



Thurrock Flexible Generation Plant

**Environmental Statement Volume 6
Appendix 15.2: Flood Zones and Model Data**

Date: January 2020

Environmental Impact Assessment

Environmental Statement

Volume 6

Appendix 15.2

Report Number: HLEF 74017

Version: Final

Date: January 2020

This report is also downloadable from the Thurrock Flexible Generation Plant website at:
<http://www.thurrockpower.co.uk>

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Contributors: -

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Summary

This document presents publicly available data used to inform the assessment in Volume 3, Chapter 15: Hydrology and Flood Risk.

Qualifications

This document has been prepared by Jonathan Morley, a Principal Consultant, who has 12 years’ experience of environmental impact assessment.

It has been checked by Ola Holmstrom who is a Chartered Engineer with over 20 years’ professional experience in consultancy in the UK.

1. Introduction

1.1.1 This appendix (appendix 15.2) presents the Environment Agency (EA) indicative Flood Zone information for the hydrology and flood risk study area for Thurrock Flexible Generation Plant (as defined in Volume 3, Chapter 15: Hydrology and Flood Risk).

1.1.2 EA Flood Zone mapping has been used to inform the baseline and impact assessment of flood risk associated with the Thurrock Flexible Generation Plant presented in Volume 3, Chapter 15: Hydrology and Flood Risk.

1.1.3 The EA indicative Flood Zones show the probability of river and sea flooding, and do not consider the presence of defences. They are shown on the EA's Flood Map for Planning (Rivers and Sea)¹. Flood Zone definitions are:

- Zone 1 Low Probability Land which has a less than 1 in 1,000 annual probability of river or sea flooding;
- Zone 2 Medium Probability Land which has between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding;
- Zone 3a High Probability Land which has a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding; and
- Zone 3b The Functional Floodplain which comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the EA.

1.1.4 The majority of the hydrology and flood risk study area is categorised as Zone 2 and 3, as shown in Section 2 – EA flood maps. Note that these maps shown an earlier iteration of the proposed development boundary but do include the entire area of the current application boundary, which is shown in Volume 2, Chapter 2: Project Description of the ES.

1.1.5 The EA flood maps show the location of main rivers, and ordinary watercourses, including Lead Local Flood Authority (LLFA) watercourses within the hydrology and flood risk study area. They are defined as:

- Main rivers – watercourses where the EA has permissive powers over their management; and

- Ordinary watercourses – includes rivers, streams, ditches, drains which do not form part of a main river and are managed by Essex County Council, as Lead Local Flood Authority.

1.1.6 The main rivers are listed in Table 1.1.

Table 1.1: Main Rivers or IDB watercourses in the hydrology and flood risk study area.

Watercourse name	EA main river or LLFA watercourse
West Tilbury Drain	EA
Mardyke & Fobbing	EA
River Thames	EA

1.1.7 Section 3 presents the tidal breach model outputs extracted from the Thurrock Strategic Flood Risk Assessment (June 2018).

¹ <http://environment.data.gov.uk/ds/catalogue/index.jsp#/catalogue>

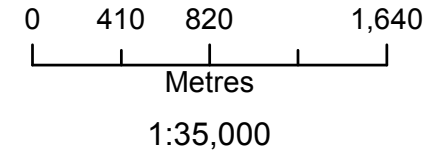
2. EA flood maps

Flood Map for Planning centred on 566300,176685







Created 23/07/2018 - Ref: EAn/2018/92748



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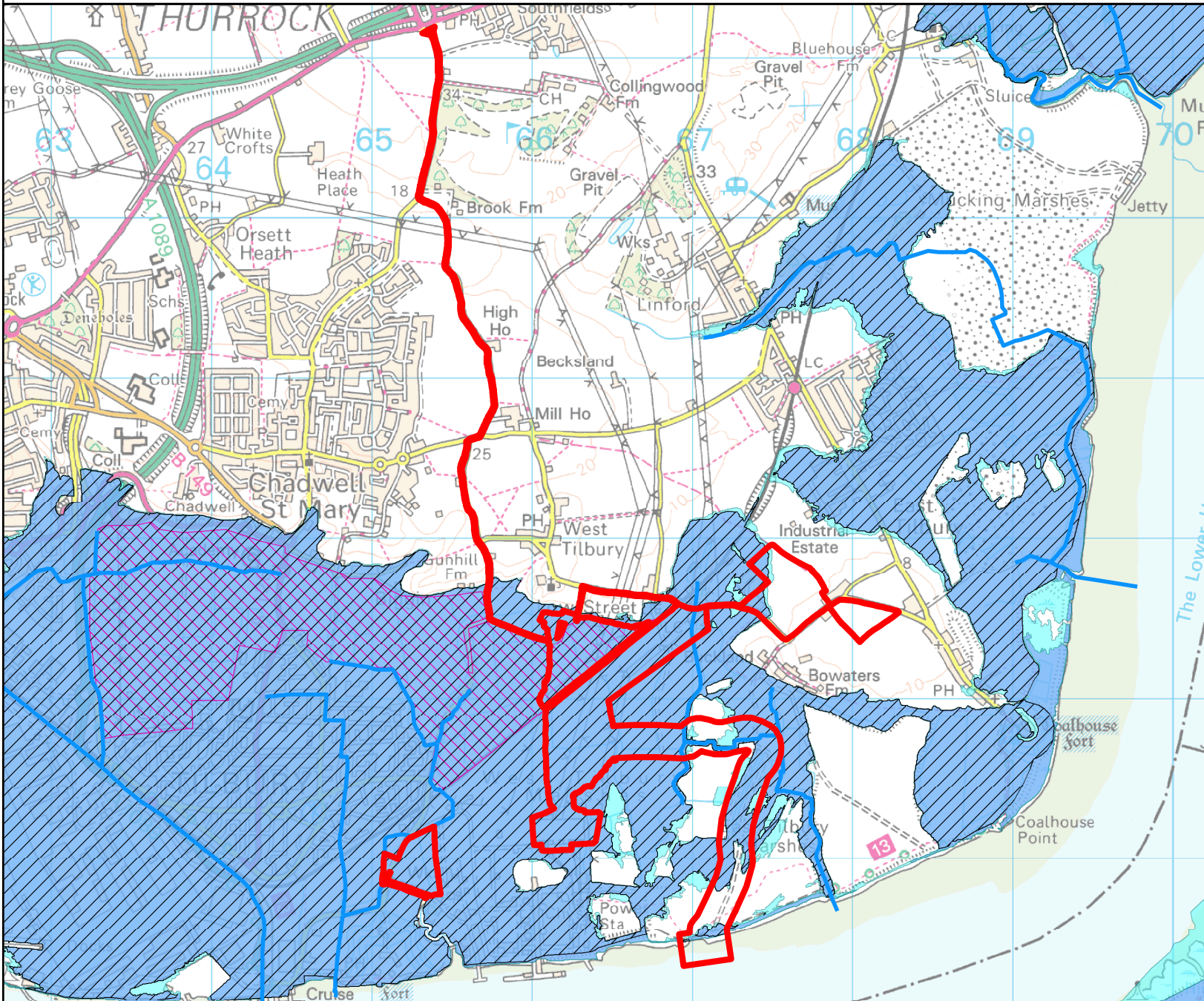
Legend

-  Site Location
-  Main Rivers
-  Areas Benefiting from Defence
-  Flood Storage Area
-  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 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.

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.

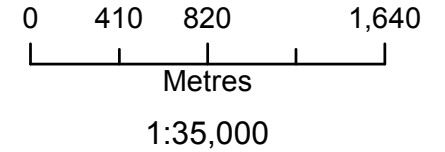


Recorded Flood Events Outlines Map centred on 566300,176685




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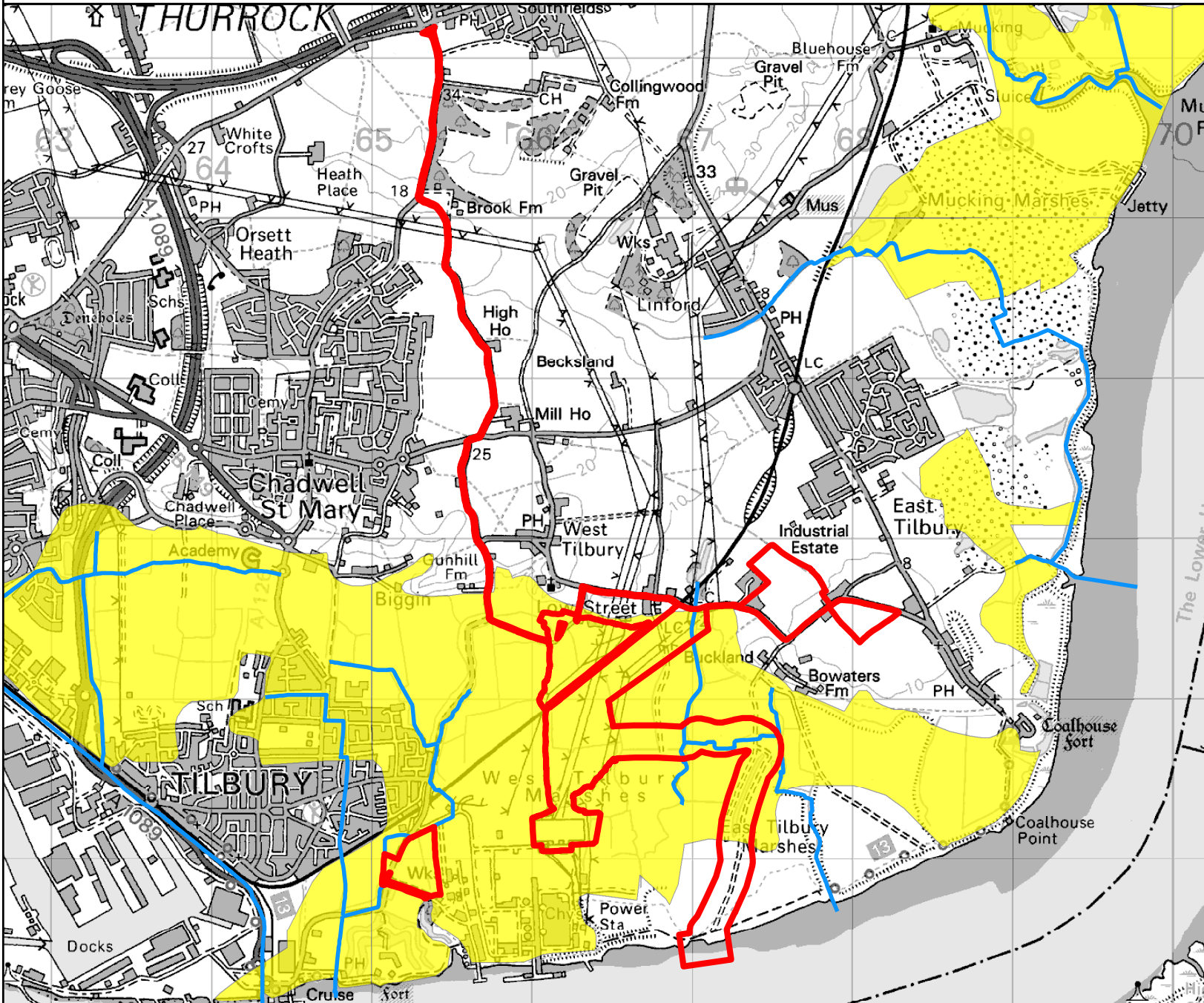


