

## Appendix D EA Product 4 Data

Product 4 Data produced by the Environment Agency, reference HNL38511JH, dated 07/03/2017:

- Flood Map for Planning (Rivers and Sea)
- The Thames Estuary 2100 (TE2100) Flood Levels
- Thames Tidal Upstream Inundation Mapping and Levels
- Flood Defence Mapping
- Thames Tidal Breach Mapping

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Product 4 (Detailed Flood Risk) for: Marble Hill Park, Twickenham, TW1 2NL  
Reference: HNL38511JH  
Date: 07/03/2017

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The information provided is based on the best data 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 to the data for this location 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.

## Flood Map Confirmation

### **The Flood Map for Planning (rivers and the sea):**

The Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map shows Flood Zone 3 - areas with a 1% (or 0.5% in tidal areas) chance of flooding in any given year and Flood Zone 2 – areas with a 0.1% chance of flooding in any given year. In addition, the map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at <http://maps.environment-agency.gov.uk>. Select “Flood Map for Planning (Rivers and Sea).”

### **At this Site:**

The Flood Map shows that some of this site lies within Flood Zone 3 - with a 0.5% chance of flooding from the sea (tidal flooding) in any given year. Some of the site also lies within Flood Zone 2 with a 0.1% chance of flooding from rivers (fluvial flooding) and, or the sea (tidal flooding) in any given year

Enclosed is an extract of our Flood Map which shows this information for your area.

### **Method of production**

The Flood Map at this location has been derived using detailed modelling of the tidal River Thames through the Thames Tidal Defences Study completed in 2006 by Halcrow Ltd and fluvial flood zones were derived from the Teddington Fluvial Flood Risk study completed in April 2009 by Halcrow Ltd.

## Model Output Data – Thames Estuary 2100

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the **Thames Estuary 2100 study completed by HR Wallingford in 2008**. The modelled node closest to your site is **2.3a**; the location of these nodes is also shown on the enclosed map.

The TE2100 plan is now live and within it are a set of levels on which the flood risk management strategy is based. The plan is the overarching flood management strategy for the Thames Estuary and therefore any development planning should be based on the same underlying data.

### **What is the difference between the TE2100 levels and the 2008 Joint Probability levels that have previously been provided?**

The values of the two sets of levels are very similar for the present day scenario. However, the TE2100 takes into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels for which we would normally shut the barrier, will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upstream of the barrier will increase and the tidal walls will need to be heightened to match. The levels previously provided do not take this scenario into consideration.

### **Why is there no return period for levels upstream of the barrier?**

The levels upstream of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked and the river maintained to a low level. For this reason the probability of any given water level upstream of the Barrier is controlled and therefore any associated return period becomes irrelevant. The Thames Barrier and associated defence system have a 1 in 1000 standard which means they ensures that flood risk is managed up to an event that has a 0.1% chance of occurring in any given year. The probability of water levels upriver is ultimately controlled by operation of the Thames Barrier.

For further information about the Thames Barrier please visit our website at:

**<http://www.environment-agency.gov.uk/homeandleisure/floods/38353.aspx>**

**TE2100 flood levels:**

Upstream of the Thames Barrier, the levels provided are the highest levels permitted by the Barrier. Downstream of the Thames Barrier they are the 1 in 1000 (0.1%) levels.

In West London, there is a heavy influence from upstream (fluvial) flows. The flood defences are built to manage tidal flood risk only. With very high fluvial flows, the river levels in west London could be above the tidal defence level.

Location	Node	Easting	Northing	Present Day Water Level	Future 2065-2100 Water Level	Future 2100 Water Level
Teddington	2.3	517010	173227	5.8	5.97	6.42
	2.3a	517525	173383	5.77	5.95	6.40
	2.4	517837	173600	5.67	5.93	6.38

**TE2100 defence levels:**

The table below shows both the current defence level, and the TE2100 plan future defence levels. New development should either include future defence raising or demonstrate that future raising has been allowed for.

Note: The defence levels near Teddington may be lower than the water levels because they take into account high fluvial events. The defences are tidal only.

