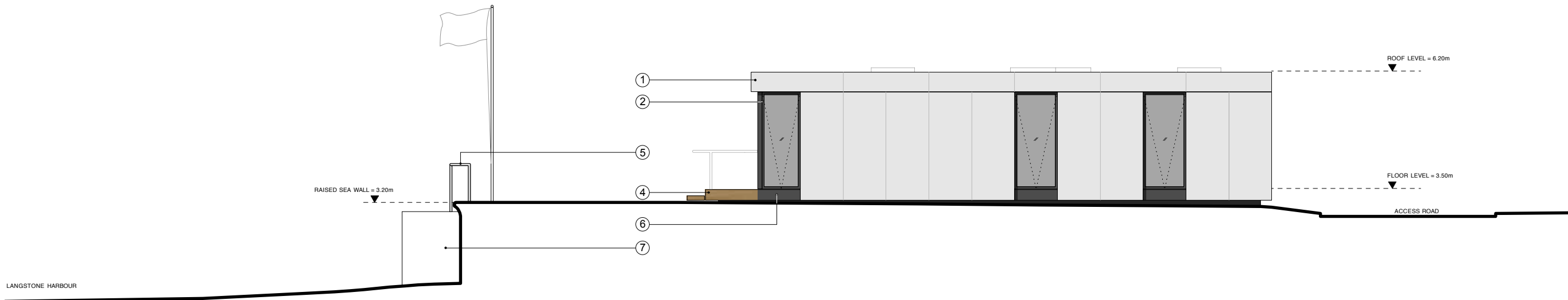
STATUS: PLANNING
SCALE: 1:100 @ A3
DATE: SEPTEMBER 2016

DRAWING NO: 1604-P1-130
TITLE: ELEVATIONS - EXISTING
PROJECT: MADDISON CHALET

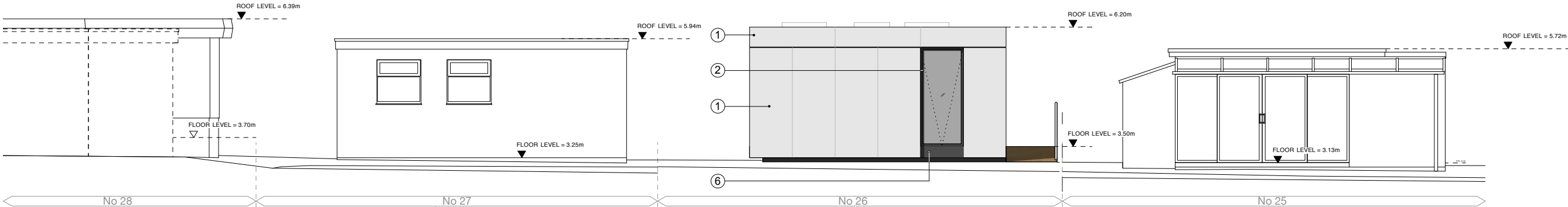
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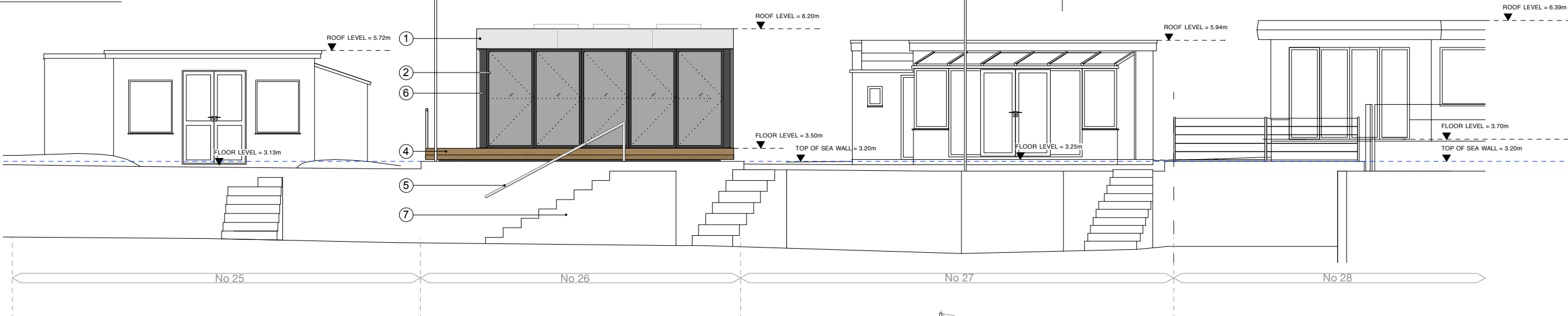
01 GROUND FLOOR / SITE PLAN - PROPOSED