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Legend

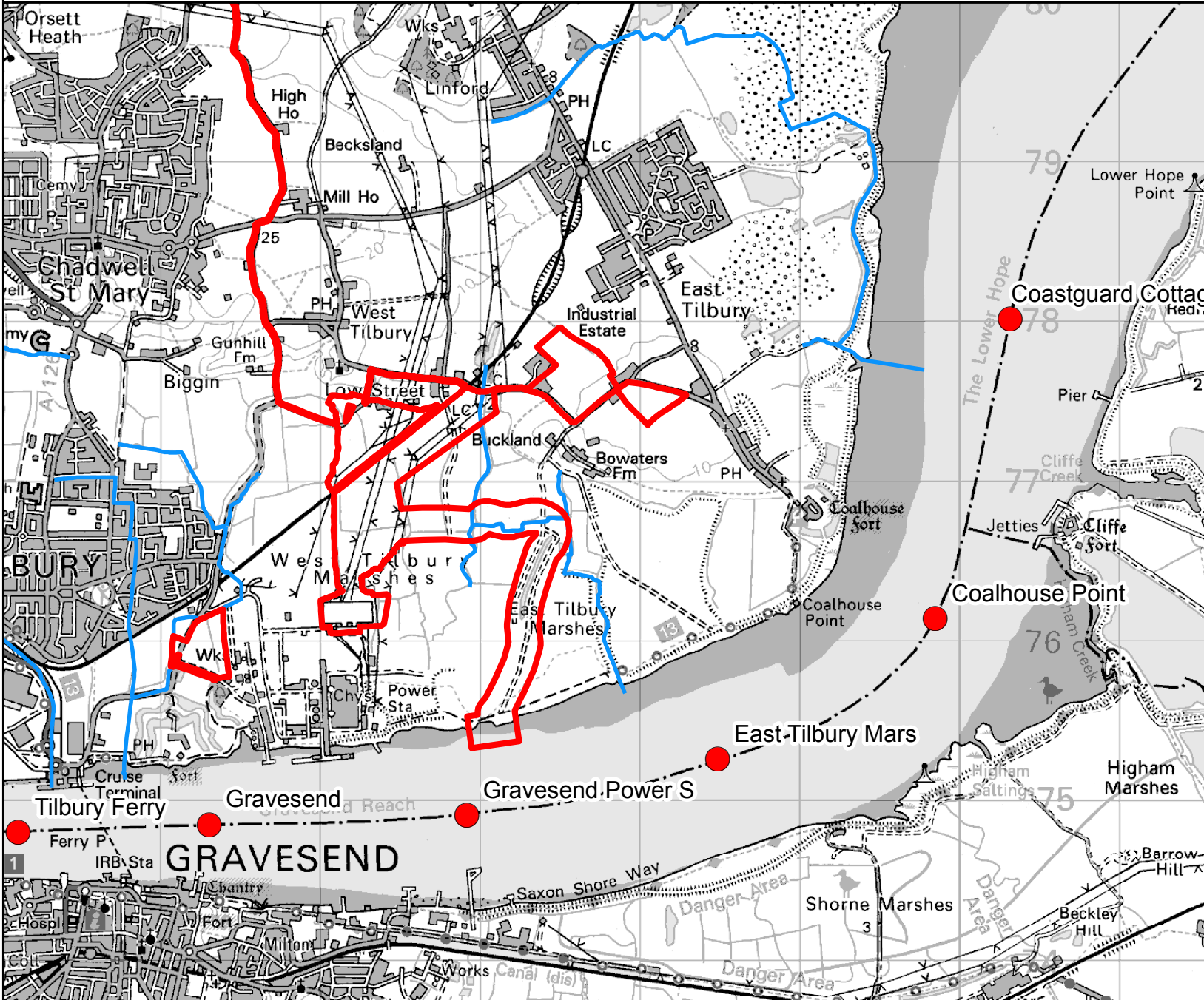
-  Site Location
-  Main Rivers
-  1953 Outline



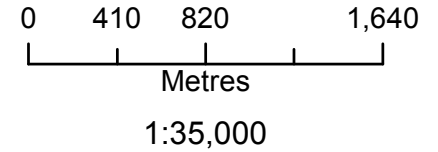
The historic flood event outlines are based on a combination of anecdotal evidence, Environment Agency staff observations and survey. Our historic flood event outlines do not provide a definitive record of flooding. It is possible that there will be an absence of datain places where we have not been able to record the extent of flooding. It is also possible for errors occur in the digitisation of historic records of flooding.

Thames TE2100 Nodes

Map centred on 566300,176685 Created 23/07/2018 - Ref: EAn/2018/92748



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Legend

- TE2100 Nodes
- Site Location
- Main Rivers

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences if present.

3. Thurrock Strategic Flood Risk Assessment (June 2018)

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Breach Location
- Maximum Modelled Flood Depth(m)**
- 0m to <= 1m
- > 1m to <= 2m
- > 2m to <= 3m
- > 3m to <= 4m
- > 4m to <= 5m
- > 5m

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

It should be noted that the breach widths and depths, though based on available guidance, are arbitrary and do not necessarily represent the actual dimensions of a potential breach at a given location.

A description of the modelling methodology and assumptions is including in the accompanying 'Breach Modelling Technical Note' (AECOM 2017).

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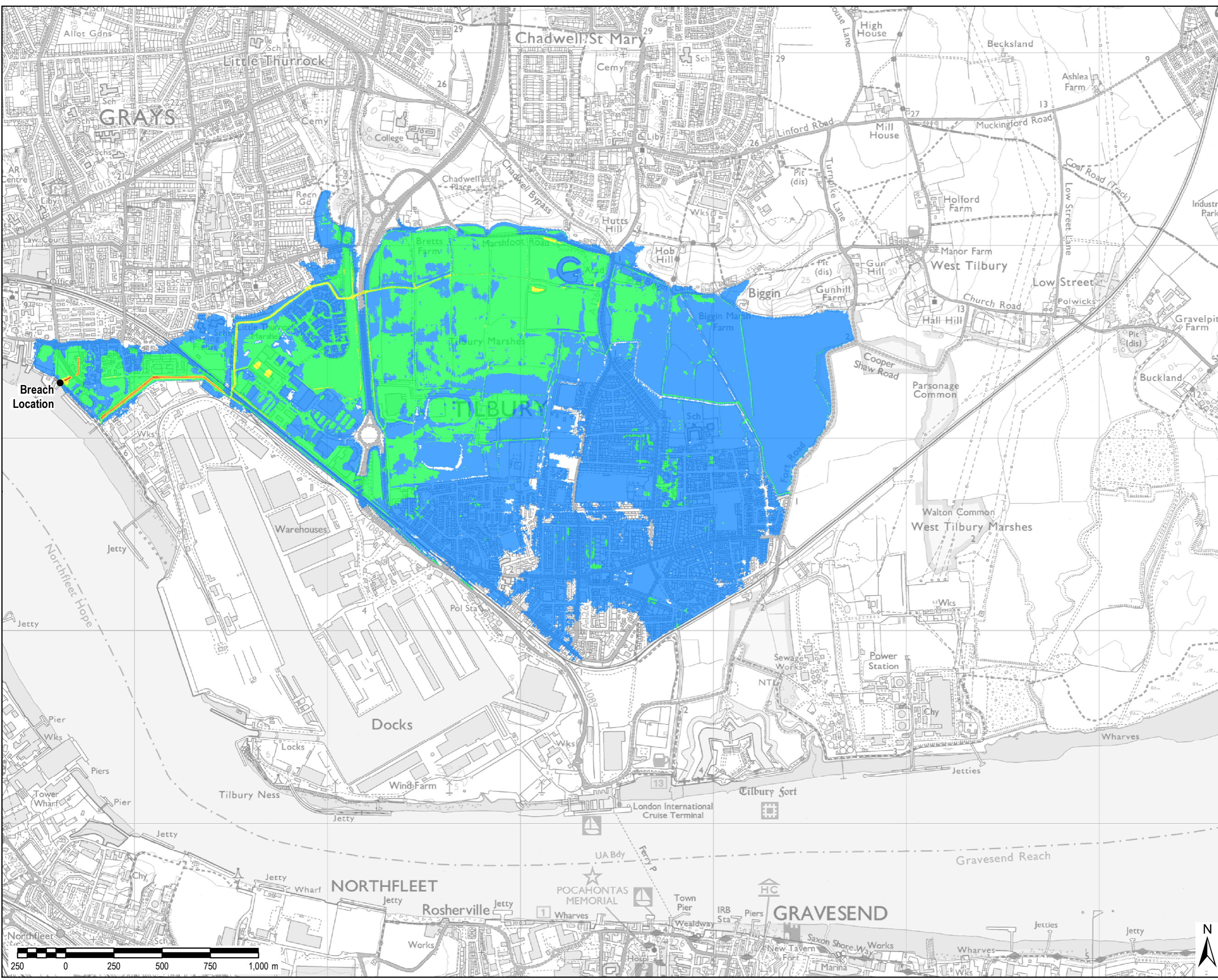
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MAXIMUM MODELLED FLOOD DEPTH FROM A BREACH AT TIL001 IN A 0.5% (1 IN 200 + CC YEAR) AEP EVENT IN 2116

