



Eleonora Pilla
Environment Agency
Canal Walk
Romsey
SO51 7LP

70047808-IT1-LTR-001

24 August 2018

Dear Eleonora Pilla,

94 - 100 Hook Lane, Bognor Regis

Thank you for your time on the call, it was very useful to be able to discuss your concerns and agree a way forward with you. We also appreciate you providing the updated flood modelling information for consideration as part of the Flood Risk Assessment.

With respect to your letter dated 7 August 2018 we have provided a summary of our discussions and the proposed resolution for each point.

Objection 1: The submitted FRA fails to assess the surface water back up from the drainage ditch at the south of the development and fluvial interaction, which it is understood had caused some flooding issue in the past.

Response: As we discussed on the call, following an inspection of the Combined Defended Modelled Flood Outlines indicates that the flood extent is similar to the fluvial extent as the topography is lower at the rear of the properties at Hook Lane, effectively creating a bowl. It was agreed that it would be suitable to use the flood levels from the Aldingbourne undefended model scenario, in order to define the requirements for the flood mitigation of the Proposed Development.

We agreed that the flood level to be used was 2.19 mAOD (fluvial undefended water level at the Site) for the combined surface water and fluvial mitigation of the Proposed Development. This will also provide mitigation against potential failure of the Felpham pumping station. This design level has been used in the calculations for the floodplain compensation.

Objection 2: Different climate change allowances have been used to assess future flood risk than those advised in 'Flood risk assessment: climate change allowances', without adequate justification. We would expect you assess the climate change for this development using the new climate change allowances higher central allowances (45%) and upper allowance (105%). We can now provide information to you. Please contact SSD Enquiries under SSDEnquireis@environment-agency.gov.uk to request an update to the Product 4 information.

Response: Following receipt of the new climate change flood levels from you, it was agreed during our phone conversation, that the flood level of 2.19m AOD (1 in 100-year event plus 105% upper climate change allowance), shall be used.



The proposed new buildings will be designed to allow for 2.19m AOD flood water level consider plus additional 300mm freeboard beneath the ground floor slab.

Objection 3: More information about the proposed flood compensation is needed. Basic requirements for compensatory floodplain storage are as follows

- ③ A volume of floodplain equal to or larger than that lost to the proposed development must be created.
- ③ The volume must apply at all levels between the lowest point on the site and the design flood level. Normally this is calculated by comparing volumes taken by the development and the volume offered by the compensatory storage for a number of horizontal 'slices' through the range defined above.
- ③ The thickness of a vertical slice should typically be 0.2 metres. In the case of large flat sites or very steep sites this may be varied, for example for flat sites to 0.1 or even 0.05 metres. The slice thickness should be set to provide between ten and fifteen slices for such unusual sites

Response: As discussed, the current calculations have been based on assumptions regarding the number of piers and the size of the piers per property. It was agreed that following detailed design the floodplain compensation calculations would need to be revisited, and these would need to be informed by suitable geo-technical investigations.

The estimated total area of the piers equals 5.76m² (450mm diameter piers, 6 No. piers per building; 6 No. buildings at the Application Site)

For each 200mm vertical increase, the piers will displace a volume of water which equals 5.76*0.2=1.15m³

To achieve an increase in floodplain storage, a 20% allowance has been accounted for in the floodplain compensation indicative area. The FRA demonstrates that the northern part of the site, near Hook Lane access, can be used as flood compensation (refer to attached Drawing 47808-FCA-001).

Level	Volume lost (m ³)	Flood compensation area required (m ²)	Flood compensation area identified (m ²)	Flood compensation volume identified (m ³)
1.3 m AOD to 1.5 m AOD	1.15	5.76	7.06	1.41
1.5m AOD to 1.7 m AOD	1.15	5.76	7.06	1.41
1.7 m AOD to 1.9 m AOD	1.15	5.76	7.02	1.41
1.9 m AOD to 2.1m AOD	1.15	5.76	7.07	1.41
2.1 m AOD to 2.19m AOD	0.52	2.6	9.60	1.92

The volume required to achieve the flood plain compensation vertical strip between 1.3 and 1.5m AOD will be achieved in the area specified. It is anticipated that localised reprofiling of the Site will be required to facilitate hydraulic connectivity between the floodplain compensation and the source of flooding.

