

Berkshire Corporate

**High Level Flood Assessment for
residential development in
Caversham**

Report K0902/Rep 1 Rev1

February 2019

Prepared and submitted by



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EXECUTIVE SUMMARY OF REPORT

This report documents work undertaken by Hydro-Logic Services for Berkshire Corporate in care of Mr Jay Chauhan, between December 2018 and February 2019.

The report aims to address EA's comments (WA/2018/125224/02-L01) under application reference no. 170574 – Appendix A. However, after a first submission of this report to EA in December 2018, further comments have been made under letter WA/2018/125224/03-L01 – Appendix E – regarding the floodplain compensation to be provided in the scheme. Therefore, any changes to the report to address those comments are shown in red.

Given the *Product 4* information provided by the EA, the flood extents and levels were revised to include the latest climate change allowance – 35% –, mentioned in EA's letter to planner, dated from October 2018.

The revised Finished Floor Levels (FFL) of the new building were estimated to be 38.38mAOD, including a 300mm freeboard specified in Environment Agency's letter to planner.

In terms of flood storage compensation, a 1010mm layer of voids laid over the entire footprint of the building – between 37.07mAOD and 37.08mAOD – has shown to provide an additional storage of 29m³ to the floodplain. Note that this estimate includes a potential 50% future reduction in the volume of the voided blocks, on top of a 60% void ratio.

Contributors for Hydro-Logic Services:

Alan Corner	Project Director & Reviewer
Joao Gil	Project Manager & Report Drafter

Other Contributors are gratefully acknowledged:

Jay Chauhan	Client
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Document Status and Revision History:

Version	Date	Author(s)	Approval	Status/Comment
0	18/01/2019	J Gil	A Corner	First Issue
1	22/02/2019	J Gil	A Corner	Second issue to address EA's comments (WA/2018/125224/03-L01)

Limitation of liability and use

The work described in this report was undertaken for the party or parties stated; for the purpose or purposes stated; to the time and budget constraints stated. No liability is accepted for use by other parties or for other purposes, or unreasonably beyond the terms and parameters of its commission and its delivery to normal professional standards.

K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

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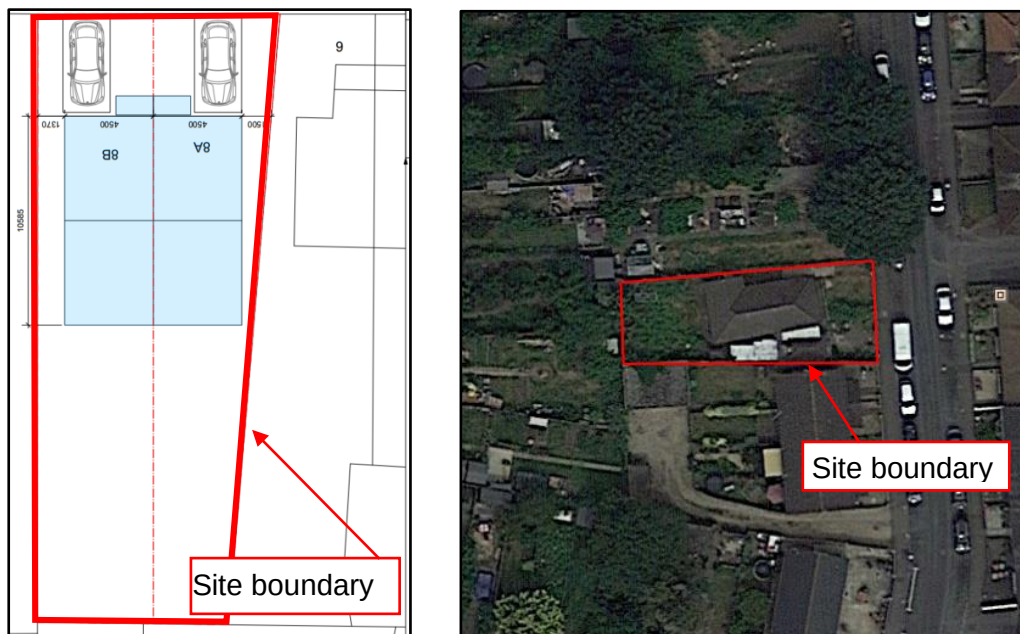
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1. Introduction

1.1 Site characteristics and proposed development overview

The proposed site covers a total area of approximately 345m² and comprises a dwelling with two car park spaces as shown in Figure 1-1. The post-development non-floodable footprint is composed by the dwelling itself and is estimated as 96m². Access to the site is to be made via Alder Road, from the East boundary of the site.

Figure 1-1 – Proposed development site layout.



a) Extract from proposed development plan

b) Site aerial photo of the pre-development site

Table 1 presents the coordinates of the site in different formats.

Table 1 – Details of the proposed development's location

OS X (Eastings)	472029
OS Y (Northings)	174676
Nearest Post Code	RG4 8EA
Lat, Long	51.466479, -0.964478

The pre-development site is comprised by a dwelling and the respective garage – Figure 1-2a. In terms of fluvial flood risk, only the main house was considered to be non-floodable. In what concerns the garage, this element was considered to be floodable as per EA's letter to planner – see Appendix A. Also, note that as shown in Figure 1-2a, the main house is already elevated by 800mm from the surrounding ground level, which is around 37.07mAOD.

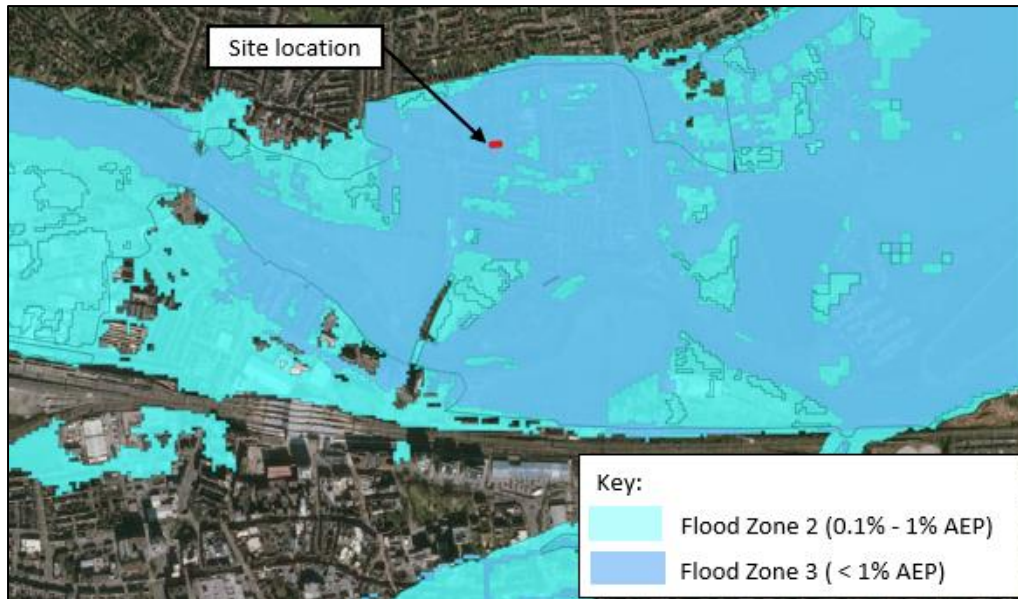
This topographic map shows a residential property with various features and elevations. Key elements include:

- Habitable house:** A large structure with a roof elevation of 37.08 and a ridge of 41.98. It is surrounded by overgrown areas and has a driveway leading to a garage.
- Garage:** A smaller structure with a roof elevation of 37.07 and a ridge of 40.50. It is located adjacent to the main house.
- Other features:** A greenhouse, a shed, and a driveway are also shown. The property is bordered by No. 8 Ardler Road to the north and east.
- Elevations:** Numerous spot elevations and contour lines are marked throughout the map, indicating the terrain's topography.

A photograph of a small, single-story brick house with a tiled roof, situated in a residential area. The house has a white door and a small window. To the left is a larger brick building, and to the right is a garden with a fence and a car parked in the foreground.

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Figure 1-3 – Location of the development against the flood map for planning



In terms of flood risk vulnerability, the development is classified as ‘more vulnerable’ according to the National Planning Policy Framework. As per Table 2, ‘more vulnerable’ developments are accepted within FZ3a, but require an exception test. In this case, the exception test is passed as the site lies within the heart of Caversham, with no other viable option in the surroundings.

Table 2 – Flood risk vulnerability according to the NPPF.

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

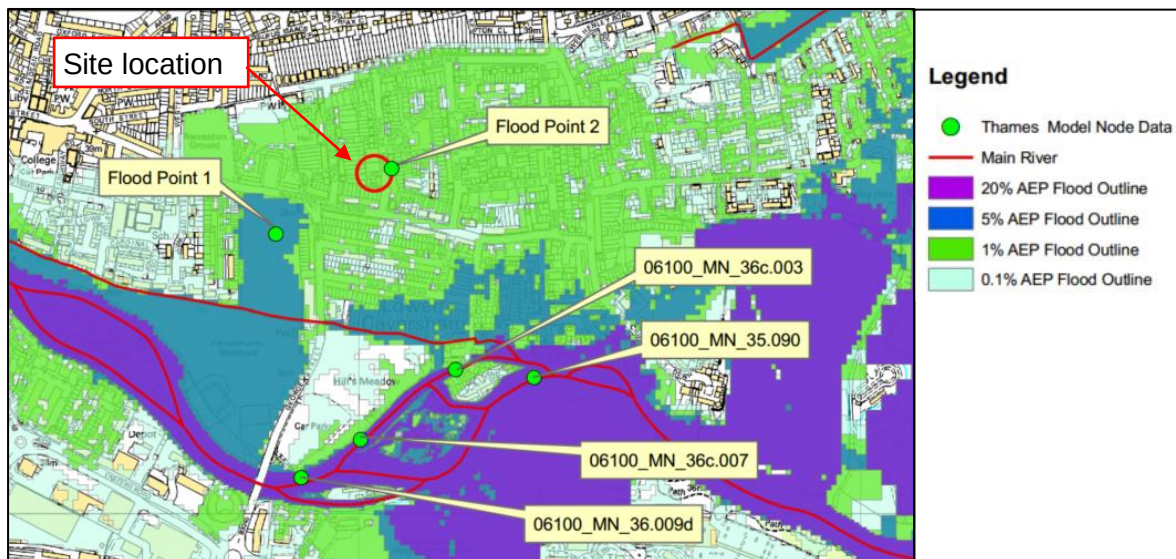
2. Analysis of Product 4 provided by the EA

2.1 Brief considerations

With a view to estimate the revised flood levels – with a climate change allowance of 35% – at the location of the site, the *Product 4* information (ref. THM109515) was requested from the EA – see Appendix C. The information received includes water levels and flood levels in locations near the site of interest.

According to Figure 2-1, it is possible to conclude that the model provided by the EA also suggests that the site is within FZ3, including a 20% climate change allowance. However, note that the site is affected by FZ3 and the current development is classified as ‘more vulnerable’, therefore a climate change allowance range between 35% and 70% would need to be assessed in this case.

Figure 2-1 – Flood outlines for events with an AEP of 0.1%, 1%, 5% and 20%, with an additional 20% climate change allowance (source: *Product 4* from EA Ref. THM109515).