Drawn JW	Checked BB	Approved HJ	Date 09/03/2018
AECOM Internal Project No. 60492009		Scale @ A3 1:18,000	

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LEGEND

- Breach Location
- Maximum Flood Hazard(m)**
- Low Hazard
- Moderate Hazard (Danger to Some)
- Significant Hazard (Danger to Most)
- Extreme Hazard (Danger to All)

NOTES

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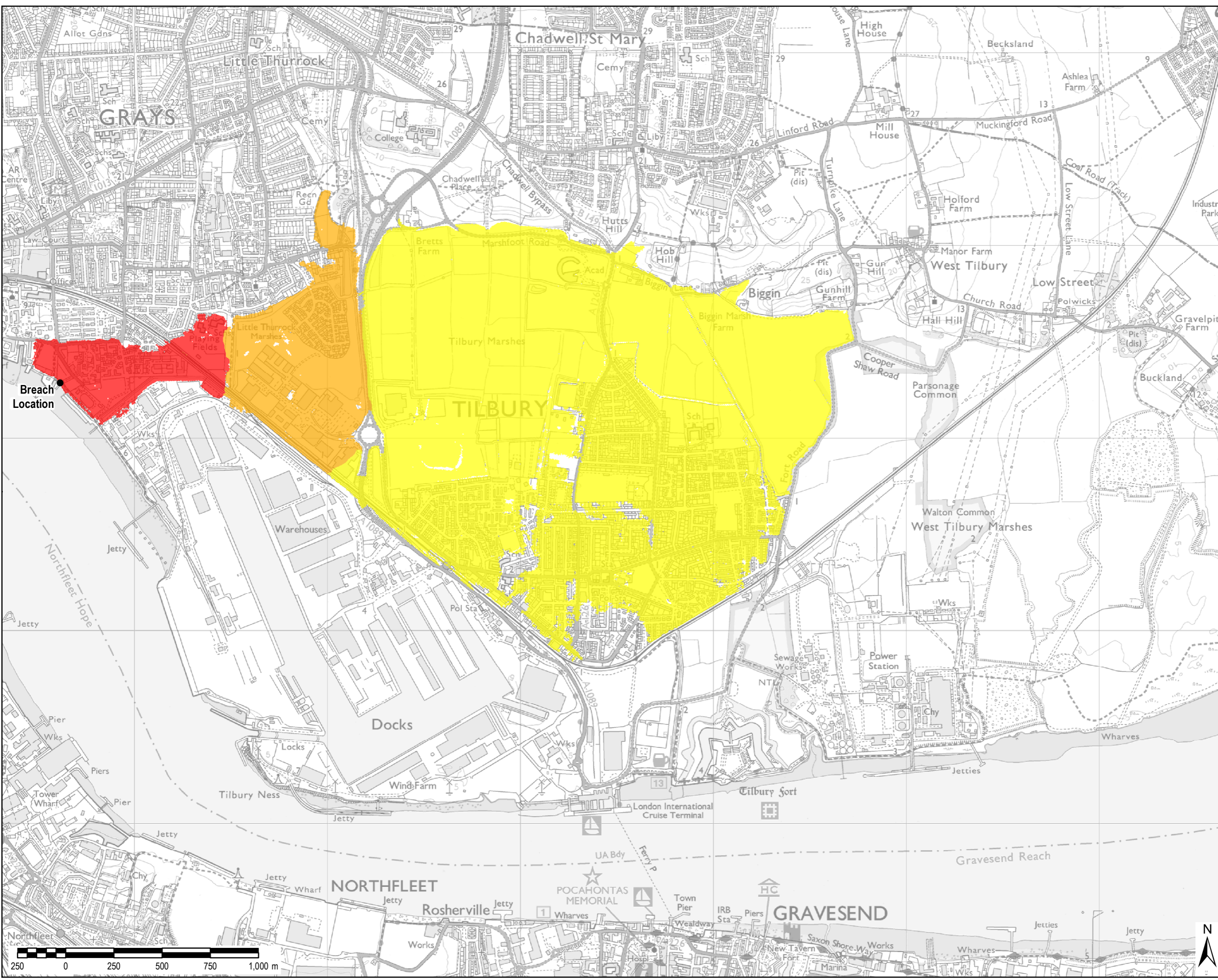
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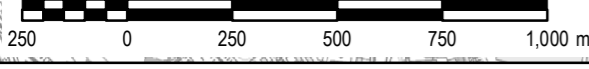
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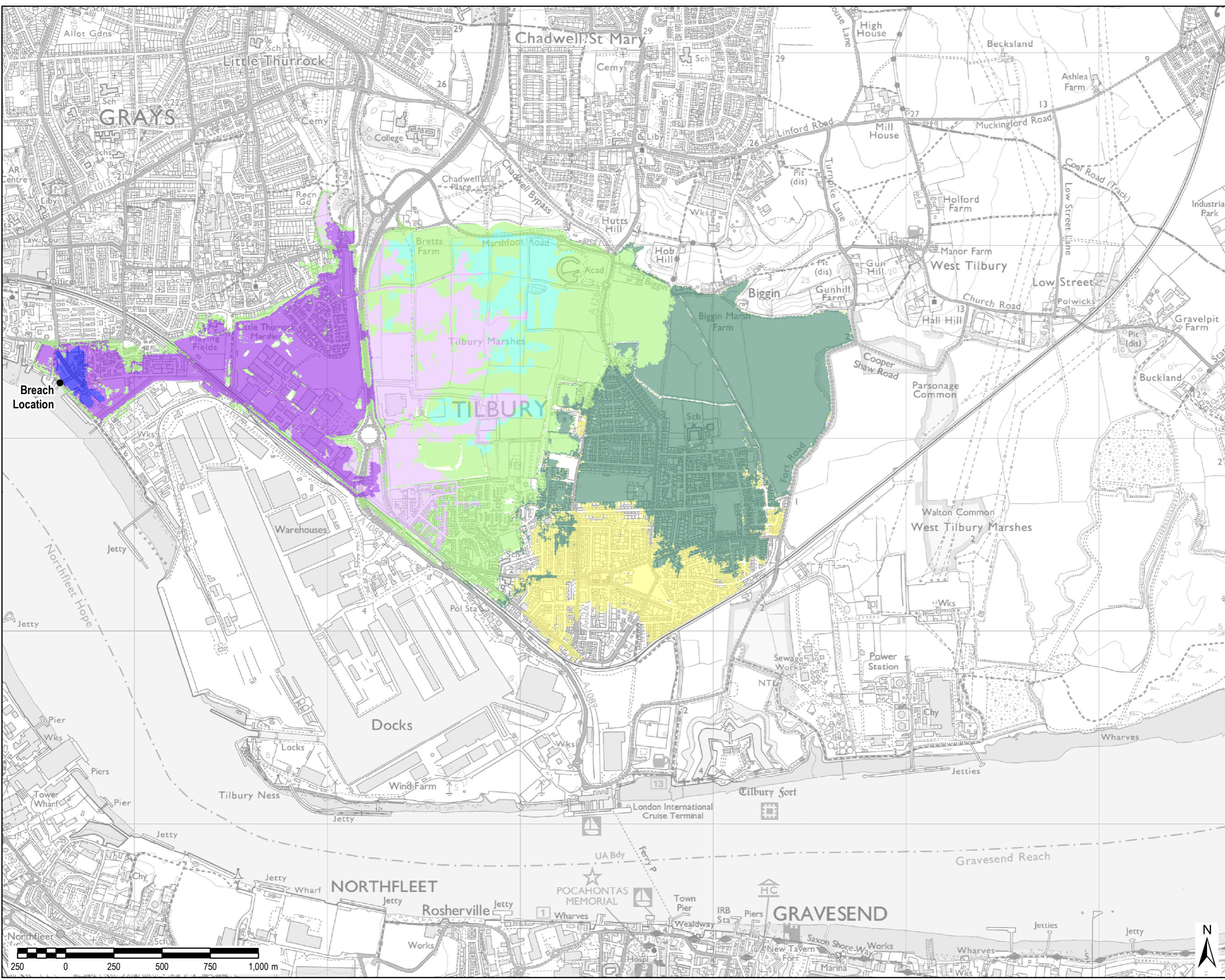
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LEGEND

- Breach Location
- Time to Inundation**
- ≤ 1 Hour
- > 1 to 4 Hours
- > 4 to 8 Hours
- > 8 to 12 Hours
- > 12 to 16 Hours
- > 16 to 20 Hours
- > 20 Hours