Location	Node	Easting	Northing	Current Defence Levels		Allow for future defence raising (both banks) to a level of...	
				Left	Right	2065-2100	2100
Teddington	2.3	517010	173227	6.02	6.02	6.45	6.90
	2.3a	517525	173383	6.02	6.02	6.45	6.90
	2.4	517837	173600	6.02	6.02	6.45	6.90

## Thames Tidal Breach Modelling

The table below displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Breach Modelling Study 2015 completed by CH2M HILL in March 2015. The exact location of the given site-specific levels and the extent of the breach are shown on the enclosed map.

This modelling simulates tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent. A series of 113 tidal models were developed for the Environment Agency at pre-determined breach locations. These were chosen using a risk-based approach by examining critical locations based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

Based on the 2008 TE2100 in-channel levels, the 0.5% (1 in 200 year) and 0.1% (1 in 1000 year) annual probability of exceedance tidal events were modelled for all breach locations downriver of the Thames Barrier. These were modelled for the 2065 and 2100 epoch which include allowances for climate change.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2065 and 2100 epochs were modelled on that basis.

This site is not located within the outlines of our breach model. No data from the breach models is available for this site.



## Thames Tidal Upstream Inundation Modelling

The enclosed map shows results for the Thames Tidal Upstream Inundation Modelling Study 2015 completed by CH2M HILL in March 2015.

Upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. Therefore 2065 and 2100 epochs were modelled on that basis.

Using the domains updated as part of the Thames Tidal Breach Modelling Study 2015 completed by CH2M HILL in March 2015, the project generated outputs for water depths, velocity, levels and hazard. However the scenario modelled is that the Thames Barrier is operational but all linear defences have been removed. It uses the TE2100 in-channel levels calculated in 2008 and only provides data for embayments upriver of the Thames Barrier.

Point	National Grid Reference		Modelled levels in mAODN	
	Easting	Northing	2065	2100
1	517051	173825	No Flood	No Flood
2	517274	173917	No Flood	No Flood
3	517306	173785	No Flood	No Flood
4	517539	173904	No Flood	No Flood
5	517579	173739	No Flood	No Flood
6	517676	173630	0.652	6.32
7	517503	173514	2.14	6.324
8	517306	173435	2.214	6.43
9	517186	173382	2.22	6.42
10	517094	173520	1.239	6.421
11	517166	173654	No Flood	No Flood
12	517271	173537	0.749	6.775

## Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure they are maintained to a crest level of 6.02 m AODN (the Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. The current condition grade for defences in the area is 2 (Good), on a scale of 1 (very good) to 5 (very poor). For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

<https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx>

Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

<http://www.environment-agency.gov.uk/homeandleisure/floods/125045.aspx>

### **Areas Benefiting from Flood Defences**

Some of this site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences (ABDs) are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year. In areas protected by the Thames Barrier, the ABDs also show where defences protect up to the 0.1% (1 in 1000) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

## Recorded Flood Events Data

We do not hold records of historic flood events from rivers and/or the sea affecting the area local to this site. However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

### **Other Sources of Flood Risk**

The Lead Local Flood Authority for your area are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse) and may hold further information .

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources.

## Additional Information

### Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

#### Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

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

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

<https://www.gov.uk/flood-risk-standing-advice-frsa-for-local-planning-authorities>

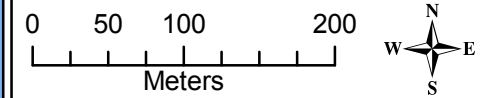
<https://www.gov.uk/government/publications/national-planning-policy-framework-technical-guidance>

<https://www.gov.uk/government/publications/development-and-flood-risk-practice-guide-planning-policy-statement-25>

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.