In order to estimate the flood level for the 1% AEP with an additional 35% and 70% climate change, two methods were followed:

- Method 1 – A linear extrapolation of the flood level for the 1% AEP plus a 35% climate change allowance. The linear extrapolation is based on the variation between the 1%AEP (with no climate change allowance) and the 1% AEP with an additional 20% climate change allowance;
- Method 2 – A rating curve was obtained for the relation between the model outflows of one of the nodes in the main channel of the river, and the flood levels at one of the flood points. After applying the 35% climate change allowance to the river flows, the respective flood level was read from the rating curve;

2.2 Estimate of flood levels for the 1% AEP plus 35% CC

2.2.1 Method 1 – Extrapolation of flood levels

As mentioned before, the estimate of the flood levels for the 1% AEP + 35%CC is based on a linear extrapolation from the range between the 1%AEP + 0%CC and the 1% AEP + 20%CC.

The flood levels for Flood Point 1 (FP1) and Flood Point 2 (FP2) – shown in Figure 2-1 – are presented in Table 3. The table was extracted directly from EA's Product 4 and shows the flood levels between the 0.1% and the 20% AEP flood events. Note that for FP1 and FP2 there is no information regarding the output flows, as these are part of the 2D model, that is triggered after spillage from the main channel.

Table 3 – Flood levels for Flood Point 1 and Flood Point 2 (AEP of 0.1%, 1%, 5% and 20%). Source: EA's Product 4 information ref. THM109515

Reference	Model	Easting (m)	Northing (m)	Flood levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20%CC)	0.1% AEP
Flood Point 1	Thames (Mapledurham to Sonning) 2011	471,835	174,566	No Data	37.47	37.97	38.15	38.39
Flood Point 2		472,055	174,687	No Data	No Data	37.80	37.98	38.19

In order to extrapolate the 1%AEP + 35%CC flood level, the variation of levels for a 1% increment of the climate change – Δd (1%) – was calculated and shown in Table 4. The figure of Δd (1%) was then applied to an overall 35% climate change allowance and the results are shown in the last column of Table 4.

Note that the closest node to the site is *Flood Point 2*, with an estimated 1% AEP + 35%CC flood level of 38.12mAOD. This extrapolation of the flood level doesn't take into account the enlargement of the flood plain with the increase of water volume in the floodplain, and therefore it is believed to be an overestimate of the 1%AEP+35%CC flood level .

Table 4 – Estimate of the 1%AEP + 35%CC via Method 1

Ref.	Model	Flood levels (mAOD)			
		1% AEP *	1% AEP +20% CC *	Δ (1%) **	1% AEP +35% CC **
Flood Point 1	Thames (Mapledurham to Sonning) 2011	37.97	38.15	9.0	38.29
Flood Point 2		37.80	37.98	9.0	38.12

* Source : EA's Product 4 information THM109515

** Extrapolated values based on the 0%

The flood depths in the vicinity of the site were also estimated based on LiDAR topographical information and are shown in Figure 2-2. According with *Method 1*, the flood depths at the site can reach values in the range of 1.3m to 1.5m.

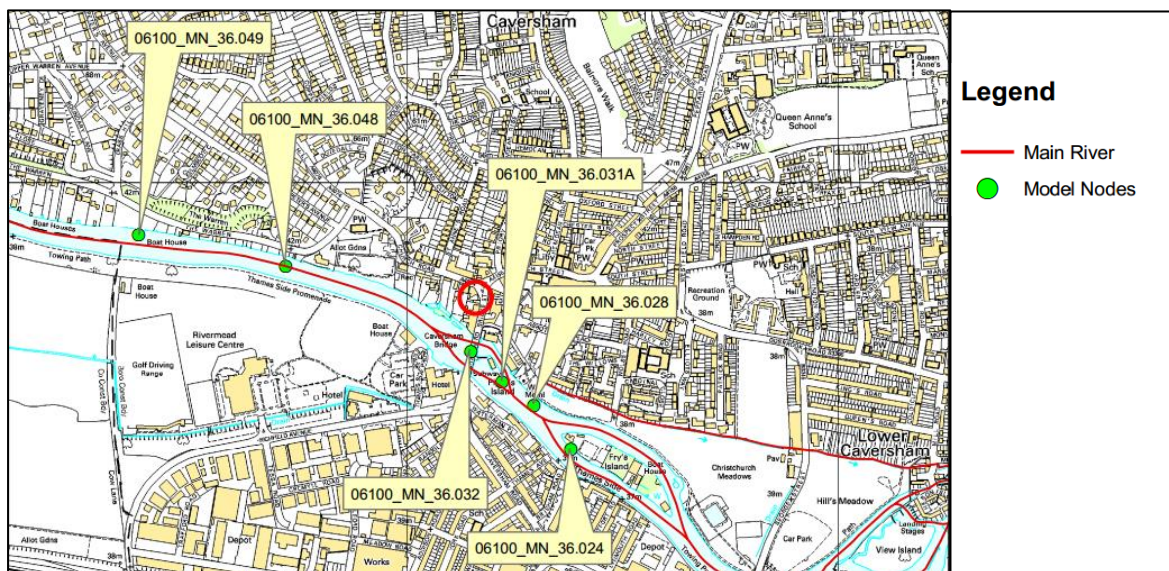
Figure 2-2 – Flood depths in the vicinity of the site, according to Method 1.



2.2.2 Method 2 – Rating curve

As the main channel nodes shown in Figure 2-1 fall in an area where river Thames splits into multiple channels, *Product 4* data ref. THM109515 doesn't show the total flows of the river. However, another set of *Product 4* information – ref. THM36512 – was available from a different site also in Caversham – roughly 800m to the west of the current site. The nodes of *Product 4* ref. THM36512 are shown in Figure 2-3.

Figure 2-3 – Location of flood nodes from EA's *Product 4* information – ref. THM36512.



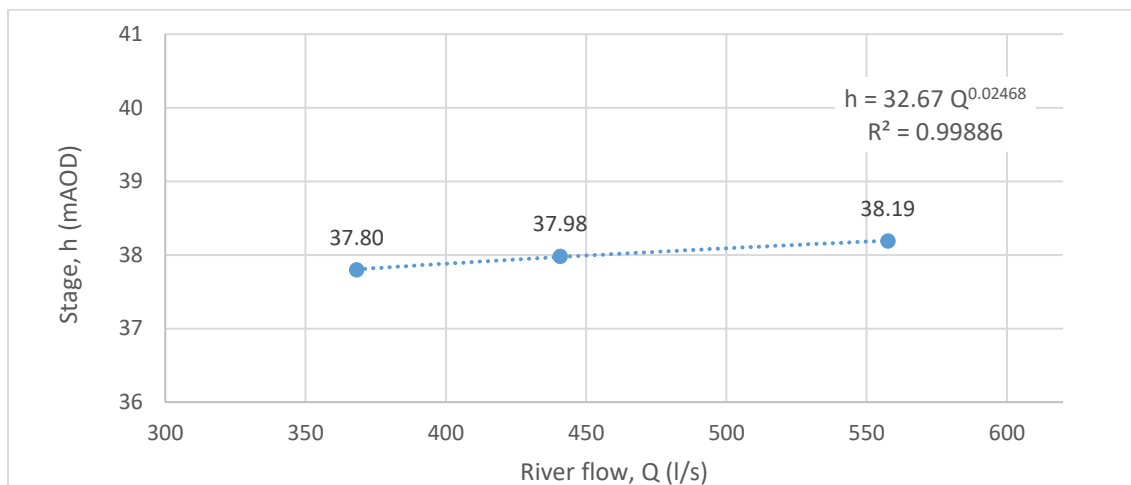
In particular node 06100_MN_36.028 was assumed to reflect the total river flows of Thames' main channel and was adopted in the analysis of the rating curve. The river peak flows at this node of the river – for AEP's between 0.1% and 20% – are highlighted in yellow in Table 5.

Table 5 – Thames river flows for AEP's between 0.1% and 20%. Source: Product 4 information ref. THM36512

Node label	Eastings (m)	Northings (m)	River flows, Q (l/s)				
			20% AEP	5% AEP	1% AEP	1% AEP (+20%CC)	0.1% AEP
06100_MN_36.049	470376	174879	221.54	276.19	349.16	413.30	487.94
06100_MN_36.048	470717	174807	223.02	281.86	361.50	426.96	520.55
06100_MN_36.032	471148	174609	223.10	284.45	374.33	450.03	571.71
06100_MN_36.031A	471220	174537	223.10	284.45	374.33	450.03	571.71
06100_MN_36.028	471294	174484	223.09	282.98	368.24	440.77	557.55
06100_MN_36.024	471380	174382	223.09	283.73	369.35	440.90	555.83

Based on the flood levels for Flood Point 2 – presented in Table 3 – and the river flows for node 06100_MN_36.028 presented in Table 5, it was possible to estimate the equation of the rating curve shown in Figure 2-4.

Figure 2-4 – Rating curve for Flood Point 2, between the 1% and the 0.1% AEP.



The river flow for the 1% AEP plus 35% climate change allowance was then estimated by linear extrapolation from the 1% AEP + 0%CC and the 1% AEP + 35% CC river flows presented in Table 5. The results of the linear extrapolation are shown in Table 6.

Table 6 – Extrapolation of the 1% AEP + 35%CC river flows from Product 4 information (ref. THM36512)

Node label	Eastings (m)	Northings (m)	River flows for the 1% AEP(l/s)			
			1% AEP	1% AEP (+20%CC)	Δ (1%) **	1% AEP ** (+35%CC)
06100_MN_36.049	470376	174879	349.16	413.30	3.21	461.41
06100_MN_36.048	470717	174807	361.50	426.96	3.27	476.06
06100_MN_36.032	471148	174609	374.33	450.03	3.79	506.81
06100_MN_36.031A	471220	174537	374.33	450.03	3.79	506.81
06100_MN_36.028	471294	174484	368.24	440.77	3.63	495.17
06100_MN_36.024	471380	174382	369.35	440.90	3.58	494.56

From the equation of the rating curve in Figure 2-4, it is possible to infer that the 1% AEP + 35%CC flood level for Flood Point 2 is therefore 38.08mAOD. This value is slightly below the value of 38.12mAOD obtained via Method 1, as it has into consideration the fact that the variation in flood level decreases with the increase of the water volume in the floodplain. The flood depths at the site are therefore expected to be similar to the results presented under Figure 2-2.

As per EA's letter to planners the Finish Floor Level of the new proposed building should therefore be set at 38.38mAOD, 300mm above the 1%AEP + 35%CC flood level.

2.3 Compensation of volume

The need for compensation of storage was also analysed for the new development. According to Table 7, the total volume of floodplain storage affected by the exiting building in a pre-development situation is 95m³. Note that this analysis follows the comments of EA within the 'EA letter to planner', of considering the garage and any annexes of the main house as floodable structures. Therefore, the 95m³ impact in the floodplain is only related to the main house in the pre-development site.

If the new development is to take place then the volume of water affected in the flood plain will be 103m³, meaning that compensation of volume by scrapping surrounding soils will be required. However, since the development is placed in the heart of Caversham such is not feasible. Therefore, a 1010mm layer of voided blocks below the house is seen as the only practicable solution in this case.