Objection 4: Due to lack of information, it is not clear if it is proposed to use stilts or voids. This is not floodplain compensation, but rather mitigation of risk by design. The use of stilts reduces the impact on the development but does not guarantee that the floodplain will be retained in the same way as a compensation scheme (which is a form of risk substitution).

Response: It is proposed that the ground floor slab for the buildings will be raised 300 mm above the flood level, with the buildings supported on piers to create a void beneath the buildings. The impact of the piers on the floodplain, and the requirements for floodplain compensation are discussed above.

I hope the responses above have answered the queries and objections raised. If you have any further queries, or would like to discuss the matter further, please do not hesitate to contact Emiliya Stoykova or Steven Brown.



Yours faithfully

Emiliya Stoykova
Assistant Engineer

Cc: Counterpoint Properties Ltd
Encl.: Drawing 47808-FCA-001
Environment Agency's flood risk data and correspondence



KEY:

Site Boundary

Contour 0.1m

Flood Compensation Area footprint

Flood Compensation Area

1.3 mAOD - 1.5 mAOD - Lowered to 1.3 mAOD

1.5 mAOD - 1.7 mAOD - Lowered to 1.3 mAOD

1.7 mAOD - 1.9 mAOD - Lowered to 1.7 mAOD

1.9 mAOD - 2.1 mAOD - Lowered to 1.9 mAOD

2.1 mAOD - 2.19 mAOD - Lowered to 2.1 mAOD

Pier assumed dia 0.45 m

Pier area 0.16 m.sq. (each pier)

Assumed No. piers per building 6

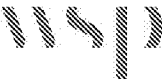
No. buildings 6

Flood water level = 2.19 mAOD (100year + 105%CC undefended fluvial model)

Flood compensation indicative area 5.76 m.sq.

To achieve an increase in floodplain storage a 20% allowance has been accounted for in the floodplain compensation indicative area, i.e. 7 m.sq.

Localised reprofiling of the Site will be required to facilitate hydraulic connectivity between the floodplain compensation and the source of flooding.

	24/08/18	ES	FIRST ISSUE		
REV	DATE	DRW	DESCRIPTION		CHK APP
STATUS:					
FOR INFORMATION ONLY					
 Mountbatten House, Basing View, Basingstoke, HANTS, RG21 4HJ Tel: +44 (0) 1256 318 800 Fax: +44 (0) 1256 318 70 www.wsp.com					
CLIENT:					
COUNTERPOINT PROPERTIES LTD					
ARCHITECT:					
CROSSLEY DESIGN ARCHITECTURE					
PROJECT:					
94 - 100 HOOK LANE BOGNOR REGIS					
TITLE:					
PROPOSED FLOOD COMPENSARION AREA					
DRAWN:		CHECKED:		APPROVED:	
QGIS FILE:		SCALE @A3:		DATE:	
70047808.qgs		1:400		24/08/18	
PROJECT No:		DRAWING No:			REV:
70047808		47808-FCA-001			

Stoykova, Emiliya

From: SSD Enquiries <[REDACTED]>
Sent: 23 August 2018 15:09
To: Stoykova, Emiliya
Subject: 180823 GE3603 Re SSD90563 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Hi Emiliya,

Further to the email below which you received from our PSO team earlier today, please be advised that this information is supplied subject to the notice which can be viewed via the following link:

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

Kind regards

Nick

Customers & Engagement Team | Environmental Planning and Engagement | Solent and South Downs Area |
Environment Agency | Romsey District Office, Canal Walk, Romsey, SO51 7LP

[REDACTED]
National Contact Call Centre 03708 506506



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From: PSO West Sussex
Sent: 23 August 2018 11:35
To: Stoykova, Emiliya <[REDACTED]>
Cc: SSD Enquiries <[REDACTED]>
Subject: RE: GE3603 Re SSD90563 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Hi Emiliya,

Thanks for your email. Please find attached updated Levels and Depths Table and Fluvial Modelled Flood Outlines with the new climate change allowances, and some extract from the 2015 Aldingbourne Flood Risk Mapping Study modelling report. I've also attached a combined (fluvial and surface water) modelled flood outline map.