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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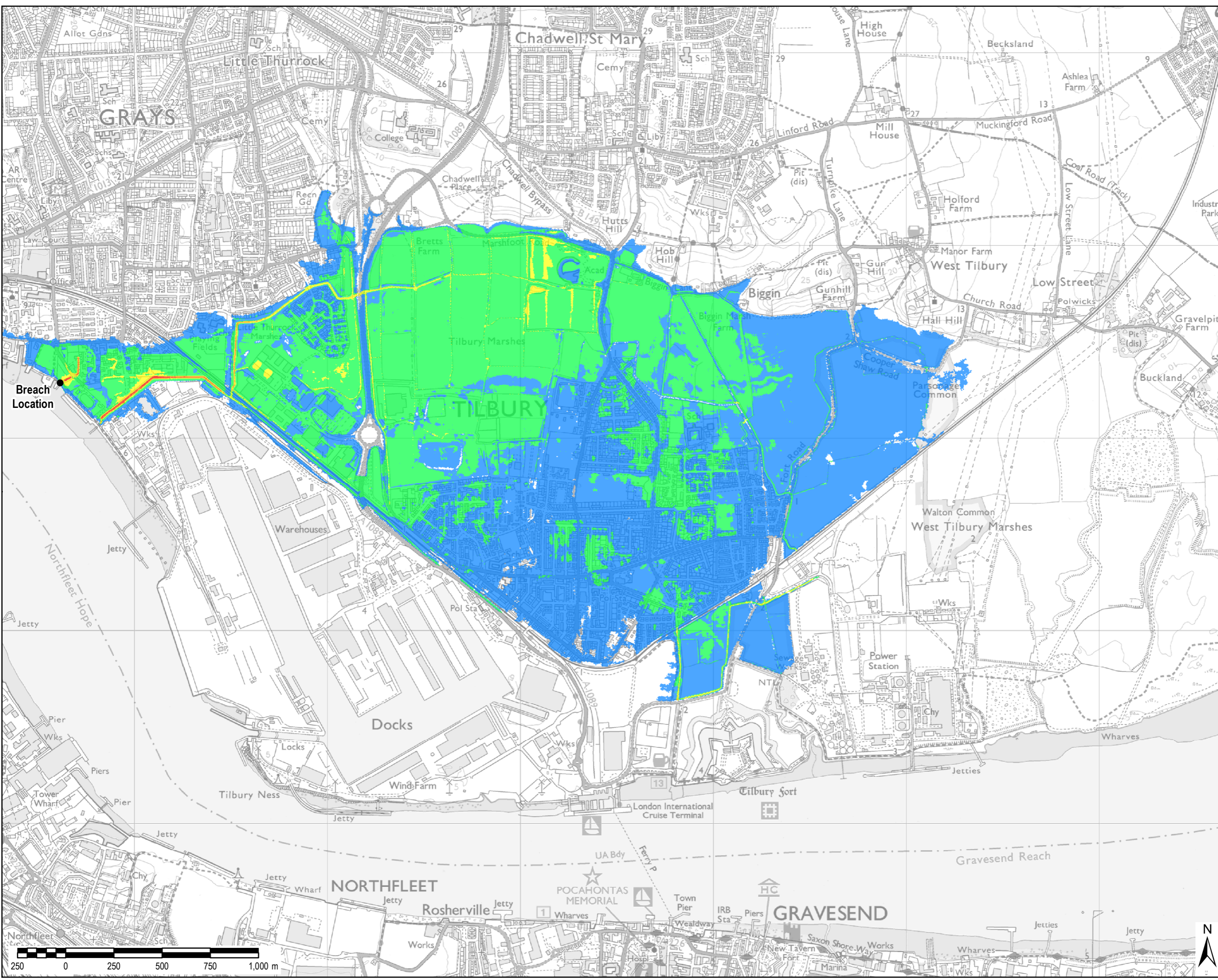
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LEGEND

- Breach Location

Maximum Modelled Flood Depth(m)

- 0m to <= 1m
- > 1m to <= 2m
- > 2m to <= 3m
- > 3m to <= 4m
- > 4m to <= 5m
- > 5m

NOTES

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LEGEND

- Breach Location
- Maximum Flood Hazard(m)**
- Low Hazard
- Moderate Hazard (Danger to Some)
- Significant Hazard (Danger to Most)
- Extreme Hazard (Danger to All)

NOTES

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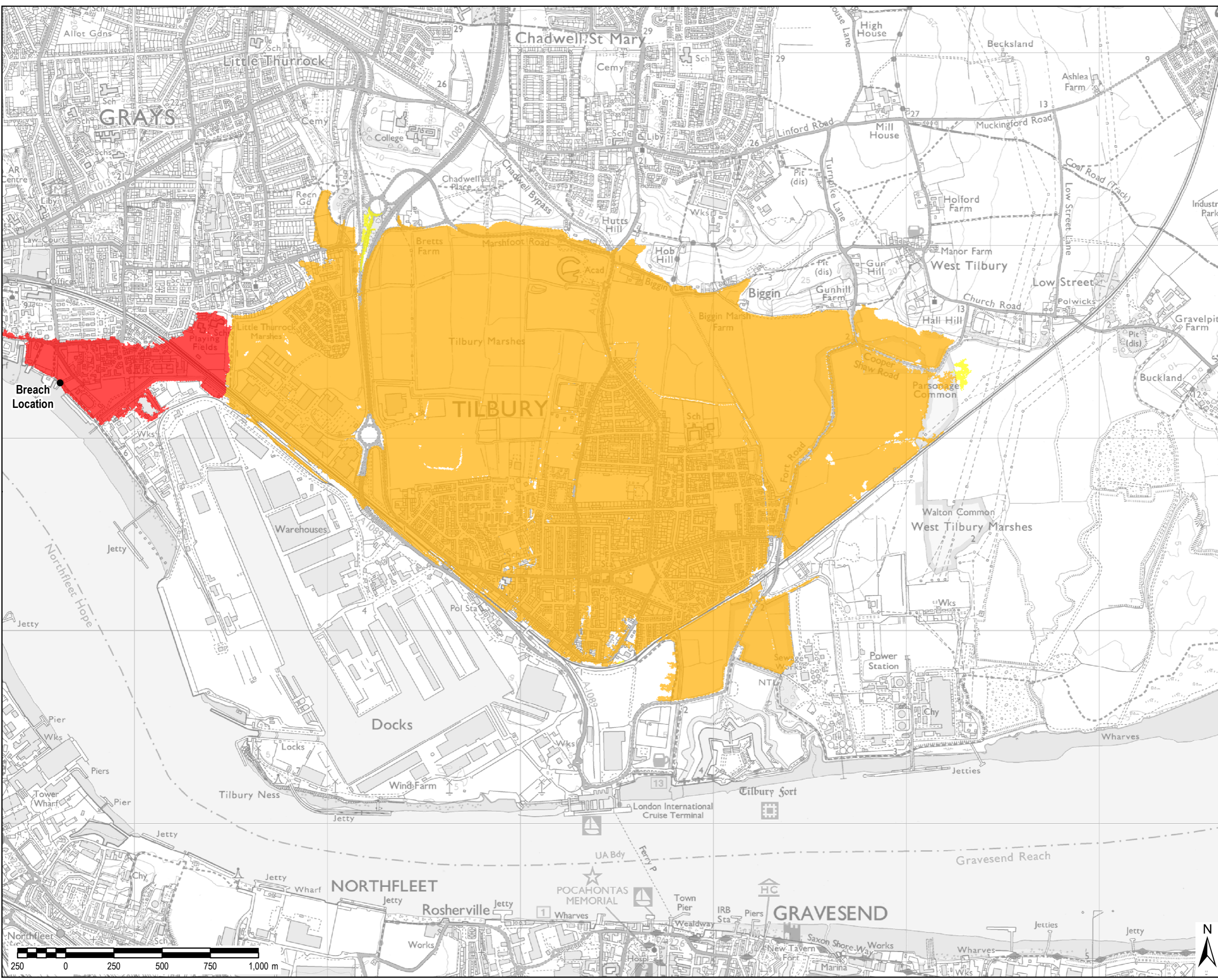
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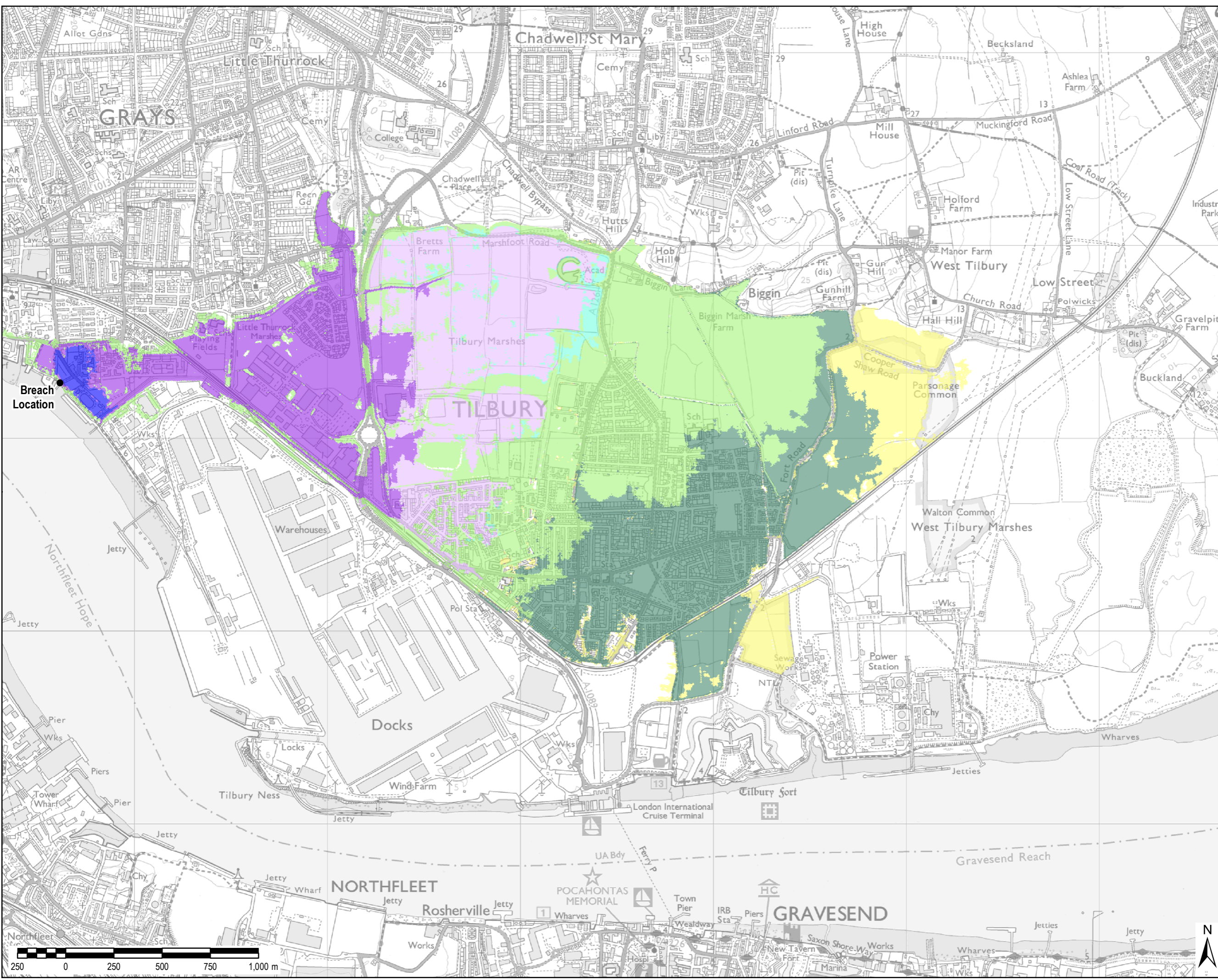
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LEGEND