However, as stated in EA's letter to planned – Appendix A – the volume of the blocks is likely to be reduced in the long term, due to debris and vegetation. To take this aspect into account, a 50% reduction factor **on top of a 60% void ratio** was added to the design, still meaning a **29m³** improvement in the floodplain storage. This solution would therefore be able to reduce the post-development impact in the floodplain storage volume down to **74m³**, meaning an improvement to the pre-development situation of **21m³ (95m³-74m³)**. **In terms of the voided layer, the comments provided by the EA under WA/2018/125224/03-L01 – Appendix E –, request a minimum opening of 1m per 5m of length of wall. Furthermore, the voids would have to extend up to the 1%AEP + 35%CC flood level – 38.08mAOD. These points are acknowledged and shown in Figure 2-5, together with the 100mm spaced steel bars that prevent access to the voids.**

Table 7 – Impact of the proposed development in the floodplain storage volume

Element	Footprint (m ²)	Volume of floodplain affected (m ³)
Pre-development		
Stairs *	18.5	13
Main house **	75.6	82
Total	94.1	95
Post-development		
Main house	95.3	103
Void blocks (1010mm deep) ***	95.3	-29
Total	95.3	74

* Estimate of volume of floodplain affected based on a level of 37.70mAOD at the top of the stairs;

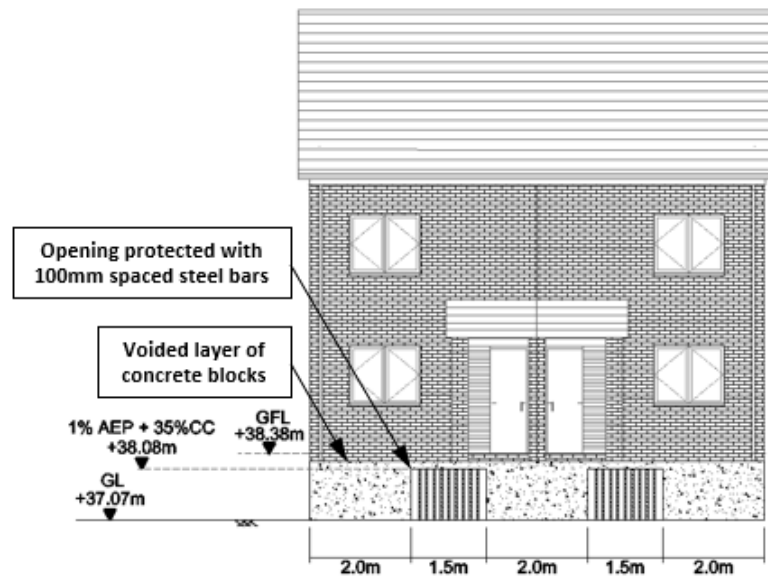
** Estimate of volume of floodplain affected based on a 1%AEP+35%CC flood level of 38.08mAOD;

*** Estimate of volume benefiting the flood plain, including a 50% reduction factor in the volume of the blocks **on top of a 60% void ratio**;

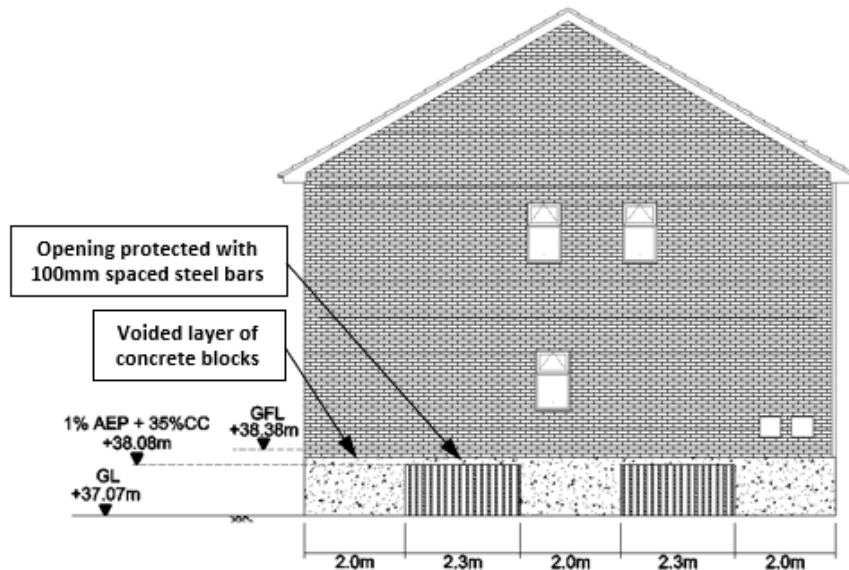
Note that the layout plans of the development didn't shown any access ramps at the date of the report. However, according to Building Regulations the local authorities may require a permanent access ramp for wheel chairs. In that case, the improvement of **21m³** to the floodplain storage provided by the layers of voided blocks could balance the volume lost by the wheel chair access ramp.

Another aspect not mentioned before is the fact that the development has a patio in its rear. This patio would have to be either built at the level of the surrounding ground, or be built as a floating deck, allowing the space between the deck and the ground to flood.

Figure 2-5 – Front and side elevation of the new development, showing the main levels of the layer of voided blocks. Generic Ground Level (GL) at 37.07mAOD, top of voided blocks set at 38.08mAOD, and Finish Floor Levels (GFL) of the new house set at 38.38mAOD.



a) Front elevation of the new property



b) Side elevation of the new property

3. Conclusion

The conclusions of this high-level flood assessment are as follow:

- According to EA's letter to planner **WA/2018/125224/02-L01**, the Finish Floor Levels of the new proposed property are to be set 300mm above the 1%AEP+35%CC flood level;
- After analysis of the *Product 4* provided by the EA, the revised flood level for the 1%AEP+35%CC was estimated to be 38.12mAOD according to "Method 1" and 38.08mAOD according to "Method 2";
- As "Method 2" was considered to be the most accurate between the two methods, the Finish Floor Levels of the new building should be set at 38.38mAOD;
- **As per EA's letter WA/2018/125224/03-L01, the adequate compensation of volume can be achieved** provided a **1010mm** layer of voids is placed below the building. In fact, even considering a future reduction of 50% in the volume of the voids **(on top of a 60% void ratio)**, a gain of **21m³** is expected in the floodplain storage volume, comparatively to the pre-development situation. **Note that the top of the voids layer should extend up to the 1%AEP+35%CC – 38.08mAOD – and be protected by 100mm spaced steel bars.**

Appendix A – EA letter to planner WA/2018/125224/02-L01 (23/10/2018)

creating a better place



Reading Borough Council
Development Control
PO Box 17
Reading
Berkshire
RG1 7TD

Our ref: WA/2018/125224/02-L01
Your ref: 180656
Date: 23 October 2018

Dear Sir/Madam,

Demolition of existing bungalow and construction of 2x 2 Storey semi-detached houses with associated car parking. Resubmission of 170574

8 Ardler Road, Caversham, Reading, RG4 5AE.

Thank you for re-consulting us with this application. We have reviewed the additional information submitted since our previous reply on this application on 13 June, including the Design and Access Statement (DAS), Flood Risk Assessment (FRA), Affordable Housing Statement dated 18 April 2018 compiled by The Town Planning Experts, revised 09 October 2018.

The application site is located within Flood Zone 3 defined as having a 'high' probability of flooding in accordance with Table 1 'Flood Risk' of the NPPF Planning Practice Guidance (PPG).

Environment Agency Position

In accordance with paragraphs 160 and 163 of the National Planning Policy Framework (NPPF) in the absence of an acceptable Flood Risk Assessment (FRA) we **object** to the grant of planning permission and recommend refusal on this basis for the following reasons:

Reasons

Part of the application site lies within Flood Zones 2 & 3 defined by the National Planning Policy Framework (NPPF) and associated Flood risk and coastal change National Planning Policy Guidance (NPPG) as having a medium & high probability of flooding.

Paragraph 163, footnote 50 of the National Planning Policy Framework (NPPF) requires applicants for planning permission to submit a FRA when development is proposed in such locations.

The FRA submitted with this application prepared by The Town Planning Experts,

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revised 09 October 2018 does not comply with the requirements set out in the National Planning Policy Framework and the associated PPG and does not therefore provide a suitable assessment of the flood risk arising from the proposed development.

In particular, the submitted FRA fails to:

- Assess the impact of climate change using the latest guidance and appropriate climate change allowances.
- Demonstrate if there is any loss of floodplain storage within the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change caused by the proposed development and if so that it can be mitigated for.
- Finished floor levels will be set to the appropriate 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change plus a 300mm freeboard.

Explanation

Climate Change

We have reviewed the FRA as submitted and the climate change allowance have been applied incorrectly. Therefore currently we are unable to understand whether the site is located within the 1% (1 in 100) AEP plus appropriate allowance for climate change flood extent and the impact that the proposals will have on flood risk up to the appropriate climate change allowance flood level. The FRA also details flood level(s) relating to the site, but it is still unclear what these are based on.

Floodplain Storage

Information has now been provided that has detailed the existing built footprint compared to the proposed built footprint. **However, the existing built footprint includes a garage which is likely to be a floodable structure.** Therefore we are unsure on whether the proposals at the site will result in any impact on floodplain storage up to the 1% (1 in 100) AEP plus appropriate allowance for climate change. Existing buildings which would flood due to their design (i.e. garages, outbuildings) intended to be used to offset any increase in built footprint will be considered floodable unless evidence (i.e. photographs) is submitted to prove otherwise. Information is needed relating to the existing non-floodable built footprint compared to the proposed non-floodable built footprint.

Finished Floor Levels

The FRA has also not detailed the proposed finished floor level of the proposed development. Therefore we are unsure whether the finished floor levels of the development will be set above the design flood level to include an appropriate freeboard.

Overcoming our Objection

The applicant can overcome our objection by submitting the information below to demonstrate that the development will not increase risk elsewhere and where possible reduces flood risk overall. If this cannot be achieved we are likely to maintain our objection to the application.

Further advice to applicant

Flood Level Information

We request that flood level information specific to the site is requested from our Customers and Engagement Team and submitted to inform these proposals. Please contact our Customers and Engagement Team at enquiries_THM@environment-agency.gov.uk to request the flood level data relevant to the site location for this

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development proposal. It is advised that the applicant should request Product 4 Data, because their use of the monitoring station data isn't appropriate.

Updated Climate Change Allowances

Our climate change allowances for planning were updated on 19 February 2016 and should be used to assess proposed development within flood risk areas. This guidance is available through the following link:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Please refer to the information at the link above to determine which allowances should be used for this development.

We advise that 'More Vulnerable' development within Flood Zone 3 should be designed to the 1% (1 in 100) AEP plus 35% allowance for climate change flood level (Higher Central) as a minimum and the 1% (1 in 100) AEP plus 70% allowance for climate change flood level (Upper End) should also be assessed/considered to determine if the mitigation or flood resistance/resilience measures could be set to this higher allowance level. We request that this information is provided to us and that justification is given relating to the level chosen to set the mitigation to within the FRA.

We advise that any FRA submitted should provide the calculations and supporting information to determine how the revised climate change levels have been calculated to determine whether the development and any required mitigation has been assessed appropriately. We include the Thames area climate change guidance, it might be appropriate to use the basic allowance detailed here for the Thames.

Floodplain Compensation

Information is needed relating to the existing non-floodable built footprint compared to the proposed non-floodable built footprint. Existing buildings which would flood due to their design (i.e. garages, outbuildings) intended to be used to offset any increase in built footprint will be considered floodable unless evidence (i.e. photographs) is submitted to prove otherwise.

It will need to be shown that any increase in built footprint or ground level raising within the 1% (1 in 100) AEP plus appropriate allowance for climate change flood extent can be directly compensated for. This is necessary to prevent the new development reducing floodplain storage, displacing flood waters and impacting on flood flows, thereby increasing flood risk elsewhere.