**Legend**

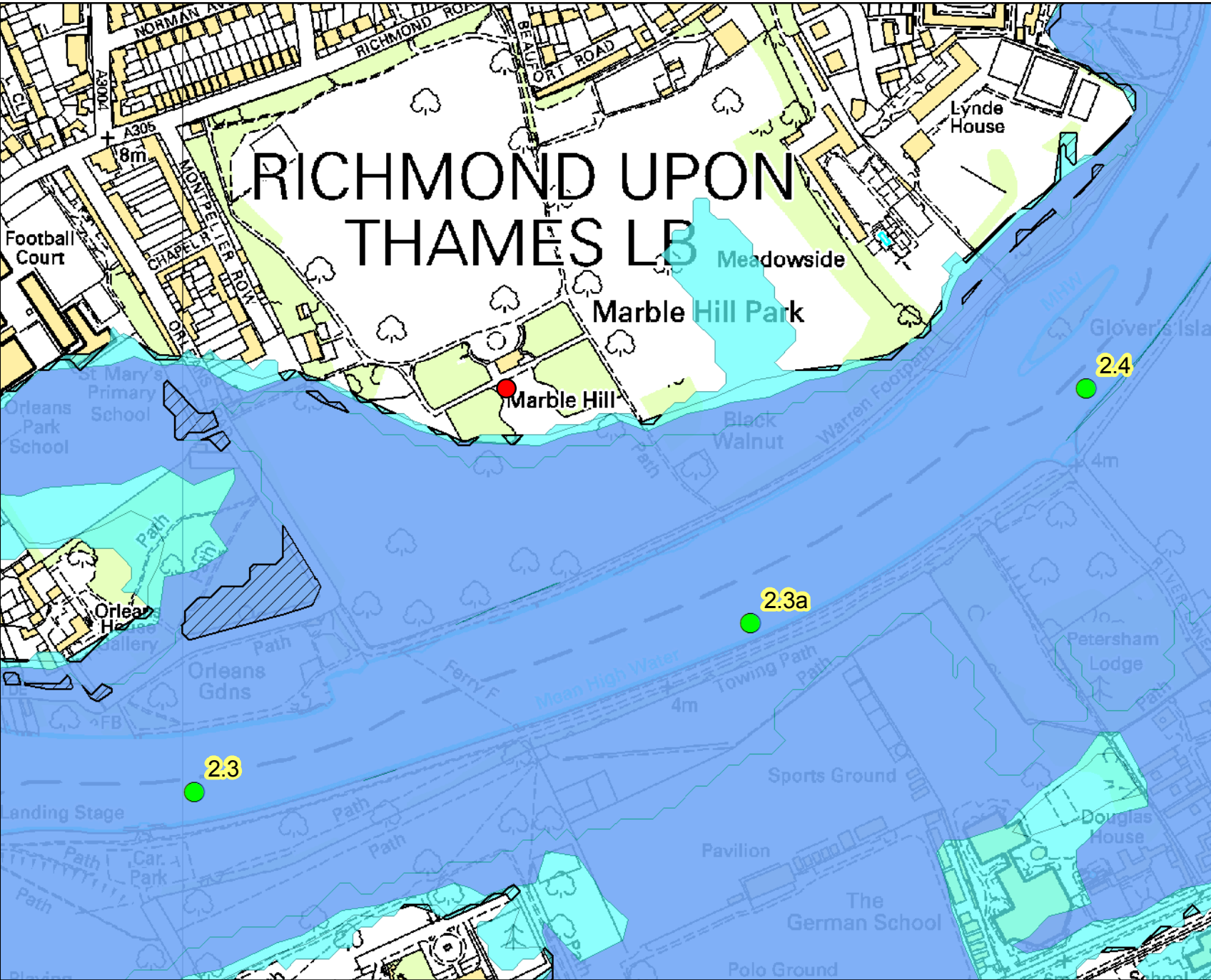
- Site Location
- TE2100Nodes
- 1707 Flood Outline
- 1928 Flood Outline
- 1953 Flood Outline
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

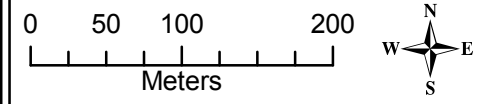
**Flood Map for Planning (assuming no defences)**