- Breach Location

Time to Inundation

- Blue: <= 1 Hour
- Purple: > 1 to 4 Hours
- Light Purple: > 4 to 8 Hours
- Cyan: > 8 to 12 Hours
- Light Green: > 12 to 16 Hours
- Dark Green: > 16 to 20 Hours
- Yellow: > 20 Hours

NOTES

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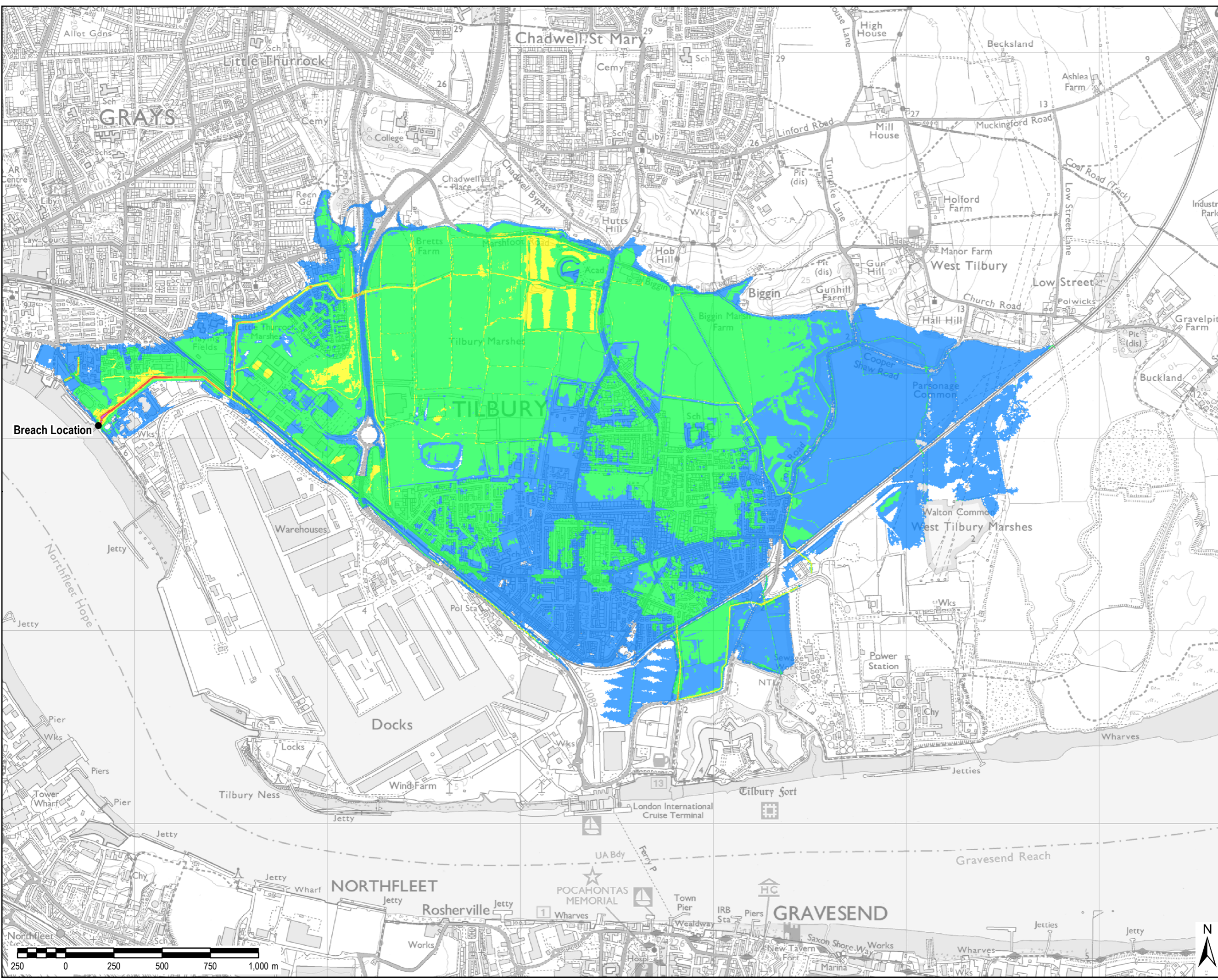
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LEGEND

- Breach Location

Maximum Modelled Flood Depth(m)

- 0m to <= 1m
- > 1m to <= 2m
- > 2m to <= 3m
- > 3m to <= 4m
- > 4m to <= 5m
- > 5m