Level-for-level floodplain compensation is the preferred method of mitigation because voids, stilts or undercroft parking tend to become blocked over time by debris or domestic effects leading to a gradual loss of the provided mitigation.

Level-for-level compensation is the matching of volumes lost to the flood plain through increases in built footprint with new floodplain volume by reducing ground levels. Please note that for this to be achievable, it requires land on the edge of the floodplain and above the 1% (1 in 100) AEP plus appropriate allowance for climate change flood level to be achievable. A comparison of ground levels (topographical survey) with modelled floodplain levels will show land above the 1% (1 in 100) AEP plus appropriate allowance for climate change floodplain to be used as compensation. We recommend that the FRA considers whether level-for-level compensation is possible and if not, explain why and detail how any associated risks from an alternative form of mitigation can be minimised.

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If it is not possible to provide level-for-level floodplain compensation then other forms of mitigation to include incorporating void openings underneath the building may be appropriate, providing the Local Authority are willing to impose a planning condition to ensure the voids remain open in perpetuity. We recommend you contact the Local Authority to make sure they would be happy with the building being raised on voids.

If voids are proposed, the underside of the void opening should be set no lower than the estimated 1% (1 in 100 year) plus appropriate allowance for climate change flood level. We recommend the applicant develops a maintenance plan to ensure the voids remain open for the life time of the development.

If it is not possible to provide level-for-level floodplain compensation or raising the building on voids, then other forms of mitigation may be considered if agreed in writing with the LPA. If the Local Authority is not satisfied that other forms of mitigation for an increase in built footprint are appropriate then the applicant should revise their development proposals to ensure that there will be no increase in built footprint on the site.

Finished Floor Levels

We request that it is demonstrated that the finished floor levels for the proposed development are set at least 300mm above the 1% AEP (1 in 100) plus 35% allowance for climate change flood level. This will reduce the risk of flooding to people and property.

Final Comments

Once again, thank you for contacting us. Our comments are based on our available records and the information as submitted to us.

We ask to be re-consulted with the results of the FRA. We will provide you with bespoke comments within 21 days of receiving formal re-consultation. Our objection will be maintained until an adequate FRA has been submitted.

In accordance with the Planning Practice Guidance (Reference ID: 7-043-20150415), please notify us by email within 2 weeks of a decision being made or application being withdrawn. Please provide us with a URL of the decision notice, or an electronic copy of the decision notice or outcome.

Yours faithfully

Mr Alex Swann
Planning Advisor

Direct dial 020 771 40593
e-mail Planning_THM@environment-agency.gov.uk

End

4

Scale bar: 0 1 2 3 4 5 6 7 8 9 10m
1:100

INDICATIVE ONLY

110B Ardler Road

Greenhouse

Overgrown

Assumed fence line

Shed

Building

Private Residence

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RD 40.50

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Appendix C – EA Product 4 data ref. THM109515 (December 2018)



Environment
Agency

Product 4 (Detailed Flood Risk) for 8 Ardler Road, Caversham
Our Ref: THM_109515

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

- i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
- ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

- Ordnance Survey 1:25k colour raster base mapping;
- Flood Zone 2 and Flood Zone 3;
- Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
- Model extents showing *defended* scenarios;
- FRA site boundary (where a suitable GIS layer is supplied);
- Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
- Flood Map areas benefiting from defences (where available/relevant);
- Flood Map flood storage areas (where available/relevant);
- Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
- Statutory (Sealed) Main River (where available within map extents);

A table showing:

- i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
- ii) Flood defence locations unique identifiers and attributes; (supplied separately)
- iii) Historic flood events outlines unique identifiers and attributes; and
- iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

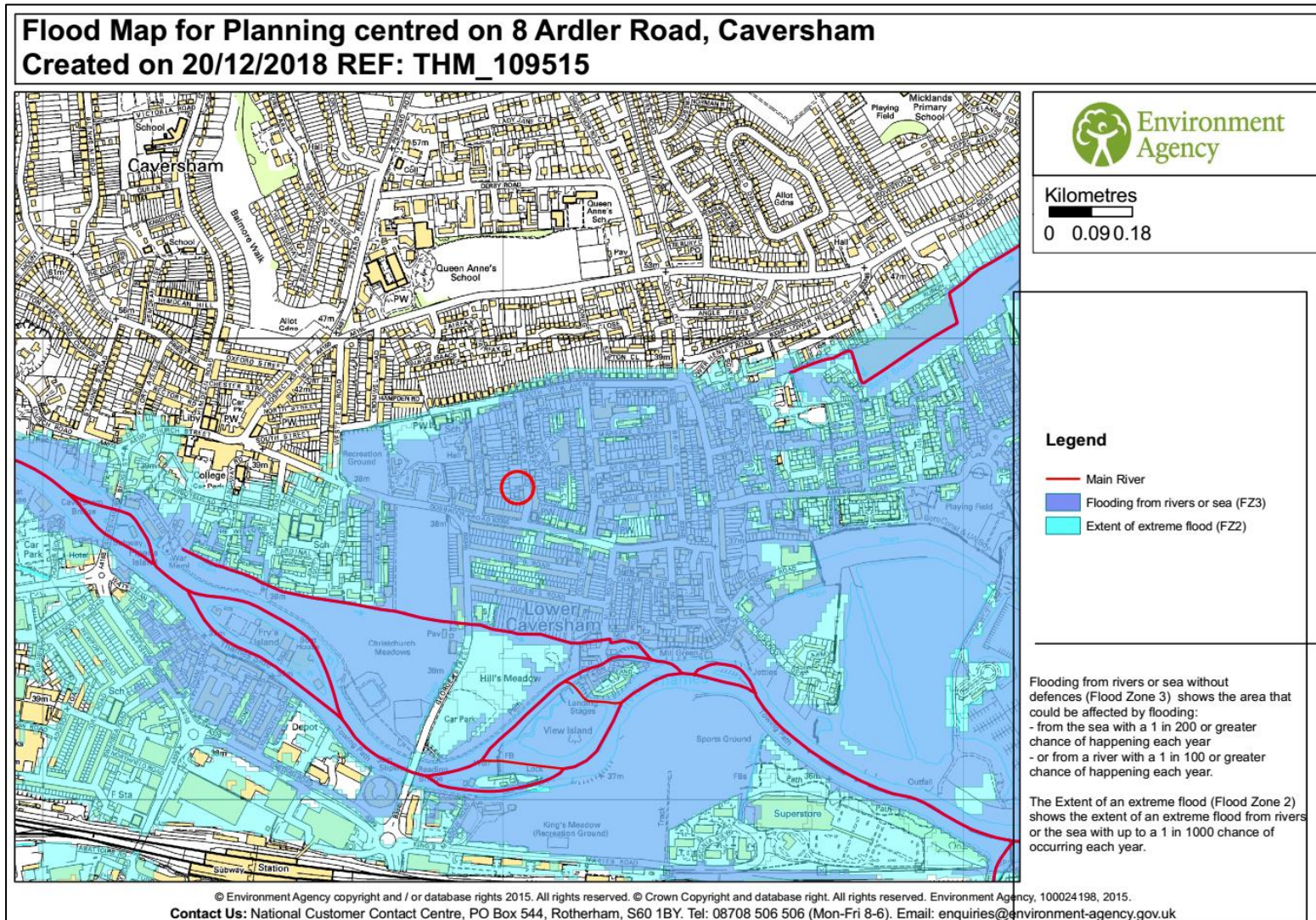
If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



THM_109515

Defence information

Defence Location: No defences on Main River

Description: This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



Model information

THM_109515

Model: Thames (Mapledurham to Sonning) 2011

Description: The information provided is taken from the Thames (Reading Complex Change) Flood Alleviation Study completed in June 2011. The study was carried out using 2D modelling software (ISIS-Tuflow).

Model design runs:

1 in 5 / 20% Annual Exceedance Probability (AEP); 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP; 1 in 1000 / 0.1% AEP and 1 in 100+20% / 1% AEP plus 20% increase in flows

Mapped Outputs:

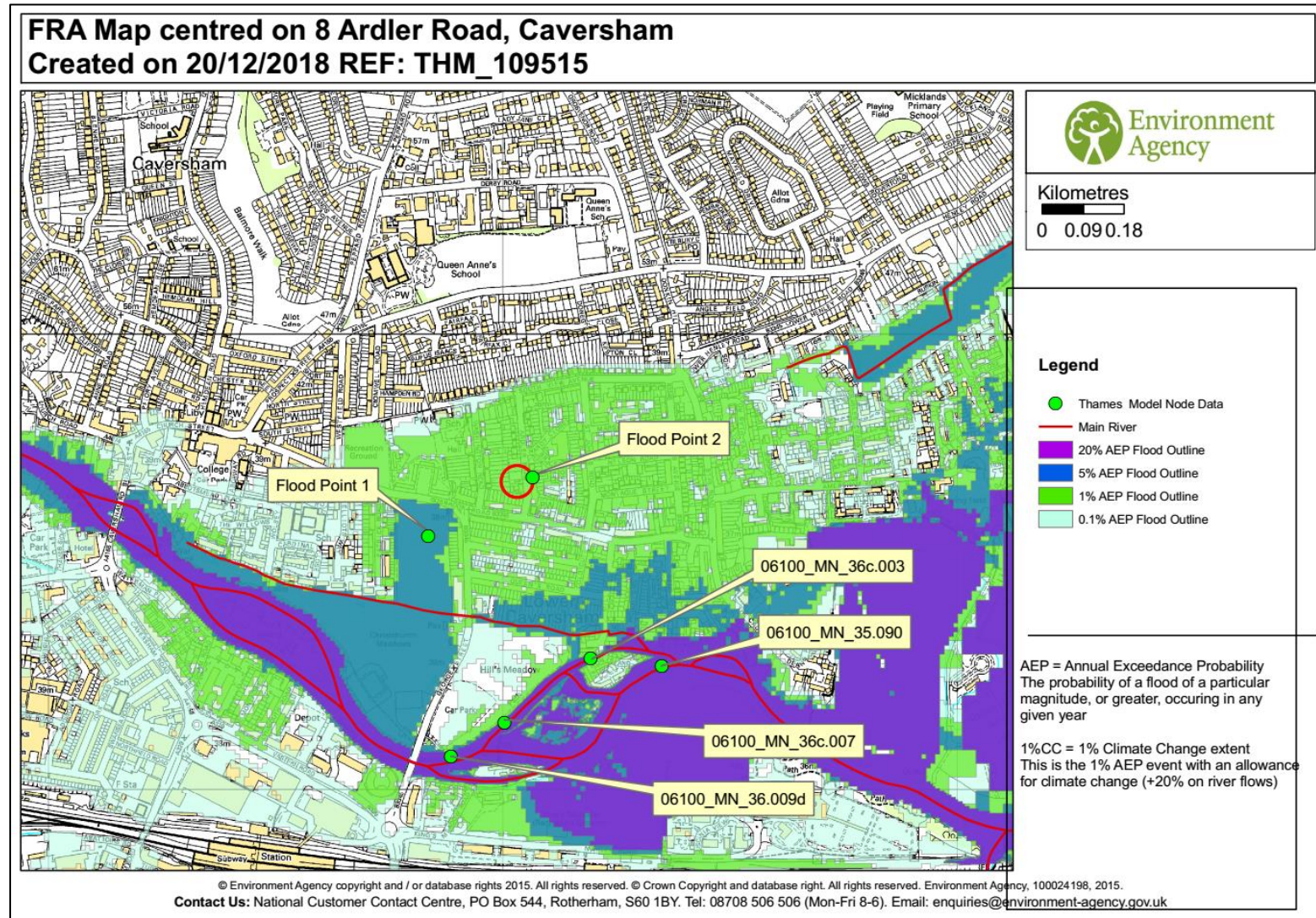
1 in 5 / 20% AEP; 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP and 1 in 1000 / 0.1% AEP