**Flood Zone 3** shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

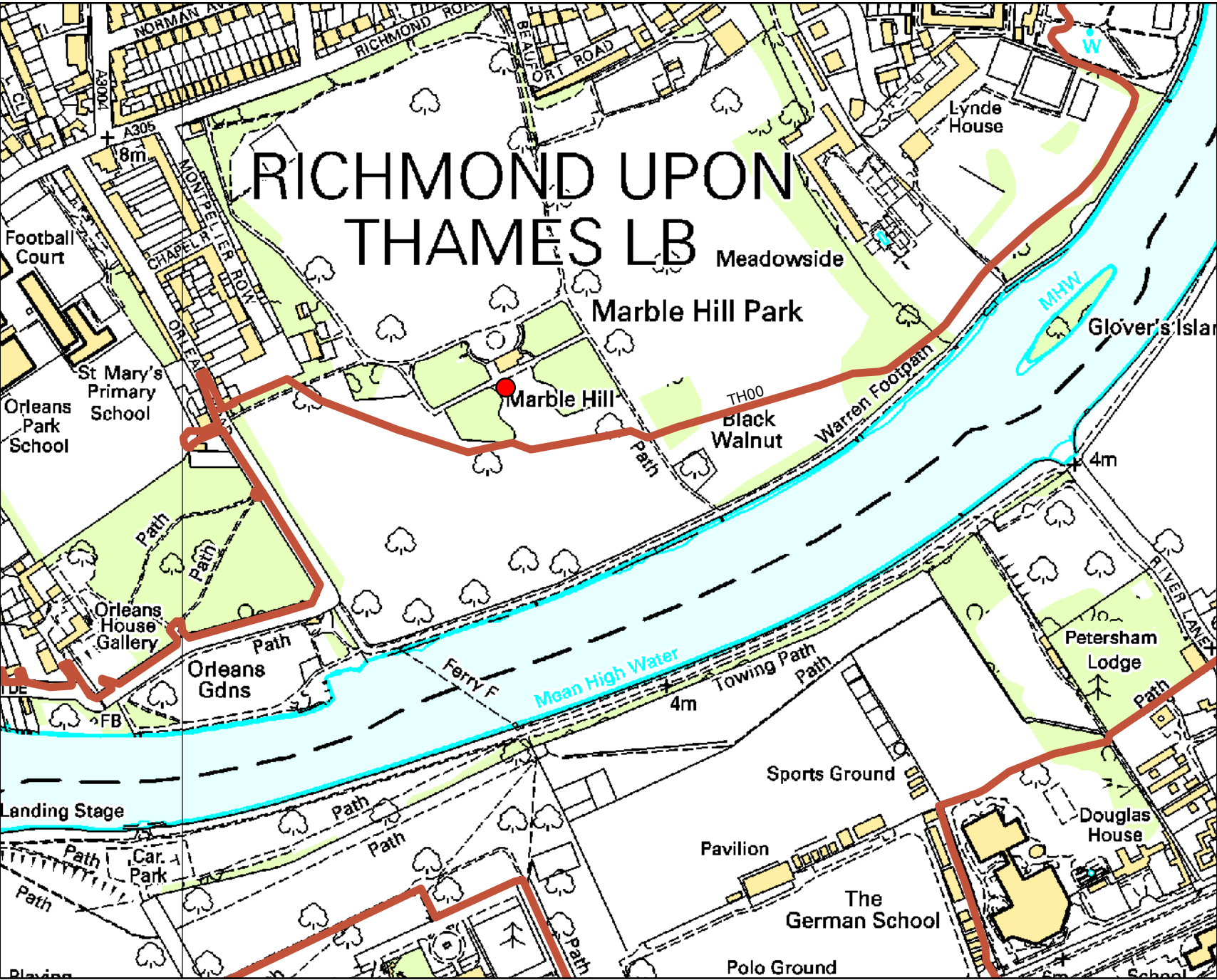
**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.





**Legend**

- Site Location
- 6.02

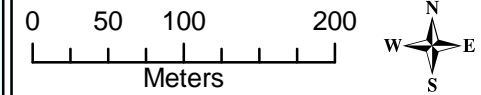


**Flood Map for Planning (assuming no defences)**

**Flood Zone 3** shows the area that could be affected by flooding:  
 - from the sea with a 0.5% or greater chance of occurring each year  
 - or from a river with a 1% or greater chance of occurring each year.