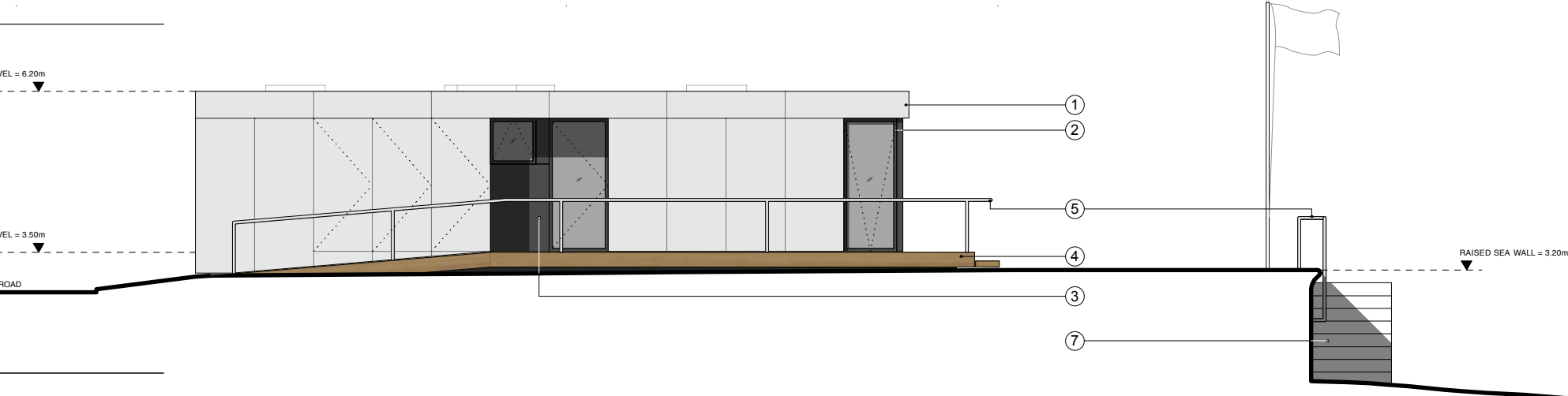
01 WEST ELEVATION



02 SOUTH ELEVATION



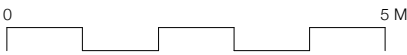
03 NORTH ELEVATION



04 EAST ELEVATION

USE FIGURED DIMENSIONS ONLY. LEVELS IN METRES ABOVE ORDNANCE SURVEY DATUM.