Model accuracy:

Levels $\pm$ 250mm

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



Modelled in-channel flood flows and levels

THM_109515

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

Node label	Model	Easting	Northing	Flood Levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
06100_MN_35.090	Thames (Mapledurham to Sonning) 2011	472349	174271	36.58	36.86	37.17	37.36	37.61
06100_MN_36c.003	Thames (Mapledurham to Sonning) 2011	472193	174287	36.86	37.24	37.73	37.95	38.25
06100_MN_36c.007	Thames (Mapledurham to Sonning) 2011	472004	174146	36.93	37.29	37.75	37.91	38.10
06100_MN_36.009d	Thames (Mapledurham to Sonning) 2011	471887	174071	36.97	37.33	37.76	37.92	38.12

Node label	Model	Easting	Northing	Flood Flows (m3/s)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
06100_MN_35.090	Thames (Mapledurham to Sonning) 2011	472349	174271	219.43	254.22	282.02	290.48	304.90
06100_MN_36c.003	Thames (Mapledurham to Sonning) 2011	472193	174287	14.26	19.66	30.60	36.18	45.91
06100_MN_36c.007	Thames (Mapledurham to Sonning) 2011	472004	174146	14.29	18.33	56.07	87.02	136.00
06100_MN_36.009d	Thames (Mapledurham to Sonning) 2011	471887	174071	216.09	274.04	336.47	352.07	382.04

Note:

Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>



Modelled floodplain flood levels

THM_109515

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

2D grid cell reference	Model	Easting	Northing	flood levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
Flood Point 1	Thames (Mapledurham to Sonning) 2011	471,835	174,566	No Data	37.47	37.97	38.15	38.39
Flood Point 2	Thames (Mapledurham to Sonning) 2011	472,055	174,687	No Data	No Data	37.80	37.98	38.19

This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:

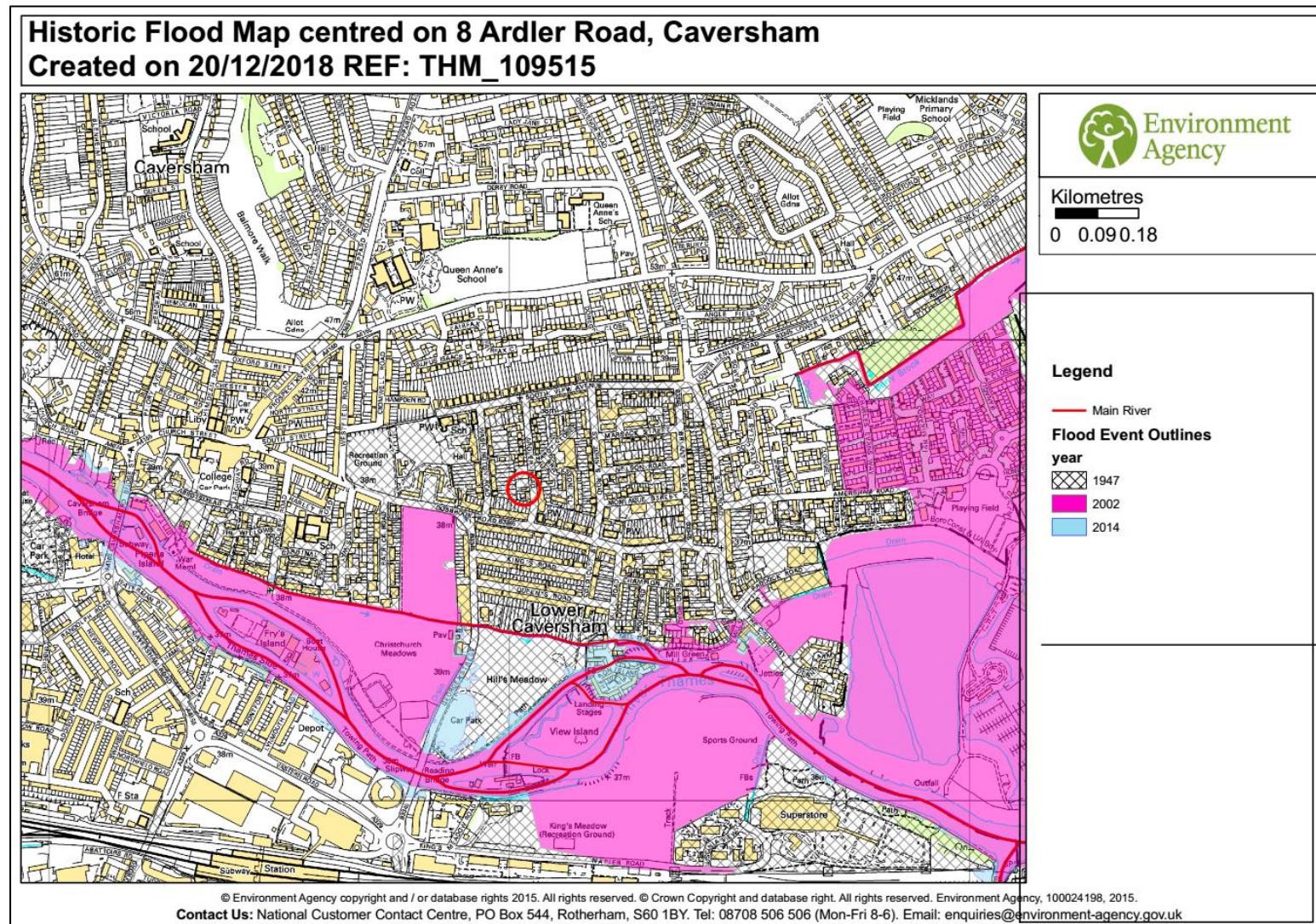
Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

**Historic flood data****THM_109515**

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA0619470300429	06MarchSpring1947	spring 1947	1947	main river	channel capacity exceeded (no raised defences)
EA0620030101899	06JanuaryNewYear2003	23/12/2002	12/01/2003	main river	channel capacity exceeded (no raised defences)
EA061002014005	Winter 2013/2014	23/11/2013	28/02/2014	main river	channel capacity exceeded (no raised defences)

Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

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Appendix D – EA Product 4 data ref. THM36512 (February 2017)


Product 4 (Detailed Flood Risk) for Bridge Street, Caversham, Reading, RG4 8AA
Our Ref: THM36512

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

- i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
- ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
 Flood Zone 2 and Flood Zone 3;
 Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
 Model extents showing *defended* scenarios;
 FRA site boundary (where a suitable GIS layer is supplied);
 Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
 Flood Map areas benefiting from defences (where available/relevant);
 Flood Map flood storage areas (where available/relevant);
 Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
 Statutory (Sealed) Main River (where available within map extents);

A table showing:

- i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
- ii) Flood defence locations unique identifiers and attributes; (supplied separately)
- iii) Historic flood events outlines unique identifiers and attributes; and
- iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

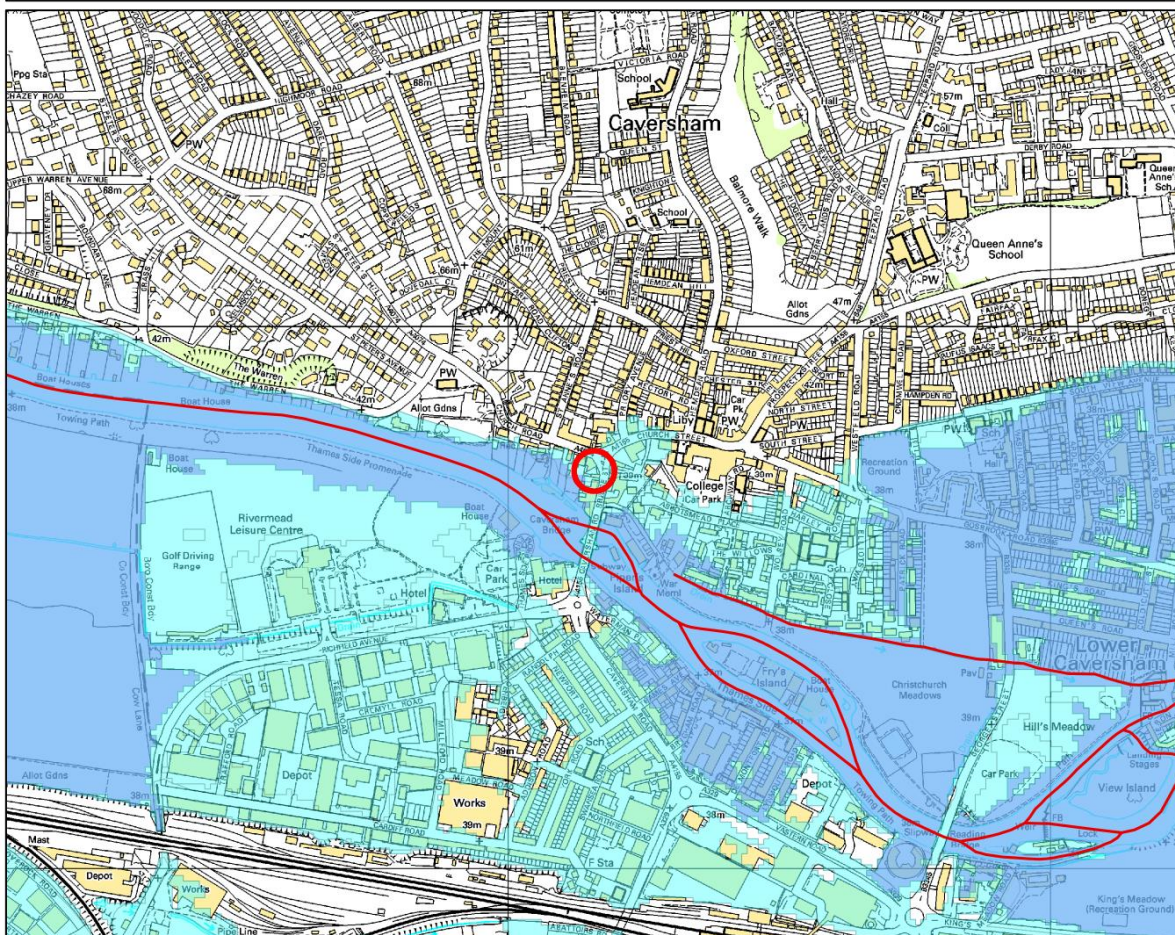
<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

Flood Map for Planning centred on Bridge Street, Caversham, Reading, RG4 8AA **Created on 02/02/2017 REF: THM36512**



Environment
Agency

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Legend

- Main River
- Flood defences
- ▨ Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- ▤ Flood Map - flood storage areas

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



THM36512

Defence information

Defence Location:

Description: This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



Model information

THM36512

Model: Thames (Mapledurham to Sonning) 2011

Description: The information provided is taken from the Thames (Reading Complex Change) Flood Alleviation Study completed in June 2011. The study was carried out using 2D modelling software (ISIS-Tuflow).