**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

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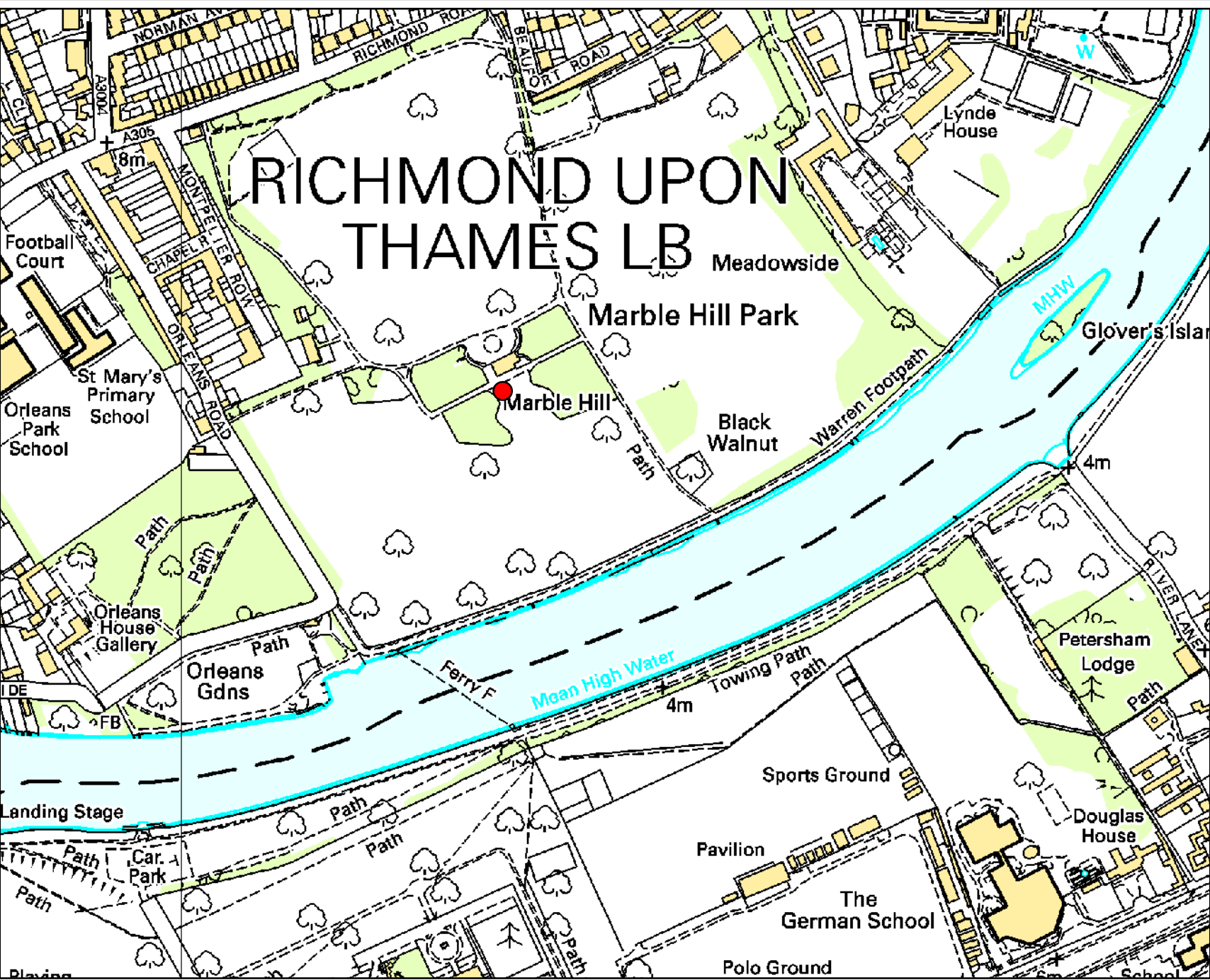
**Legend**

- Site Location
- Upriver MLWL Outlines**
- Epoch**
- 2014
- 2065
- 2100

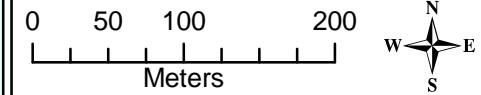
**Thames Tidal Breach Modelling 2015**

A modelled representation of tidal breaches along the Thames from Teddington to the Mar Dyke and River Darent, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epochs 2065 and 2100.