NOTES

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LEGEND

- Breach Location
- Maximum Flood Hazard(m)**
- Low Hazard
- Moderate Hazard (Danger to Some)
- Significant Hazard (Danger to Most)
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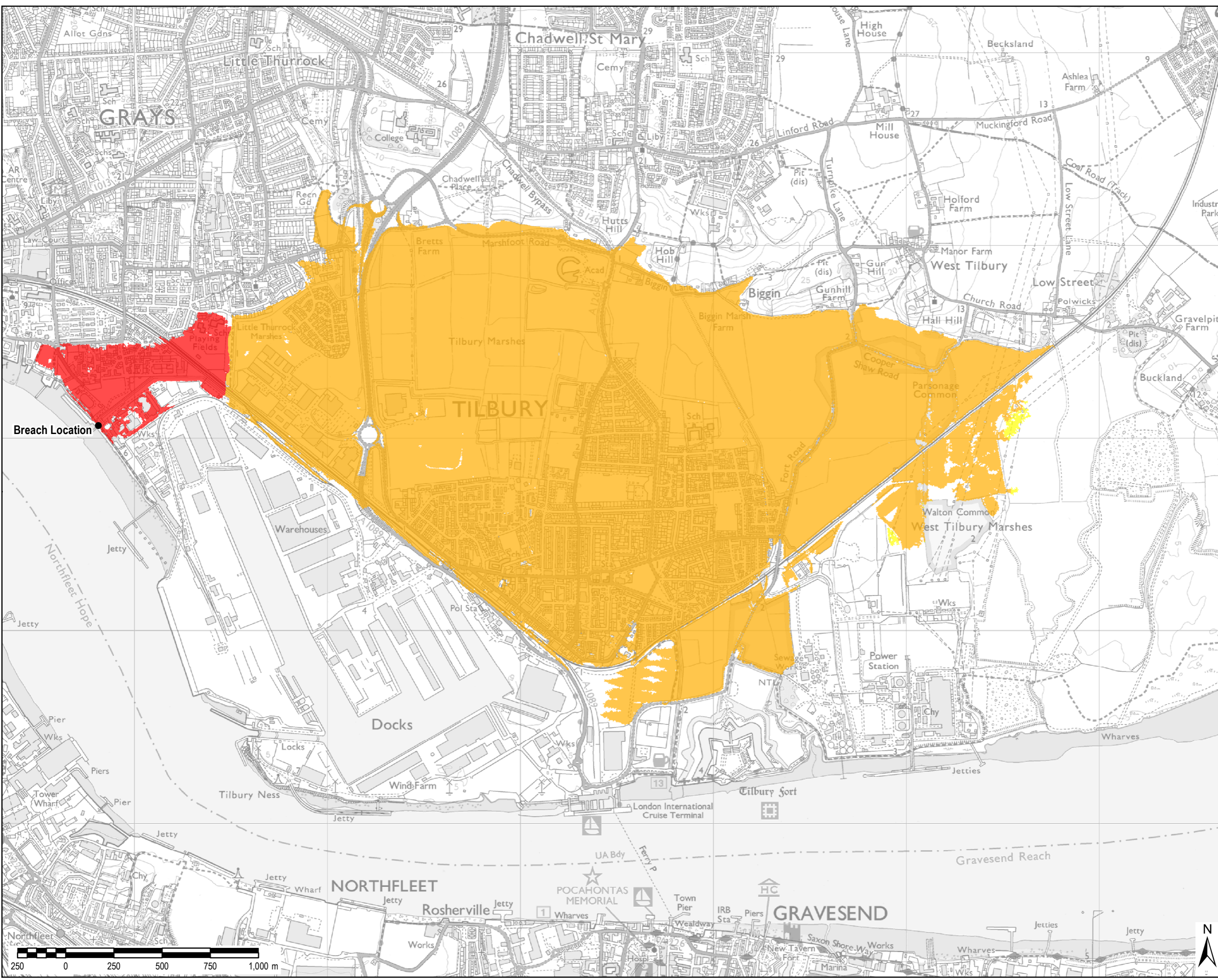
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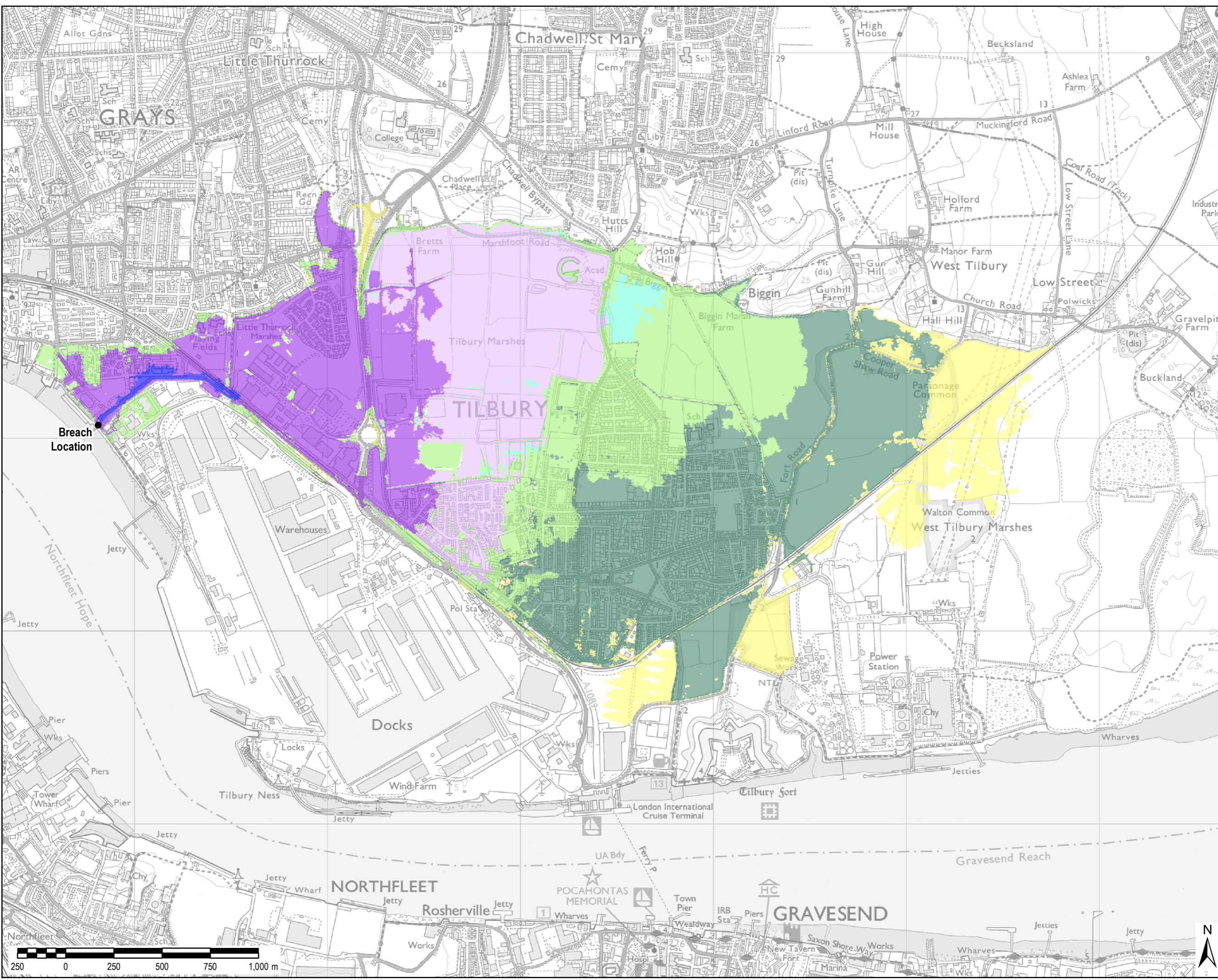
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LEGEND

- Breach Location
- Time to Inundation**
- ≤ 1 Hour
- > 1 to 4 Hours
- > 4 to 8 Hours
- > 8 to 12 Hours
- > 12 to 16 Hours
- > 16 to 20 Hours
- > 20 Hours

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

It should be noted that the breach widths and depths, though based on available guidance, are arbitrary and do not necessarily represent the actual dimensions of a potential breach at a given location.

A description of the modelling methodology and assumptions is included in the accompanying 'Breach Modelling Technical Note' (AECOM 2017).

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Purpose of Issue **FINAL**

Client **THURROCK COUNCIL**

Project Title **THURROCK COUNCIL LEVEL 1 SFRA**

Drawing Title **TIME TO INUNDATION MODELLED FROM A BREACH AT TIL002 IN A 0.5% (1 IN 200 +CC YEAR) AEP EVENT IN 2116**

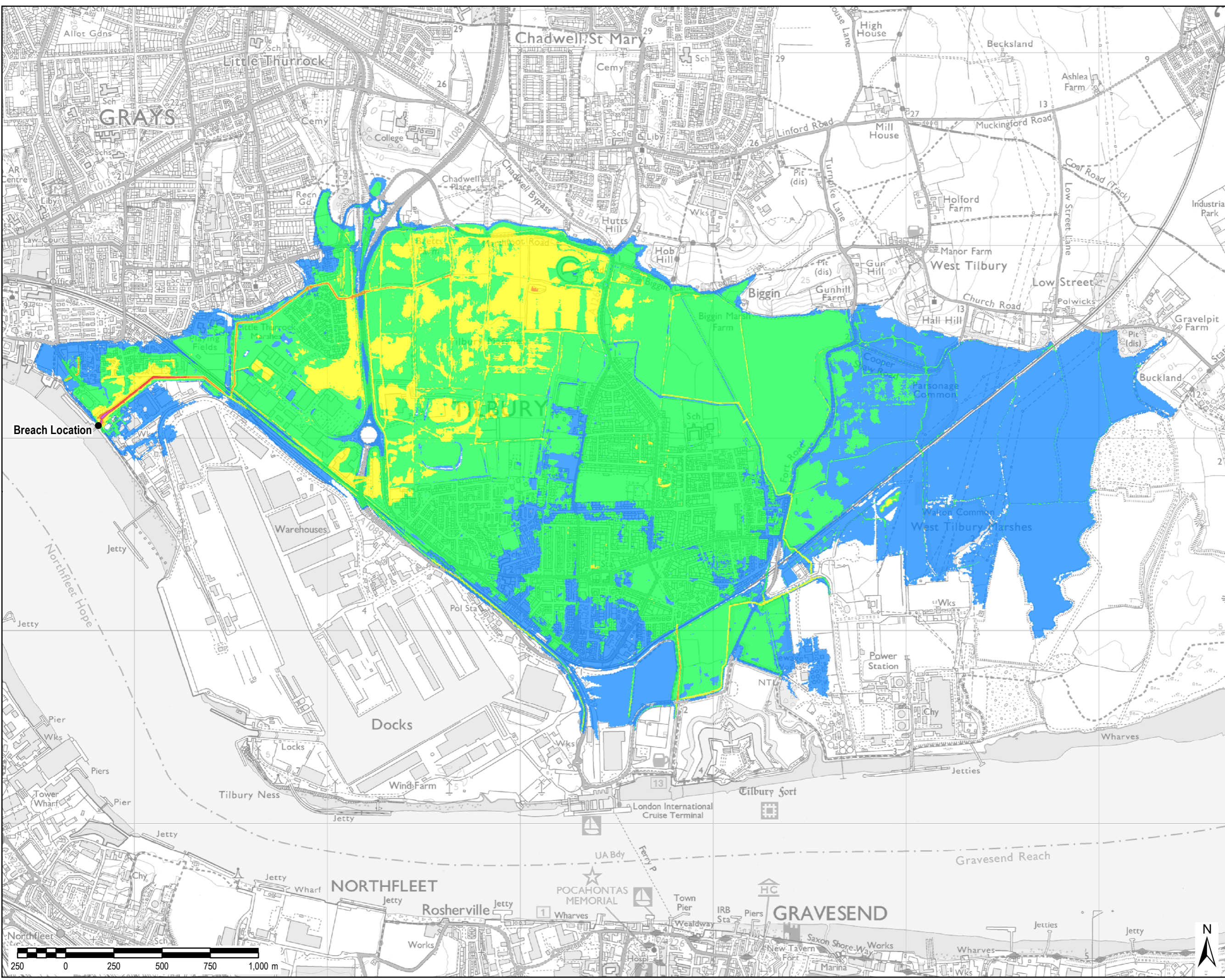
Drawn JW	Checked BB	Approved HJ	Date 06/04/2018
AECOM Internal Project No. 60492009		Scale @ A3 1:18,000	

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Drawing Number **A001 TIL002 200YR + CC (2116) TTI**

File Name: \\ba-wip-003\700 - Water\Water\Projects & Jobs\6049160492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL002_200yr_TTI.mxd



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- LEGEND**
- Breach Location
- Maximum Modelled Flood Depth(m)**
- 0m to <= 1m
 - > 1m to <= 2m
 - > 2m to <= 3m
 - > 3m to <= 4m
 - > 4m to <= 5m
 - > 5m