Do not hesitate to contact us if you have further enquiries.

Kind regards,
Ee

Eleonora Pilla

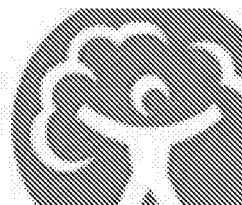
Flood and Coastal Risk Management Officer | Partnership & Strategic Overview | West Sussex
Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

External: 020 847 48395 | Mobile: 07810 050246



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From: Stoykova, Emiliya [redacted]
Sent: 13 August 2018 14:04
To: PSO West Sussex [redacted]
Cc: SSD Enquiries <[redacted]>
Subject: RE: GE3603 Re SSD90563 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Hi Leanne,

The provided Product 4 includes only flood water levels from the Aldingbourne model for the 1 in 1000-year event. Please can you confirm if the flood levels are available for the upper climate change allowance (105%) as well as the higher central allowance (45%) at the Site?

Many thanks

Kind regards,

Emiliya Stoykova MEng (Hons) MSc GradCIWEM
Assistant Engineer - Water



T [redacted]

Mountbatten House, Basing View
Basingstoke, Hampshire
RG21 4HJ

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From: PSO West Sussex [redacted]
Sent: 13 July 2018 10:19
To: Stoykova, Emiliya [redacted]
Cc: SSD Enquiries <[redacted]>
Subject: RE: GE3603 Re SSD90563 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Dear Emiliya,

Thank you for your email. I can confirm that the embankment (Asset ID 149096) mentioned in the Product 4 is a coastal defence.

Kind regards,

Leanne Prentice

FCRM Officer, Partnerships & Strategic Overview Team West Sussex

Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD



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ARE YOU AT RISK FROM FLOODING?

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From: Stoykova, Emiliya [REDACTED]

Sent: 12 July 2018 07:32

To: SSD Enquiries [REDACTED]

Subject: 180712: GL3003 - INF - SSD90503 94 - 100 Hook Lane, Bognor Regis - FRA Enquiry

Dear Matthew,

Thank you for the data provided.

Please can you confirm that the existing flood defences (Asset ID 149096) are for tidal flooding?

Many thanks

Kind regards,

Emiliya Stoykova MEng (Hons) MSc GradCIWEM

Assistant Engineer - Water



Mountbatten House, Basing View
Basingstoke, Hampshire
RG21 4HJ

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From: SSD Enquiries [redacted]
Sent: 11 July 2018 10:42
To: Stoykova, Emiliya
Subject: 180711: SSD90563 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Dear Ms Stoykova

Thank you for your email of July 19. Please find attached a Product 4, which also has most of the answers to your questions.

For FRA and pre-planning advice please see attached FRA Advisory Text and Planning Advice from the Environment Agency.

For information on flooding from other sources such as surface water please contact the Lead Local Flood Authority, West Sussex County Council.

Please be aware that in February 2016 the Environment Agency updated its guidance on climate change allowances. Guidance on climate change allowances and how to use them in Flood Risk Assessments can be found [here](#).

For future reference, detailed flood information and maps can be viewed using the [Long Term Flood Risk Information](#) service and [Flood Map for Planning](#) service. Flood and Coastal Risk Management asset information, and details of all planned maintenance activities can be viewed using the [Asset Management Service](#).

There is no groundwater monitoring site within 500m of this location. The nearest one is about 1.3km to the north; I have attached the data from this site for information. This information is not available with the Open Government Licence but we may be able to license you under the Environment Agency Conditional licence as in the link below.

<https://www.gov.uk/government/publications/environment-agency-conditional-licence/environment-agency-conditional-licence>

Groundwater level measurements – AfA 075, detailed information about this dataset including all the conditions applicable to this dataset, can be found on the [Register Licence Abstract](#) (you will need to download this spreadsheet to access the information about AfA 075). However, you must first check the supporting information and the above link to determine if the conditions on use are suitable for your purposes. If they are not, this information is not provided with a licence for use, and the data is provided for read right only.