# RICHMOND UPON THAMES LB



Upstream Inundation Modelling Map for: Marble Hill Park, Twickenham, TW1 2NL - 07/03/2016 - HNL38511JH



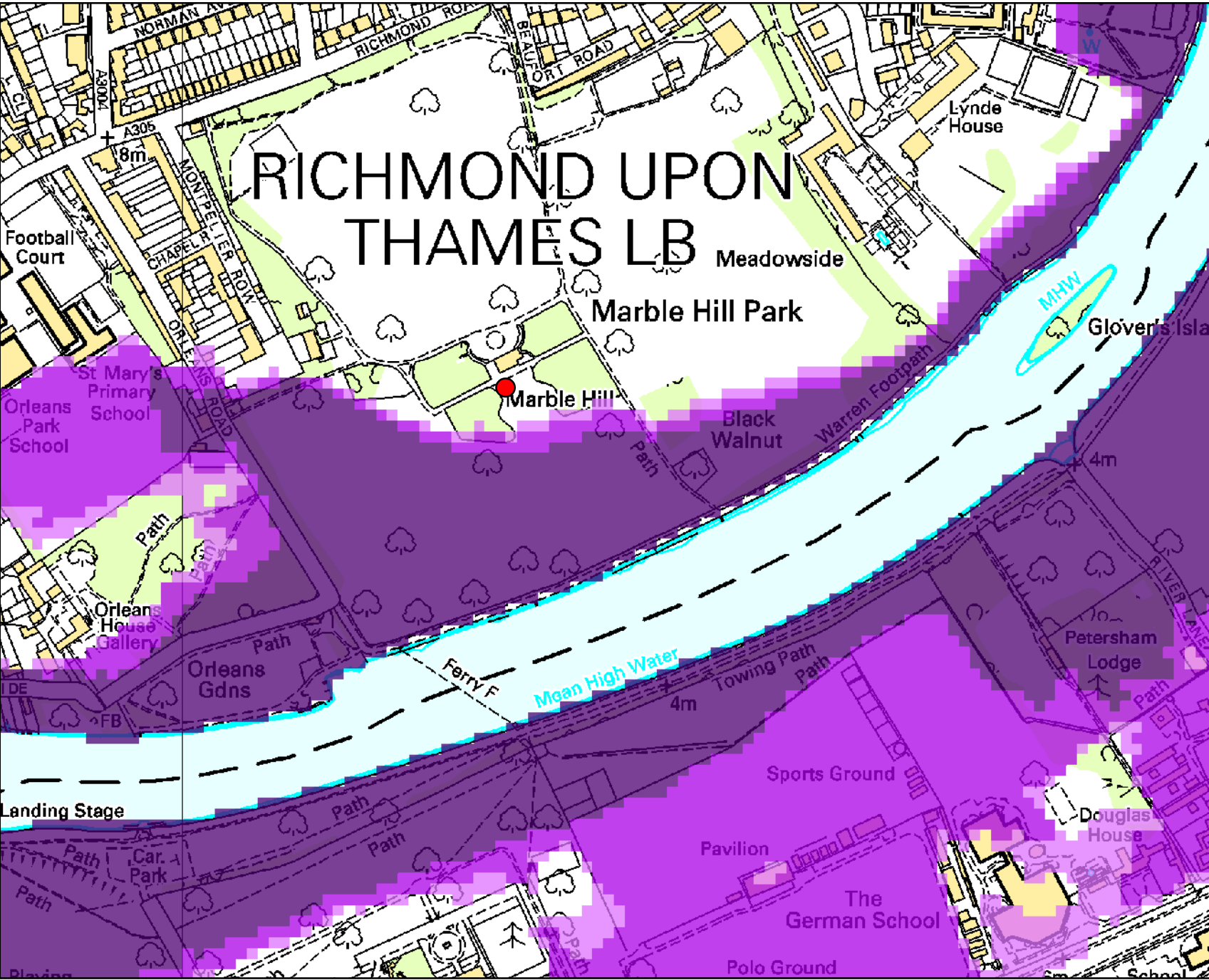
**Legend**

- Site Location
- Upriver MLWL Outlines**
- Epoch**
- 2014
- 2065
- 2100

**Upstream Inundation Modelling 2015**

The modelled scenario is that the Thames Barrier is operational but all linear defences have been removed. The modelling is based on the 2008 TE2100 in-channel levels including an allowance for climate change.

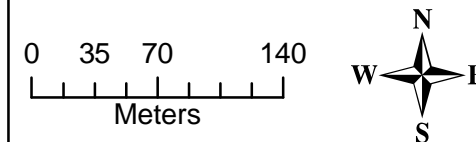
Upstream of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. Therefore 2014, 2065 and 2100 epochs were modelled using Maximum Likely Water Levels (MLWLs).