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Purpose of Issue
FINAL

Client
THURROCK COUNCIL

Project Title
**THURROCK COUNCIL
 LEVEL 1 SFRA**

Drawing Title
**MAXIMUM MODELLED FLOOD
 DEPTH FROM A BREACH AT
 TIL002 IN A 0.1% (1 IN 1000 +CC YEAR)
 AEP EVENT IN 2116**

Drawn JW	Checked BB	Approved HJ	Date 09/03/2018
AECOM Internal Project No. 60492009		Scale @ A3 1:18,000	

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Drawing Number
A001 TIL002 1000YR + CC (2116) DEPTH

File Name: \\ba-wip-003\700 - Water\WaterProjects & Jobs\6049160492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL002_1000yr_Depth.mxd

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LEGEND

- Breach Location
- Maximum Flood Hazard(m)**
- Low Hazard
- Moderate Hazard (Danger to Some)
- Significant Hazard (Danger to Most)
- Extreme Hazard (Danger to All)

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Purpose of Issue
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Client
THURROCK COUNCIL

Project Title
**THURROCK COUNCIL
LEVEL 1 SFRA**

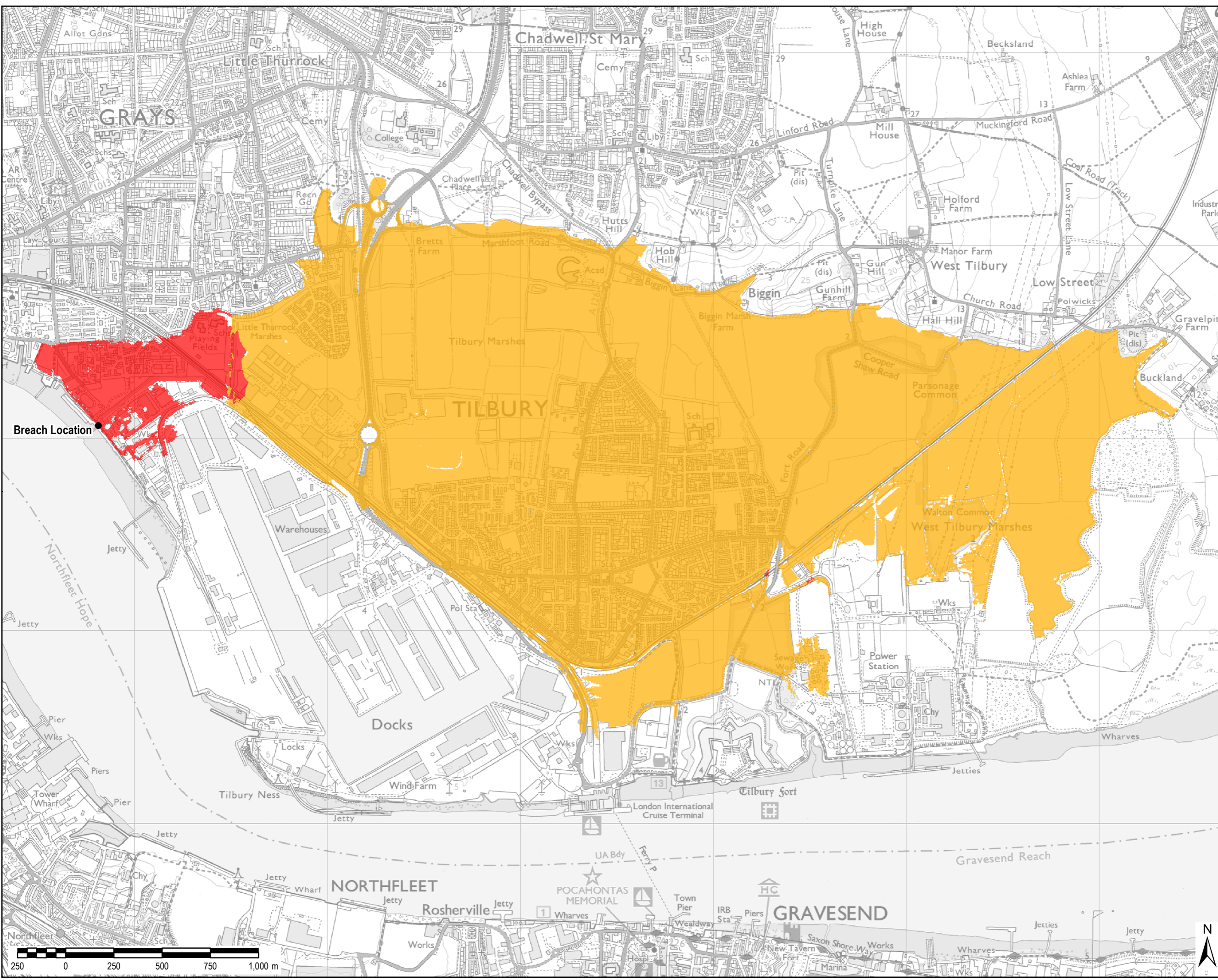
Drawing Title
MAXIMUM MODELLED FLOOD HAZARD FROM A BREACH AT TIL002 IN A 0.1% (1 IN 1000 +CC YEAR) AEP EVENT IN 2116

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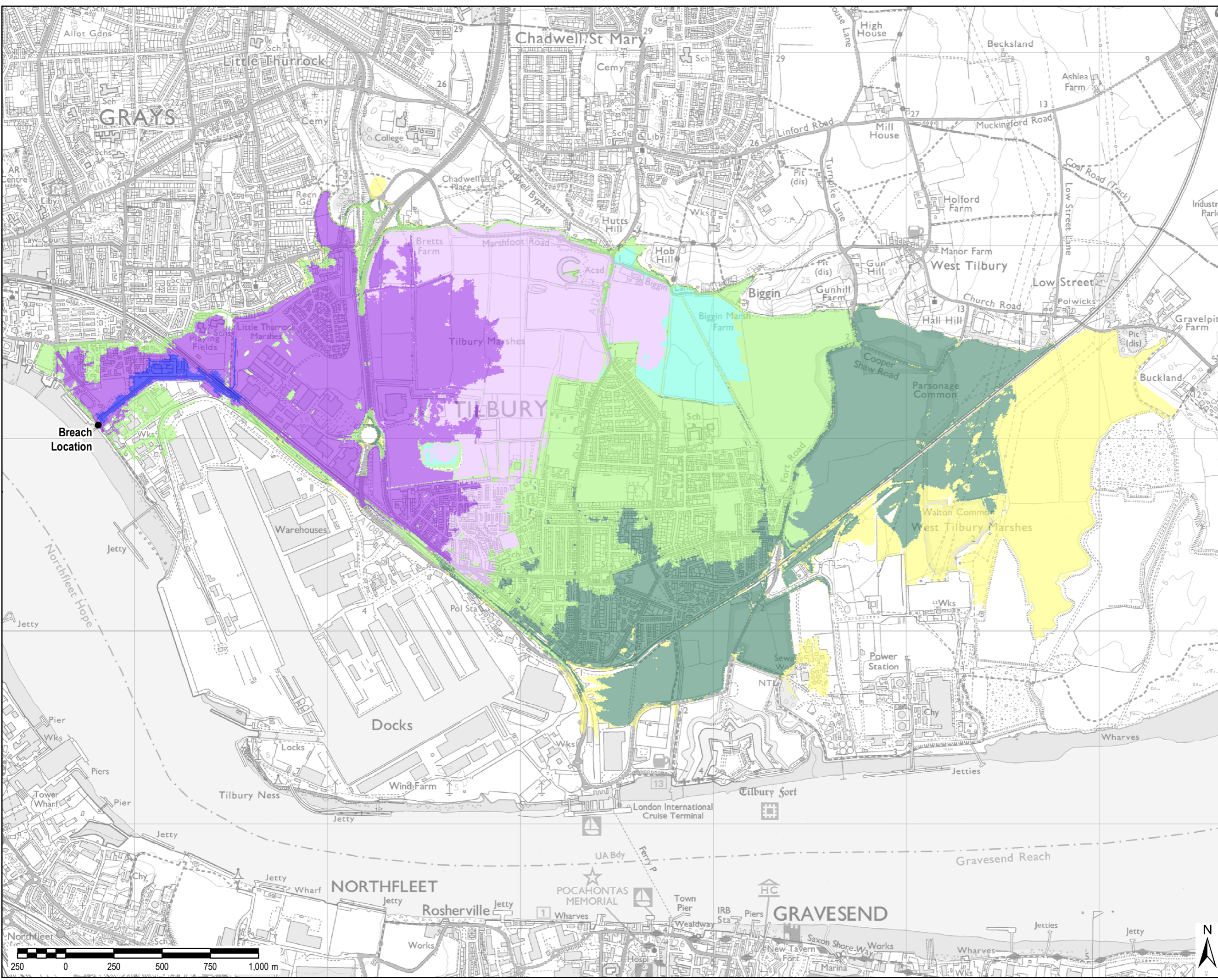
Drawing Number
A001 TIL002 1000YR + CC (2116) HAZARD



File Name: \\ba-wip-003\700 - Water\WaterProjects & Jobs\6049160492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL002_1000yr_Hazard.mxd



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- LEGEND**
- Breach Location
- Time to Inundation**
- Blue: <= 1 Hour
 - Purple: > 1 to 4 Hours
 - Light Purple: > 4 to 8 Hours
 - Cyan: > 8 to 12 Hours
 - Green: > 12 to 16 Hours
 - Dark Green: > 16 to 20 Hours
 - Yellow: > 20 Hours

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Purpose of Issue: **FINAL**

Client: **THURROCK COUNCIL**

Project Title: **THURROCK COUNCIL LEVEL 1 SFRA**

Drawing Title: **TIME TO INUNDATION MODELLED FROM A BREACH AT TIL002 IN A 0.1% (1 IN 1000 +CC YEAR) AEP EVENT IN 2116**

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Drawing Number: **A001 TIL002 1000YR + CC (2116) TTI**