With regards to Source Protection Zones and Aquifer classifications please use the link below:

<http://magic.defra.gov.uk/MagicMap.aspx>

Finally, the site is located in the South East River Basin Management Plan.

Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

For information on what you can expect from us and our full service commitment to you, please click on this link;

<https://www.gov.uk/government/publications/environment-agency-customer-service-commitment--2/environment-agency-customer-service-commitment>

Yours sincerely

Matthew Murphy
Customers and Engagement
Environment Agency | Chichester Office, Oving Road, Chichester, West Sussex, PO20 2AG

Matthew.Murphy@environment-agency.gov.uk

Working days: Monday to Friday



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From: Stoykova, Emiliya [REDACTED]
Sent: 19 June 2018 13:24 [REDACTED]
To: Enquiries, Unit [REDACTED]
Subject: 94 – 100 Hook Lane, Bognor Regis - FRA Enquiry

Dear Sirs,

94 – 100 Hook Lane, Bognor Regis Flood Risk Assessment – Enquiry

We have been instructed by our client to undertake a Flood Risk Assessment and drainage strategy for a proposed development comprising 6 residential dwellings at the above site. The Ordnance Survey grid reference for the site is 494296, 099738 and the nearest postcode is PO22 8AT. Attached is a location plan for your information.

With regards to completing a Flood Risk Assessment in compliance with the National Planning Policy Framework (NPPF), please could the Environment Agency provide the following information, where available.

Information required for the FRA:

- 1 Predicted flood levels for the site. If predicted flood levels are available, please could the Environment Agency confirm that these levels are suitable for use in a formal Flood Risk Assessment.
- 2 Please can you confirm the status of any hydraulic modelling undertaken on the watercourse in the vicinity of the site (Aldingbourne Rife). Can you also confirm that the output from this modelling is fit for purpose in terms of undertaking a flood risk assessment.
- 3 A detailed fluvial flood map for the area. We already have access to the Agency's Flood Maps provided on the Government's website.
- 4 A detailed surface water flood map for the area. Please could the Environment Agency confirm the level of risk to the site from surface water flooding. We already have access to the Risk of Flooding from Surface Water Maps on the Government's website.
- 5 Historical records of flooding at or within the vicinity of the site, including groundwater flooding. If the Environment Agency does not hold any records, please can you confirm that the site has no record of flooding in the past.
- 6 Significant hydraulic structures in the area that might control the flow.
- 7 Recent channel and hydraulic structure survey data for the watercourses and hydraulic structures in the site's vicinity. If this information is available, please can the Environment Agency provide the cost of acquiring this data.
- 8 The Aquifer classification for the area.
- 9 Protection Zones at or within 500m of the site.
- 10 Groundwater levels on or within 500m of the site.
- 11 Any additional flood data or policy the Environment Agency considers useful for the above site, including any previous historical agreements associated with this specific development site.

Please can the Environment Agency also confirm the following in order to inform the Flood Risk Assessment:

- 1 The River Basin Management Plan the site is located within.
- 2 The Flood Catchment Management Plan the site is located within.
- 3 The site is shown to be located within Flood Zone 3 associated with the Aldingbourne Rife.
- 4 The specific freeboard requirement above the 1 in 100 year climate change flood level for all structures constructed on site (typically residential dwellings).