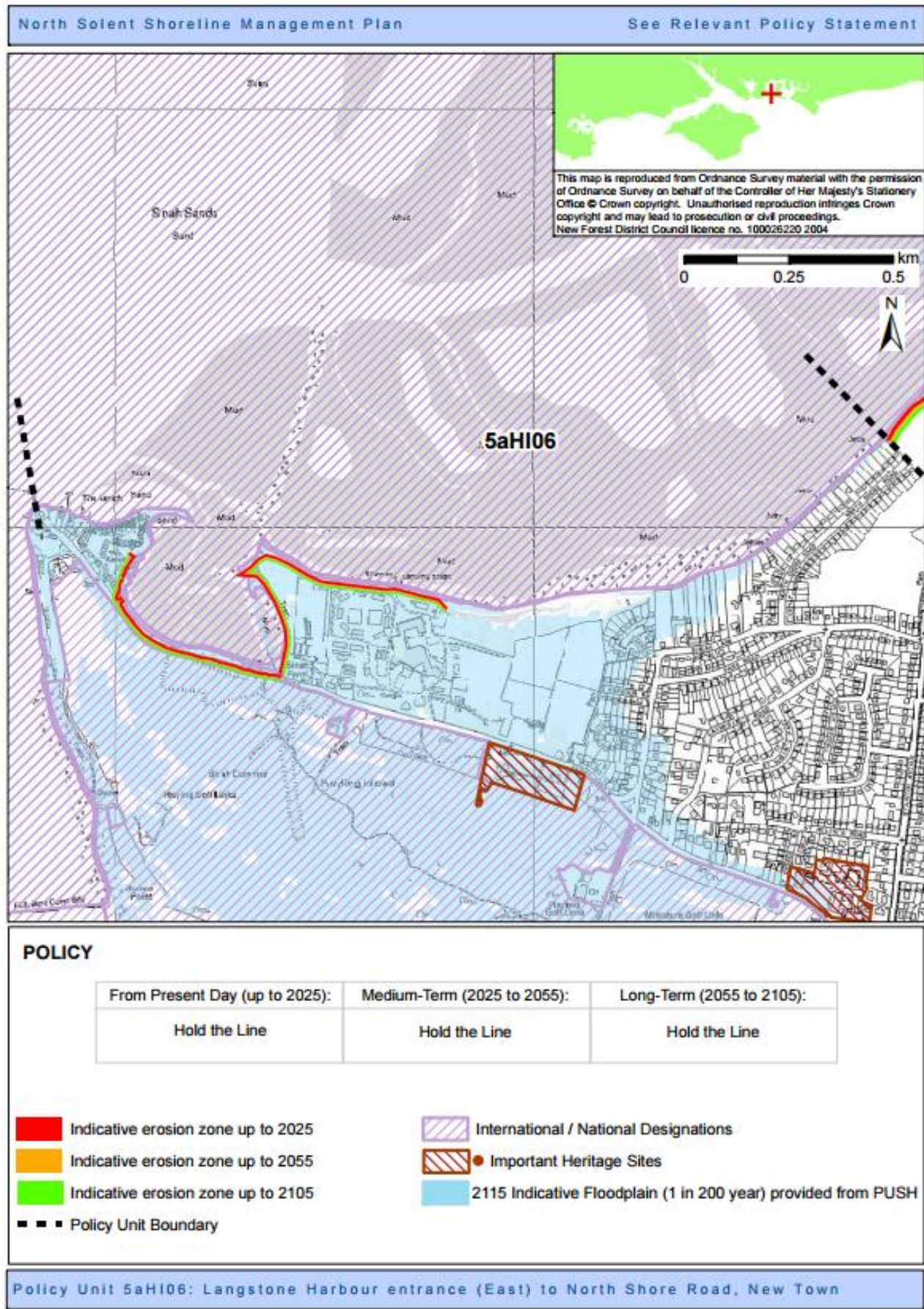
- 1. Light grey fibre-cement cladding
- 2. Dark grey windows
- 3. Dark grey fibre-cement cladding
- 4. Oiled hardwood deck
- 5. Stainless steel railing
- 6. Dark grey aluminium panel
- 7. Concrete steps



STATUS: PLANNING
SCALE: 1:100 @ A3
DATE: SEPTEMBER 2016

DRAWING NO: 1604-P1-400
TITLE: ELEVATIONS - PROPOSED
PROJECT: MADDISON CHALET

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Appendix B – EA Data

- Figure 1 – EA Flood Map for Planning (Source: EA).
- Figure 2 – Modelled Tidal Flood Levels (Source: EA)
- Figure 3 – Risk of Surface Water Flooding Map (Source: EA)



Chainage point: 161	Easting: 468789	Northing: 100080
---------------------	-----------------	------------------

Year	Tide Level (mAOD*)	
	0.5% annual exceedance probability/1 in 200 Year (Flood Zone 3)	0.1% annual exceedance probability/1 in 1000 Year (Flood Zone 2)
2011	3.2	3.4
2070	3.7	3.9
2115	4.4	4.5

* Levels in metres above Ordnance Datum Newlyn.