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Modelled Flood Levels For: Marble Hill Park, Twickenham, TW1 2NL - 07/03/2017 - HNL/38511/JH

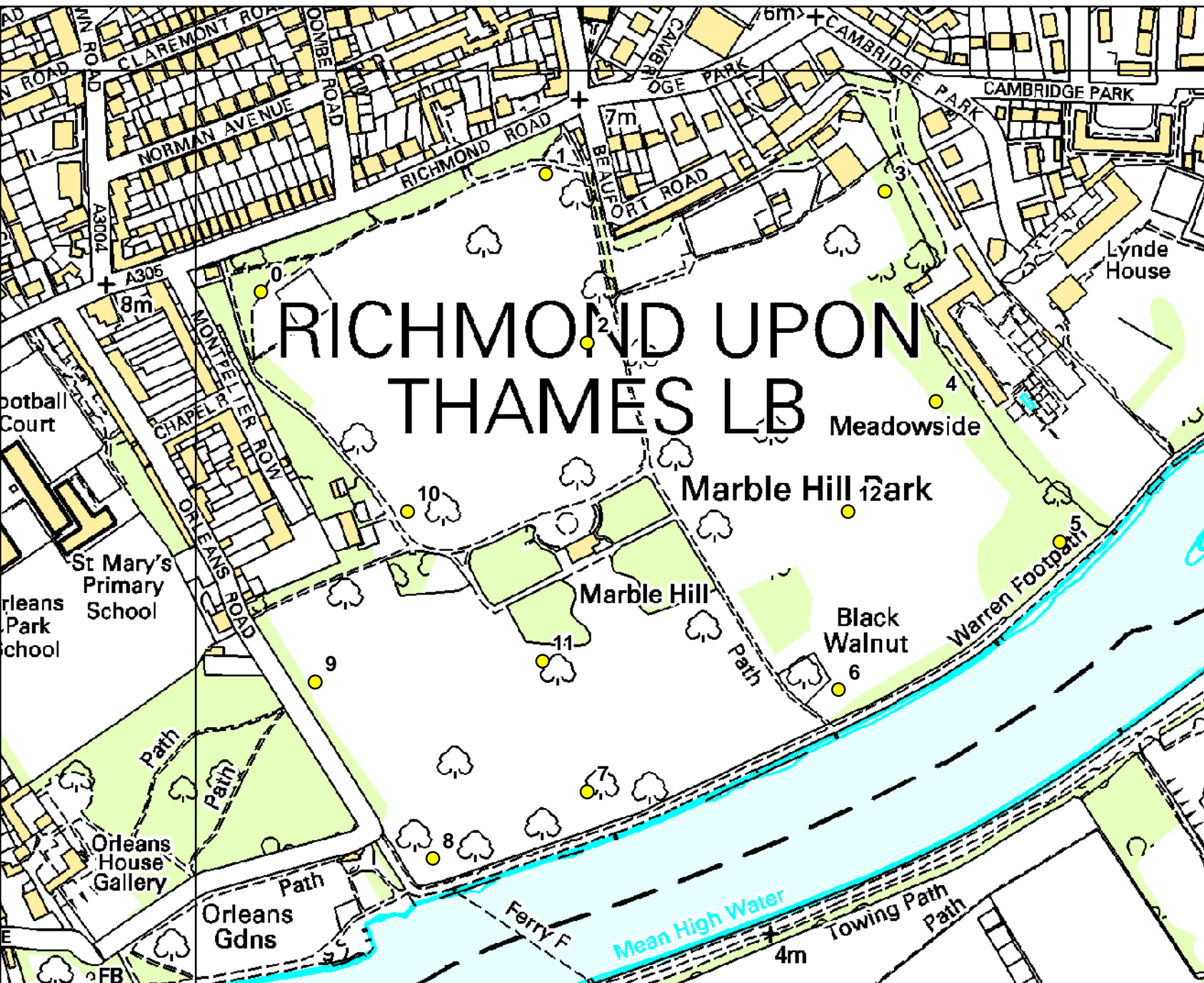


**Legend**

- Site Location
- Points

Upstream Inundation Modelling 2015

The modelled scenario is that the Thames Barrier is operational but all linear defences have been removed. The modelling is based on the 2008 TE2100 in-channel levels including an allowance for climate change. Upstream of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. Therefore 2014, 2065 and 2100 epochs were modelled using Maximum Likely Water Levels (MLWLs).



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