Model design runs:

1 in 5 / 20% Annual Exceedance Probability (AEP); 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP; 1 in 1000 / 0.1% AEP and 1 in 100+20% / 1% AEP plus 20% increase in flows

Mapped Outputs:

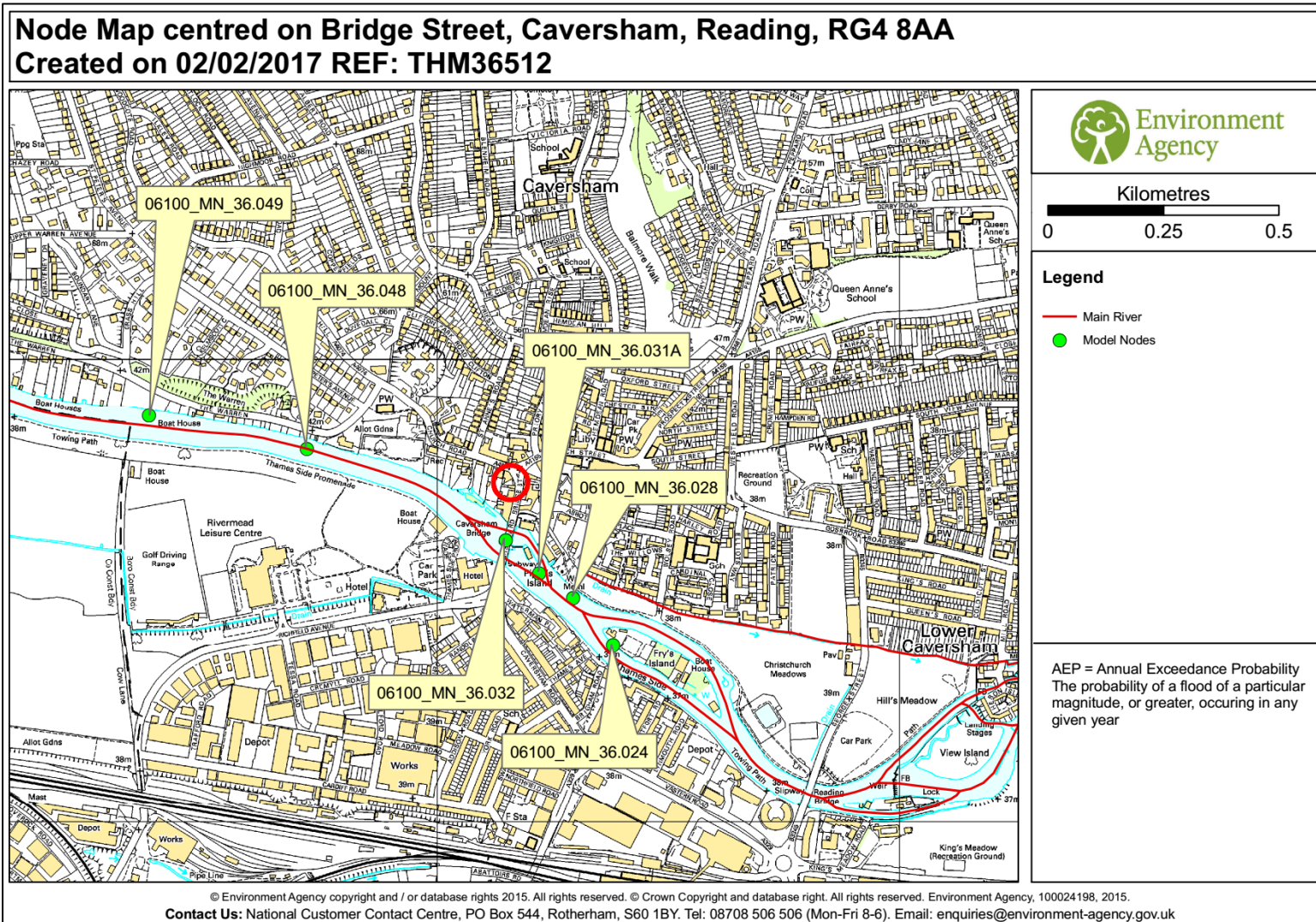
1 in 5 / 20% AEP; 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP and 1 in 1000 / 0.1% AEP

Model accuracy:

Levels $\pm$ 250mm

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

**Modelled in-channel flood flows and levels****THM36512**

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

Node label	Model	Easting	Northing	Flood Levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
06100_MN_36.049	Thames (Mapledurham to Sonning) 2011	470376	174879	37.39	37.81	38.34	38.62	39.01
06100_MN_36.048	Thames (Mapledurham to Sonning) 2011	470717	174807	37.31	37.71	38.22	38.48	38.83
06100_MN_36.032	Thames (Mapledurham to Sonning) 2011	471148	174609	37.23	37.64	38.15	38.39	38.71
06100_MN_36.031A	Thames (Mapledurham to Sonning) 2011	471220	174537	37.20	37.59	38.06	38.26	38.51
06100_MN_36.028	Thames (Mapledurham to Sonning) 2011	471294	174484	37.18	37.58	38.05	38.25	38.50
06100_MN_36.024	Thames (Mapledurham to Sonning) 2011	471380	174382	37.15	37.55	38.02	38.23	38.47

Node label	Model	Easting	Northing	Flood Flows (m3/s)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
06100_MN_36.049	Thames (Mapledurham to Sonning) 2011	470376	174879	221.54	276.19	349.16	413.30	487.94
06100_MN_36.048	Thames (Mapledurham to Sonning) 2011	470717	174807	223.02	281.86	361.50	426.96	520.55
06100_MN_36.032	Thames (Mapledurham to Sonning) 2011	471148	174609	223.10	284.45	374.33	450.03	571.71
06100_MN_36.031A	Thames (Mapledurham to Sonning) 2011	471220	174537	223.10	284.45	374.33	450.03	571.71
06100_MN_36.028	Thames (Mapledurham to Sonning) 2011	471294	174484	223.09	282.98	368.24	440.77	557.55
06100_MN_36.024	Thames (Mapledurham to Sonning) 2011	471380	174382	223.09	283.73	369.35	440.90	555.83

Note:

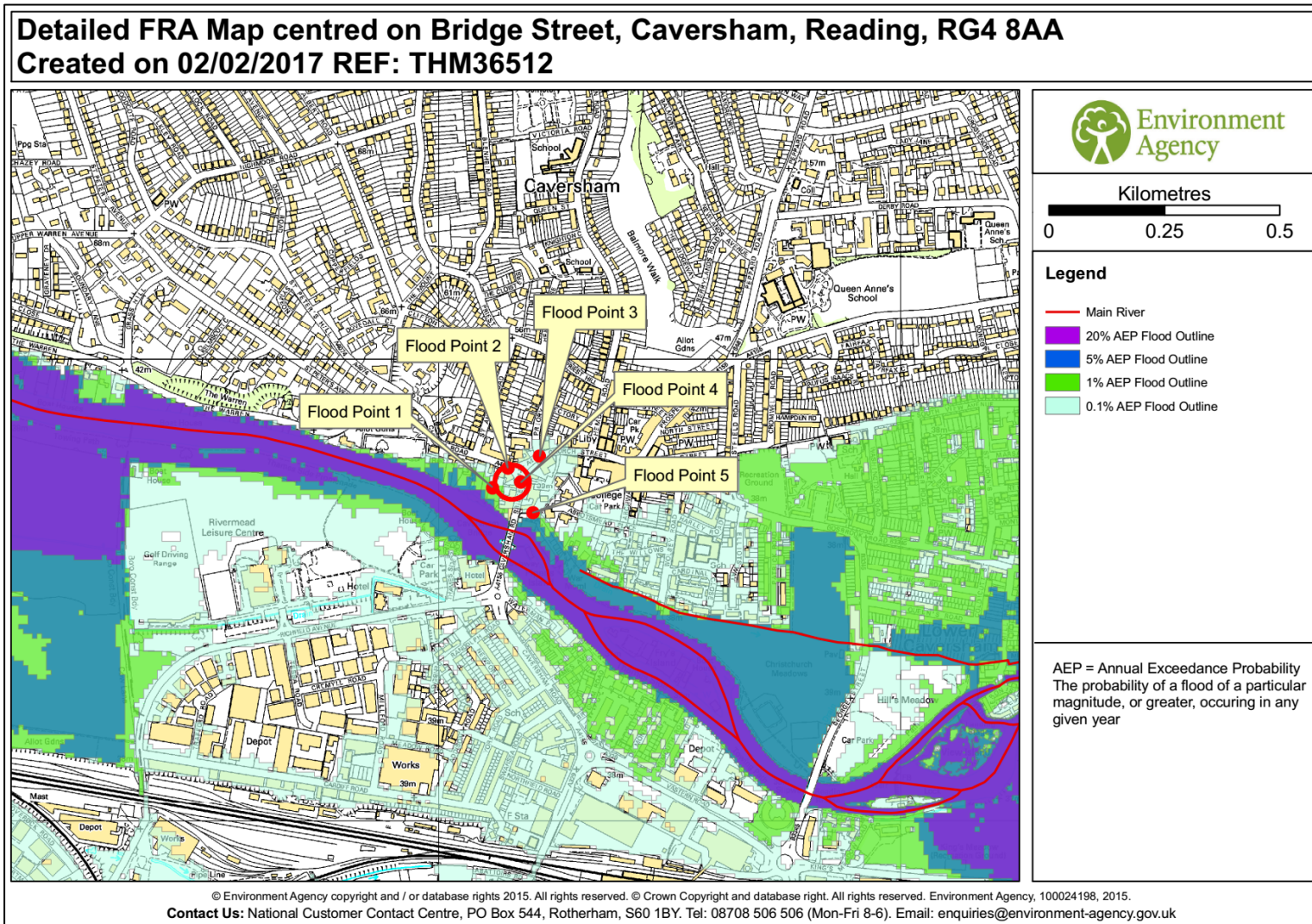
Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222



Modelled floodplain flood levels

THM36512

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

2D grid cell reference	Model	Easting	Northing	flood levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	0.1% AEP
Flood Point 1	Thames (Mapledurham to Sonning) 2011	471,117	174,720	No Data	No Data	38.16	38.40	38.73
Flood Point 2	Thames (Mapledurham to Sonning) 2011	471,149	174,765	No Data	No Data	No Data	No Data	38.69
Flood Point 3	Thames (Mapledurham to Sonning) 2011	471,218	174,788	No Data	No Data	No Data	No Data	38.68
Flood Point 4	Thames (Mapledurham to Sonning) 2011	471,177	174,734	No Data	No Data	No Data	No Data	38.68
Flood Point 5	Thames (Mapledurham to Sonning) 2011	471,203	174,667	No Data	No Data	No Data	No Data	38.51

This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:

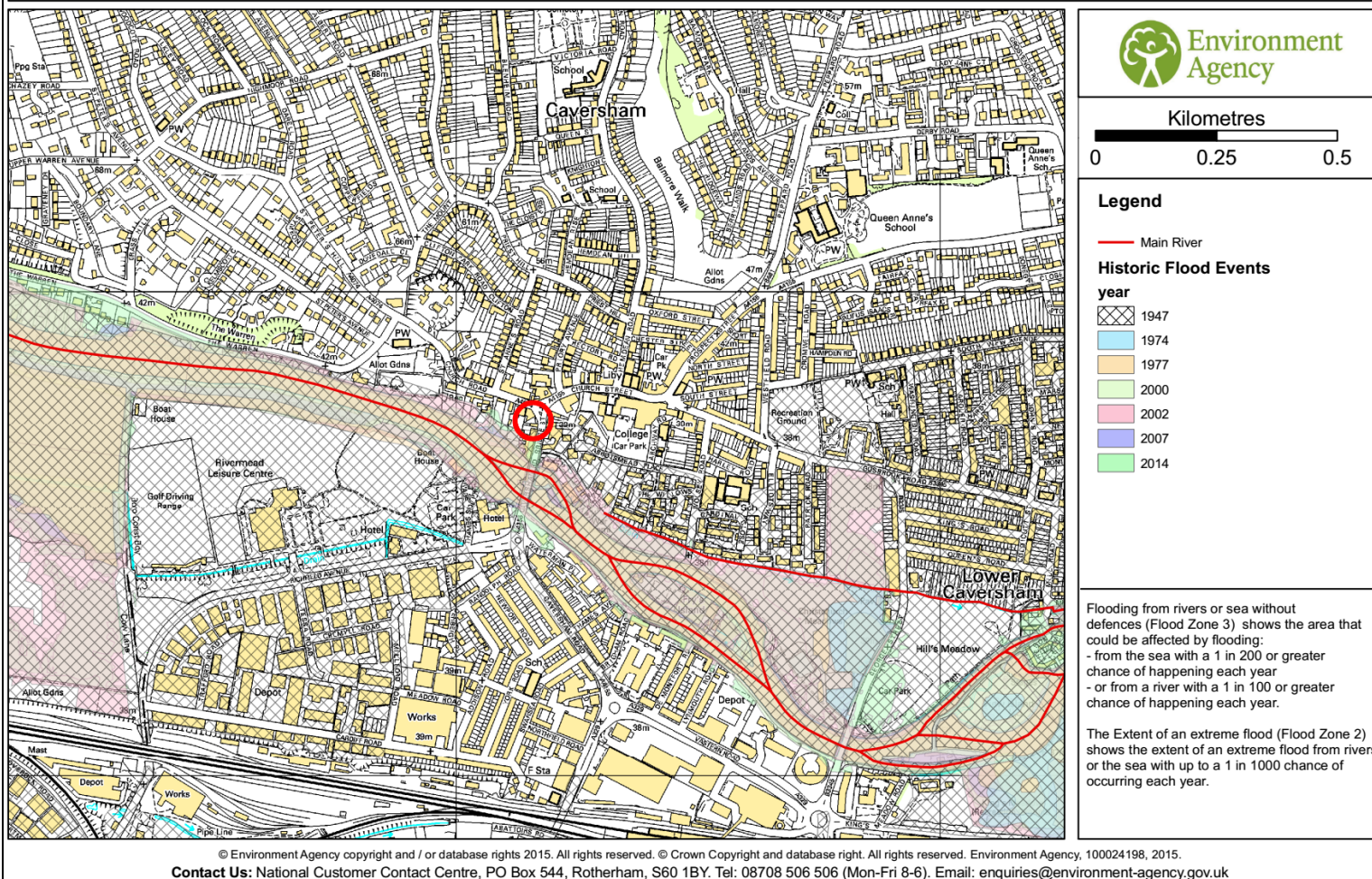
Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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Historic Flood Map centred on Bridge Street, Caversham, Reading, RG4 8AA **Created on 02/02/2017 REF: THM36512**



K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

**Historic flood data****THM36512**

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA0619470300103	06MarchSpring1947	01/01/1947	12/12/1947	main river	channel capacity exceeded (no raised defences)
EA0619770800424	06AugustSummer1977	01/01/1977	12/12/1977	main river	channel capacity exceeded (no raised defences)
EA0620001200990	06DecemberWinter2000	01/01/2000	12/12/2000	main river	channel capacity exceeded (no raised defences)
EA0620030101899	06JanuaryNewYear2003	23/12/2002	12/01/2003	main river	channel capacity exceeded (no raised defences)
EA061002014009	EA06Winter13-14	23/11/2013	28/02/2014	main river	channel capacity exceeded (no raised defences)

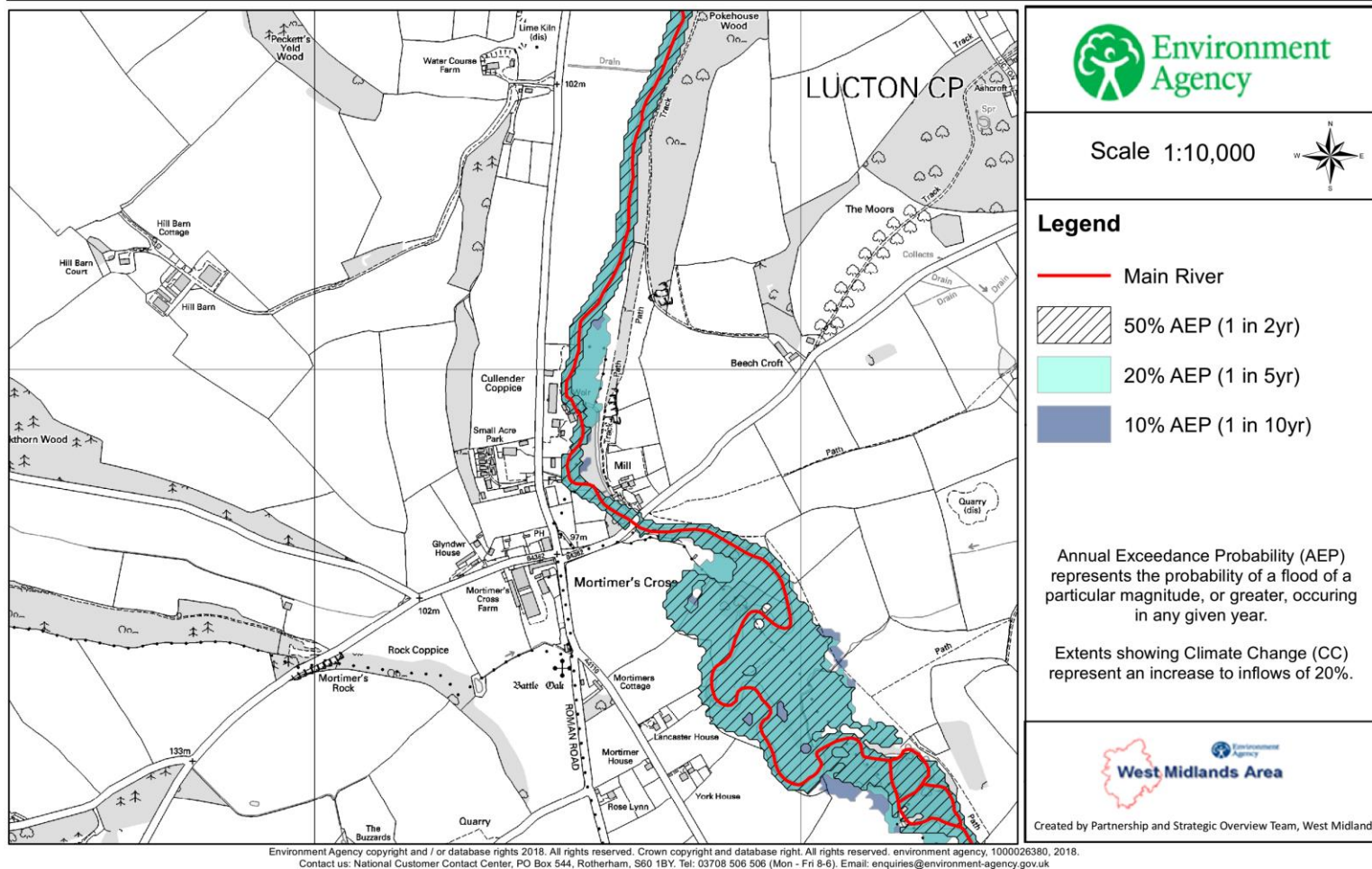
Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

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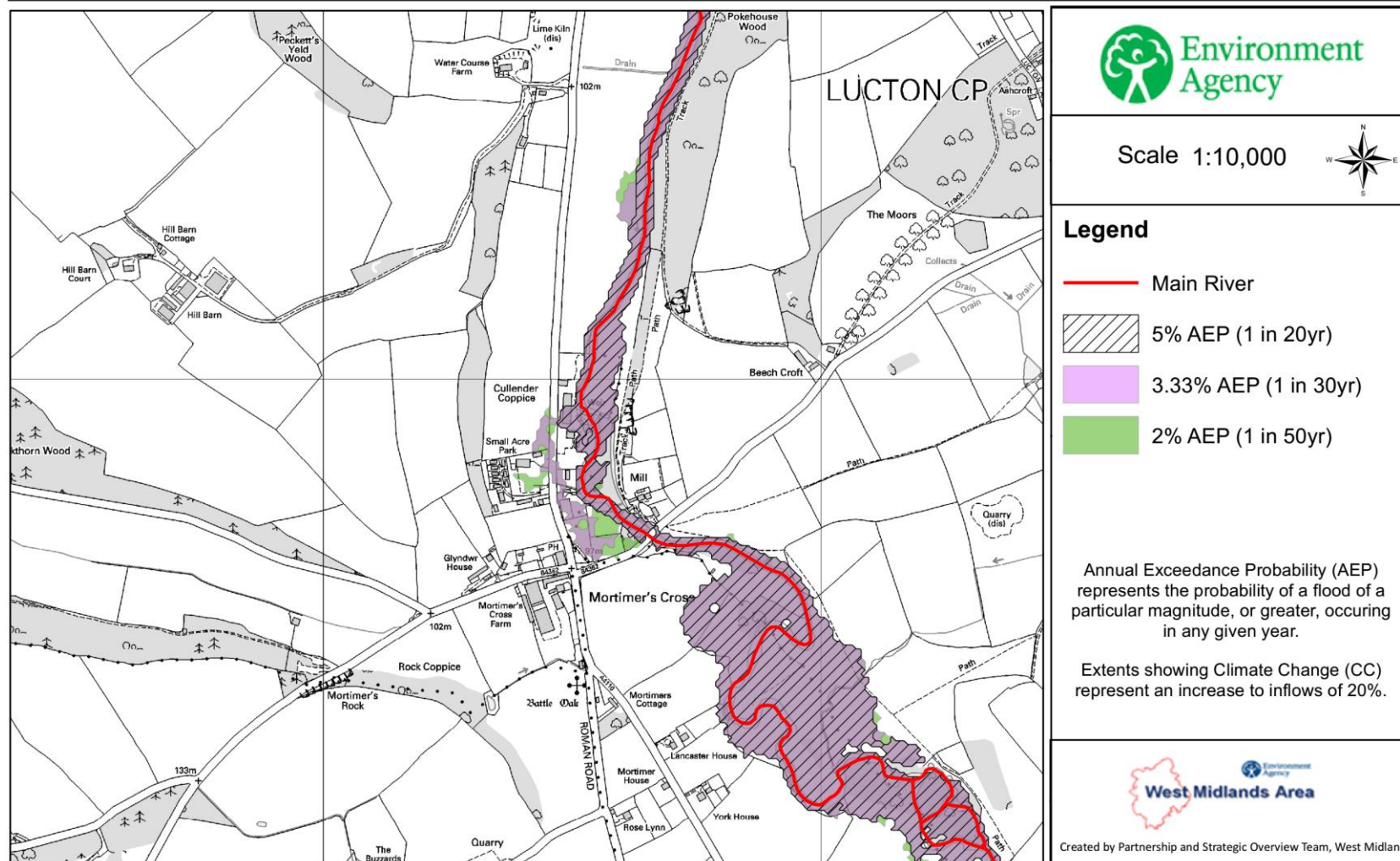
K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