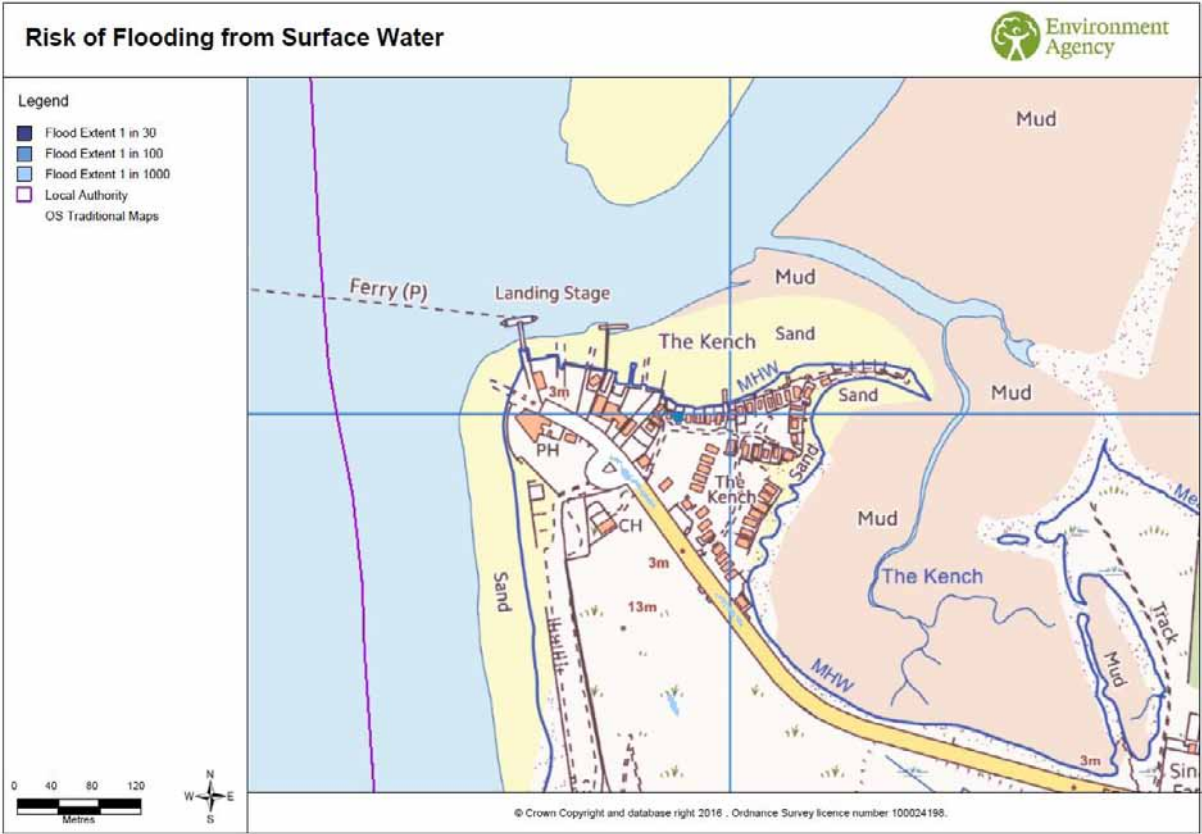
These values are based on 2011 base data, and have been projected for climate change using estimates for sea level rise presented in Table 4 of the Technical Guidance to the National Planning Policy Framework.

Note 1:

Extreme sea level values are for still water sea levels only. Extreme sea level values include the effect of storm surge but do not account for any local increase in sea level that may be induced by onshore wave action. Wave set-up would need to be estimated separately.