Kind regards,

Emiliya Stoykova MEng (Hons) MSc GradCIWEM

Assistant Engineer - Water



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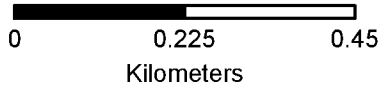


Legend

- Main River
- 5% AEP (Defended Fluvial)
- 1% AEP (Defended Fluvial)
- 0.1% AEP (Defended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



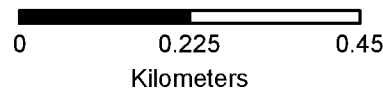


Legend

- Main River
- 1% AEP (Undefended Fluvial)
- 0.1% AEP (Undefended Fluvial)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



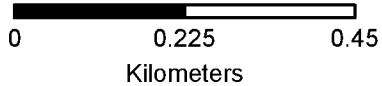


Legend

- Main River
- Defended 1% AEP plus Climate Change (45%)
- Defended 1% AEP plus Climate Change (105%)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000







Environment
Agency

N



Legend

-  Main River
-  Undefended 1% AEP plus Climate Change (45%)
-  Undefended 1% AEP plus Climate Change (105%)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



00.2250.45

Kilometers

Product 4 Flood Risk Data Requested by: WSP

Site: 94 - 100 Hook Lane, Bognor Regis, PO22 8AT

Table 1: Water Levels: Fluvial Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability			
	Eastings	Northings	1%	0.1%	1% + CC (45%)	1% + CC (105%)
1	494326	99775	-	-	-	-
2	494303	99770	-	-	-	-
3	494333	99755	-	-	-	-
4	494295	99748	-	-	-	-
5	494334	99715	-	1.93	1.72	1.93
6	494292	99720	-	1.93	1.74	1.93
7	494336	99676	-	-	-	-
8	494289	99698	-	1.93	1.73	1.93

Table 2: Water Levels: Fluvial Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability			
	Eastings	Northings	1%	0.1%	1% + CC (45%)	1% + CC (105%)
1	494326	99775	-	-	-	-
2	494303	99770	-	-	-	-
3	494333	99755	-	-	-	2.19
4	494295	99748	-	-	-	-
5	494334	99715	-	2.19	1.75	2.19
6	494292	99720	-	2.22	1.77	2.19
7	494336	99676	-	-	-	2.19
8	494289	99698	-	2.22	1.77	2.19

Table 3: Water Depth: Fluvial Defended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			1%	0.1%	1% + CC (45%)	1% + CC (105%)
1	494326	99775	-	-	-	-
2	494303	99770	-	-	-	-
3	494333	99755	-	-	-	-
4	494295	99748	-	-	-	-
5	494334	99715	-	0.53	0.32	0.53
6	494292	99720	-	0.45	0.26	0.45
7	494336	99676	-	-	-	-
8	494289	99698	-	0.49	0.29	0.49

Table 4: Water Depth: Fluvial Undefended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			1%	0.1%	1% + CC (45%)	1% + CC (105%)
1	494326	99775	-	-	-	-
2	494303	99770	-	-	-	-
3	494333	99755	-	-	-	0.19
4	494295	99748	-	-	-	-
5	494334	99715	-	0.58	0.35	0.79
6	494292	99720	-	0.50	0.29	0.71
7	494336	99676	-	-	-	0.16
8	494289	99698	-	0.54	0.32	0.75

All levels taken from: 2015 Aldingbourne Flood Risk Mapping Study by JBA Consulting. New climate change allowances taken from 2017 Aldingbourne Climate Change Modelling by JBA Consulting.

Produced on: 23/08/2018

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

Under normal conditions flow from the Aldingbourne Rife is conveyed under the sea wall via two gravity outfall structures which have tidal flaps. When tidal conditions and river flows dictate, flow is pumped over the sea wall by Felpham pumping station to discharge into a stilling bay on the upper foreshore. [From section 1.2]

There are no other raised defences identified in the Aldingbourne catchment. However, Felpham pumping station has been identified as a defence as an inland pumping station. Therefore, both defended (pumps running) and undefended (Felpham pumping station removed) design modelling was completed as part of the study. [From section 1.2.1]

The main flood risks along the study reach are considered to be a result of flood water exceeding bankfull levels and spilling onto the floodplain and urban area, or from rainfall exceeding sewer capacity leading to surface water runoff. [From section 3.1.2]

There are no formal defences in the Aldingbourne catchment, but as noted in section 1.2.1, Felpham pumping station is considered to be a defence and was therefore removed from the undefended model. As a result, the only outfall in operation at Felpham was the gravity outfall which is susceptible to tide locking. [From section 7.1.6]