Modelled Flood Outlines Centred on HR6 9PD - Created 08/10/2018 [98304]



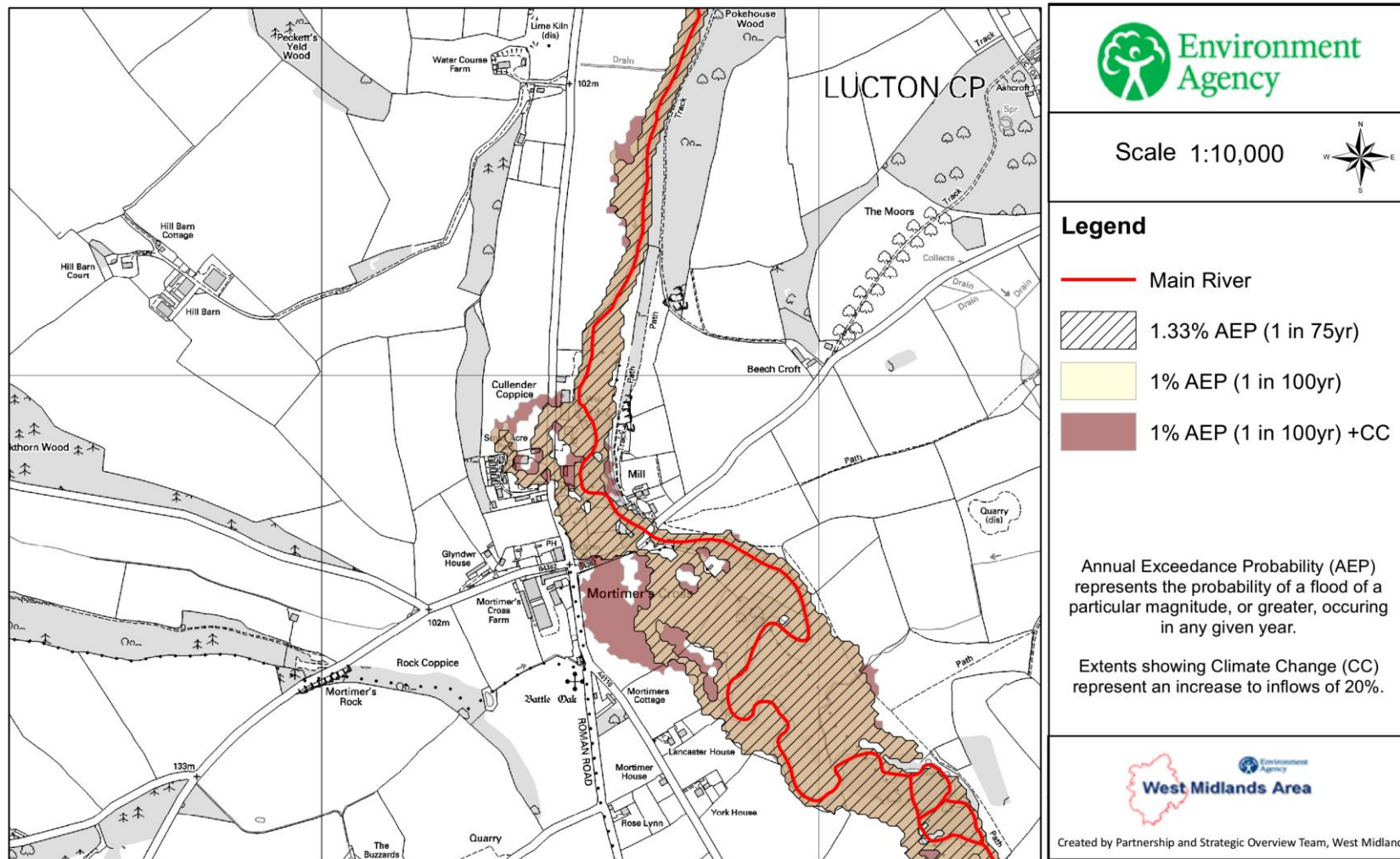
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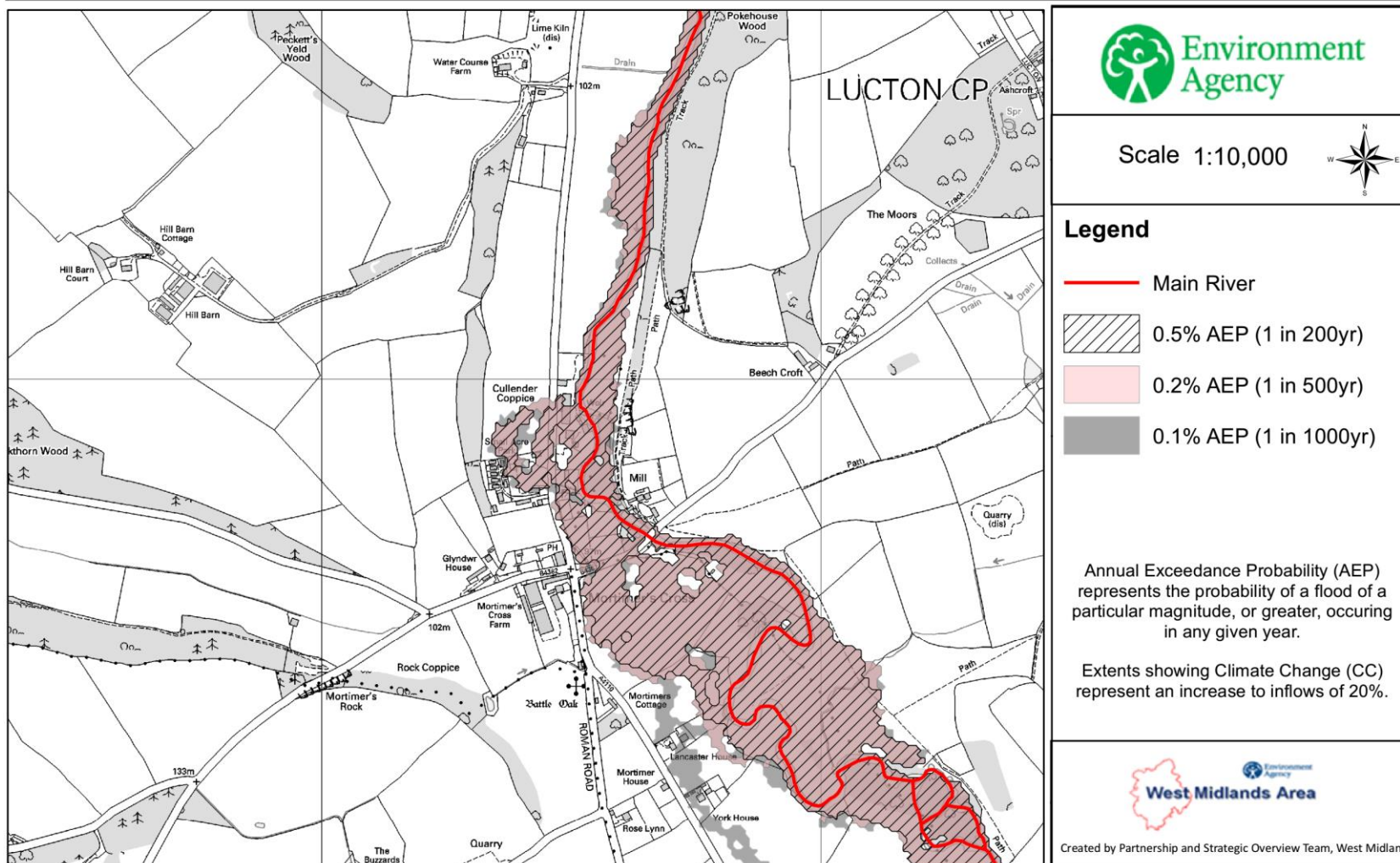
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Appendix E – EA letter to planner WA/2018/125224/03-L01 (22/02/2019)

creating a better place



Reading Borough Council
Development Control
PO Box 17
Reading
Berkshire
RG1 7TD

Our ref: WA/2018/125224/03-L01
Your ref: 180656
Date: 13 February 2019

Dear Sir/Madam

Demolition of existing bungalow and construction of 2x 2 Storey semi-detached houses with associated car parking. Resubmission of 170574

8 Ardler Road, Caversham, Reading, RG4 5AE.

Thank you for your consultation which we received on 22 January 2019. We have reviewed the additional information submitted including the document listed below and have the following comments to make.

- The Flood Risk Assessment, prepared by Hydro-Logic Services, K0902, revision 0, dated January 2019.

Summary

In our response to this application, our reference WA/2018/125224/02-L01, dated 23 October 2018, we objected to this application and recommend refusal of planning permission because of the absence of an acceptable Flood Risk Assessment (FRA). In particular the submitted FRA had failed to assess the impact of climate change using the latest guidance and appropriate climate change allowances, demonstrate if there is any loss of floodplain storage within the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change caused by the proposed development and if so that it can be mitigated for, and provide finished floor levels above the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change plus a 300mm freeboard.

Since our response, we have received additional information as noted above. We are satisfied by the proposed finished floor levels and climate change assessment provided within the Flood Risk Assessment, prepared by Hydro-Logic Services, K0902, revision 0, dated January 2019.

Unfortunately, the proposed floodplain compensation scheme to mitigate for the loss in floodplain storage is not adequate. We therefore **maintain our objection** to this proposal as submitted.

Environment Agency position

In the absence of an acceptable Flood Risk Assessment (FRA) we **object** to this application and recommend that planning permission is refused.

Reason

Cont/d..

K0902_Caversham_Alder_Road_Rep1_Rev1_Issue_20190222

The submitted FRA does not comply with the requirements for site-specific flood risk assessments, as set out in paragraphs 30 to 32 of the Flood Risk and Coastal Change section of the planning practice guidance. The FRA does not therefore adequately assess the development's flood risks. In particular, the FRA fails to:

1. Demonstrate the loss of floodplain storage within the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change caused by the proposed development can be mitigated for.

The proposed development will result in a loss of floodplain storage and will impede flood flows within an area of high flood risk. The applicant has proposed to mitigate for this by using a 500mm layer of voided blocks. This design does not provide sufficient mitigation, as the voided blocks are likely to become silted over time and the voided area does not extend up to the 1% annual probability (1 in 100) flood level with an appropriate allowance for climate change.

Overcoming our objection

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

The applicant should demonstrate that a void can be provided with openings at least 1 metre wide, extending from the existing ground level to above the 1% annual probability (1 in 100) flood level with an appropriate allowance for climate change. There should be 1 metre opening in every 5 metre length of wall on all sides of the building. The void should be open and maintained as such in perpetuity. If the void openings are a security risk, then vertical steel bars placed at 100mm centres can be installed.

Final comments

Once again, thank you for contacting us. Our comments are based on our available records and the information as submitted to us.

We ask to be re-consulted with the results of the FRA. We will provide you with bespoke comments within 21 days of receiving formal re-consultation. Our objection will be maintained until an adequate FRA has been submitted.

If you are minded to approve this planning application contrary to our advice please contact us prior to doing so.

In accordance with the Planning Practice Guidance (Reference ID: 7-043-20140306), please notify us by email within 2 weeks of a decision being made or application being withdrawn. Please provide us with a URL of the decision notice, or an electronic copy of the decision notice or outcome.

If I can be of any further assistance, please contact me directly.

Yours faithfully

Mr Samuel Pocock
Planning Advisor

Direct dial 0208 474 5075

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

End

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