Note 2:

Annual exceedance probability describes the likelihood (chance) of being exceeded in any given year.



Appendix C – Information Relating To JFLOW

JFLOW and flood outlines (Source: EA)

Flood Zones have been produced using JFLOW, a nationally consistent model. JFLOW has been used to produce the 1% (1 in 100 year) and 0.1% (1 in 1000 year) flood outlines.

The flood outlines have been developed by applying flow and tide models to a 3D ground level map of England and Wales, known as a Digital Terrain Model (DTM). This is created by flying an aircraft over the whole of the country using radar to record and create a contoured model of the land. This DTM is used as the basis of a grid of cells which is used to estimate the extent of flooding in a flood of a given return period or probability.

The size of the flood event (1 in 100 or 1 in 1000 year) is determined by the inflows to the JFLOW model, which are calculated using statistical techniques from the Flood Estimation Handbook. The technique used is based upon catchment descriptors and data transfer, the details of these can be found in the Flood Estimation Handbook volume 3. The Flood Estimation Handbook provides a consistent technique for estimating inflows to the national model and its methods are widely accepted.

The methodology is a raster-based approach, driven by an underlying Digital Elevation Model (DEM).

- Each cell has a ground level and water depth
- Water can move to any of surrounding 8 cells where the water level is lower
- Water will pond in low spots until the water level is high enough to spill
- The velocity of movement depends on water surface slope and surface roughness

The above points describe the basic principles of the model. The two underlying principles are:

- Mass conservation within each cell
- Calculation of the fluxes between the cells

Each grid cell is treated as a small storage area. Mass conservation is applied to each grid cell. The flux between cells is calculated using a form of the generalised weir equation.

Efficient coding is achieved by keeping a list of all currently wet cells and a list of newly wet cells. This avoids having to search through each cell in the ground grid.

For whole catchment modelling, the hydrographs used as inflow boundary conditions represent the whole hydrograph at that inflow location and a simple conceptual method has been derived to account for the amount of flow within the channel banks. A simple solution was therefore sought which would approximately account for the proportion of flow contained within the channel without requiring further information about the channel.

The simple conceptual method used involves two assumptions:

1. That bankfull flow (Q_b) is equal to QMED as calculated by the Flood Estimation Handbook (FEH) methods. QMED has a return period of 2 years. This assumption derives from the

concept of dominant discharge in fluvial geomorphology (Wolman and Leopold, 1957; Wolman and Miller, 1960) where the cross-section shape is assumed to be formed by a discharge with a recurrence interval of 1-2years.

2. That the additional channel flow (Q_c) scales with both Q_b and depth above bankfull (d).

The basis of the current model is that each grid cell acts as a small flood cell and the links to each of the surrounding cells are automatically calculated. It is therefore capable of simulating the inundation extent at a level of detail equal to the underlying DEM. It is fundamentally volume conservative and so, in a given time period, will simulate the peak water levels across the floodplain depending on the volume of water that has entered the floodplain. This approach is a half-way house between the common 1D hydrodynamic models and a 2D hydrodynamic model.

Limitations

JFLOW was used to produce flood maps for the whole of England and Wales for all catchments greater than 3 sq-km in a consistent manner. The method is therefore very generalised and therefore cannot take account of information that may be very significant locally. This might include:

1. Effects of bridges and other structures including flood defences are not taken into account.
2. Errors in the DTM, caused by trees and buildings for example.
3. The effect of reservoirs and urban drainage and other man made influences on the flow regime can only be taken into account in a very general sense in JFLOW.
4. The channel is assumed to be able to take the 2 year flow. This may not be true especially in those modified by man.
5. Hydraulic roughness is assumed to be the same everywhere in JFLOW, but of course it is not.

For these and many other reasons, the flood outlines produced by JFLOW can only be taken as a rough guide, showing where more detailed flood risk assessments are essential. Flood risk assessments should also be undertaken near small watercourses whose catchments are too small to have been included in the JFLOW modelling.