File Name: \\ba-wip-003\700 - Water\Water\Projects & Jobs\6049160492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL002_1000yr_TTI.mxd



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LEGEND

- Breach Location

Maximum Modelled Flood Depth(m)

- 0m to <= 1m
- > 1m to <= 2m
- > 2m to <= 3m
- > 3m to <= 4m
- > 4m to <= 5m
- > 5m

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Purpose of Issue
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Client
THURROCK COUNCIL

Project Title
**THURROCK COUNCIL
 LEVEL 1 SFRA**

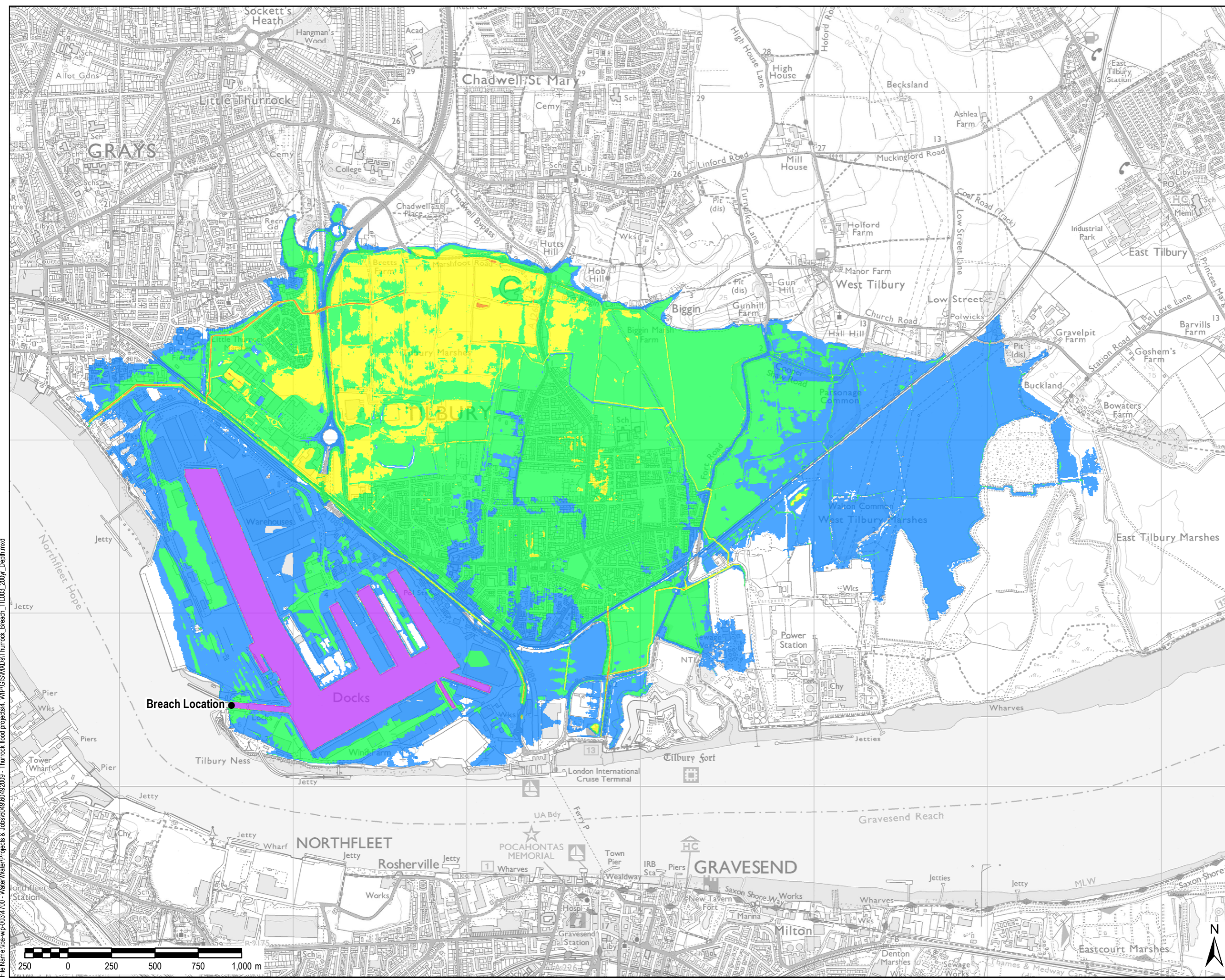
Drawing Title
**MAXIMUM MODELLED FLOOD
 DEPTH FROM A BREACH AT
 TIL003 IN A 0.5% (1 IN 200 + CC YEAR)
 AEP EVENT IN 2116**

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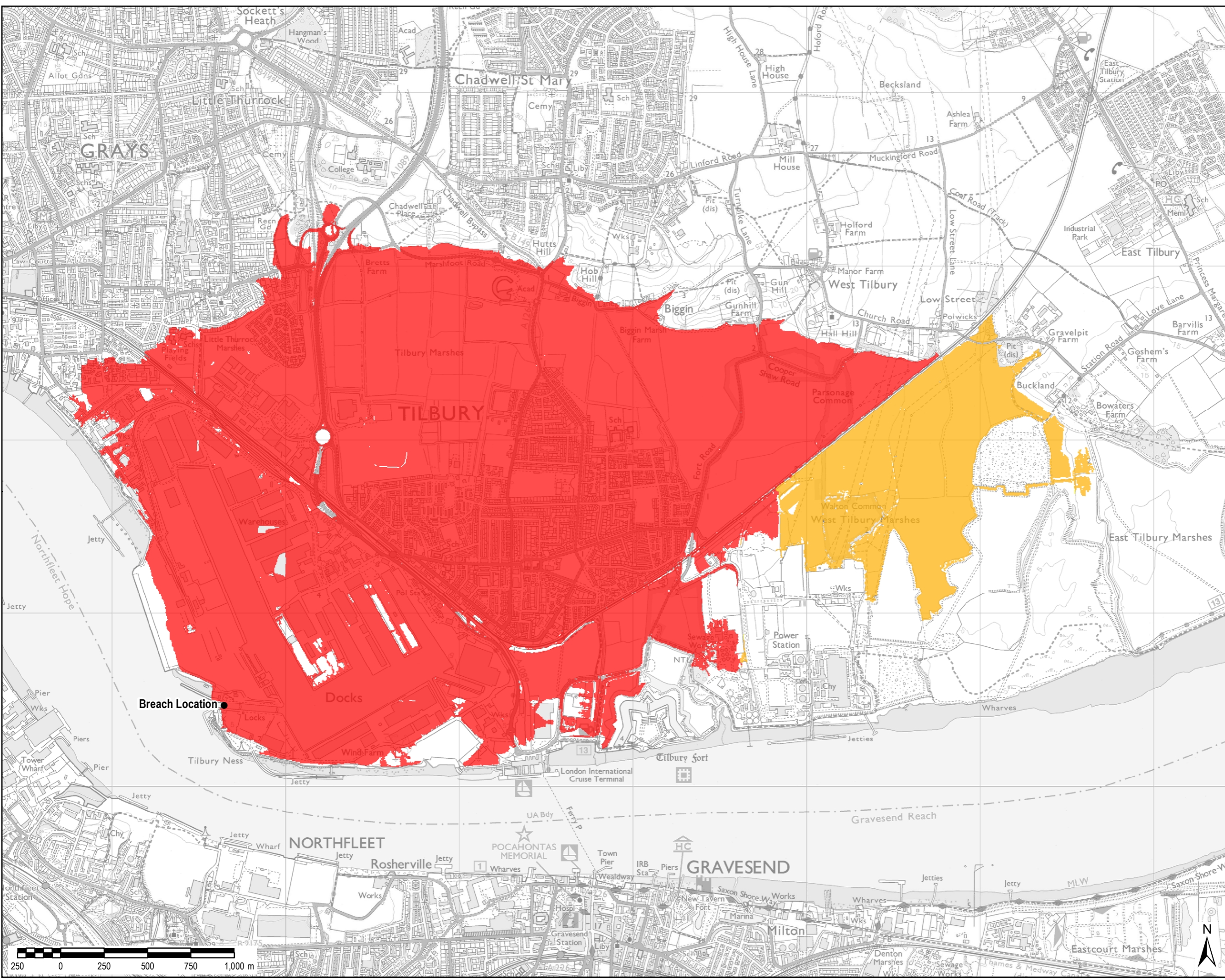
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Drawing Number
A001 TIL003 200YR + CC (2116) DEPTH



File Name: \\ba-wip-03\700 - Water\WaterProjects & Jobs\60492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL003_200yr_Depth.mxd

File Name: \\ba-wip-03\700 - Water\WaterProjects & Jobs\6049160492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL003_200yr_Hazard.mxd



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- LEGEND**
- Breach Location
- Maximum Flood Hazard(m)**
- Low Hazard
 - Moderate Hazard (Danger to Some)
 - Significant Hazard (Danger to Most)
 - Extreme Hazard (Danger to All)

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Client
THURROCK COUNCIL

Project Title
**THURROCK COUNCIL
 LEVEL 1 SFRA**

Drawing Title
**MAXIMUM MODELLED FLOOD
 HAZARD FROM A BREACH AT
 TIL003 IN A 0.5% (1 IN 200 + CC YEAR)
 AEP EVENT IN 2116**

Drawn JW	Checked BB	Approved HJ	Date 09/03/2018
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Drawing Number
A001 TIL003 200YR + CC (2116) HAZARD



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LEGEND

- Breach Location
- Time to Inundation**
- ≤ 1 Hour
- > 1 to 4 Hours
- > 4 to 8 Hours
- > 8 to 12 Hours
- > 12 to 16 Hours
- > 16 to 20 Hours
- > 20 Hours

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Client **THURROCK COUNCIL**

Project Title **THURROCK COUNCIL LEVEL 1 SFRA**

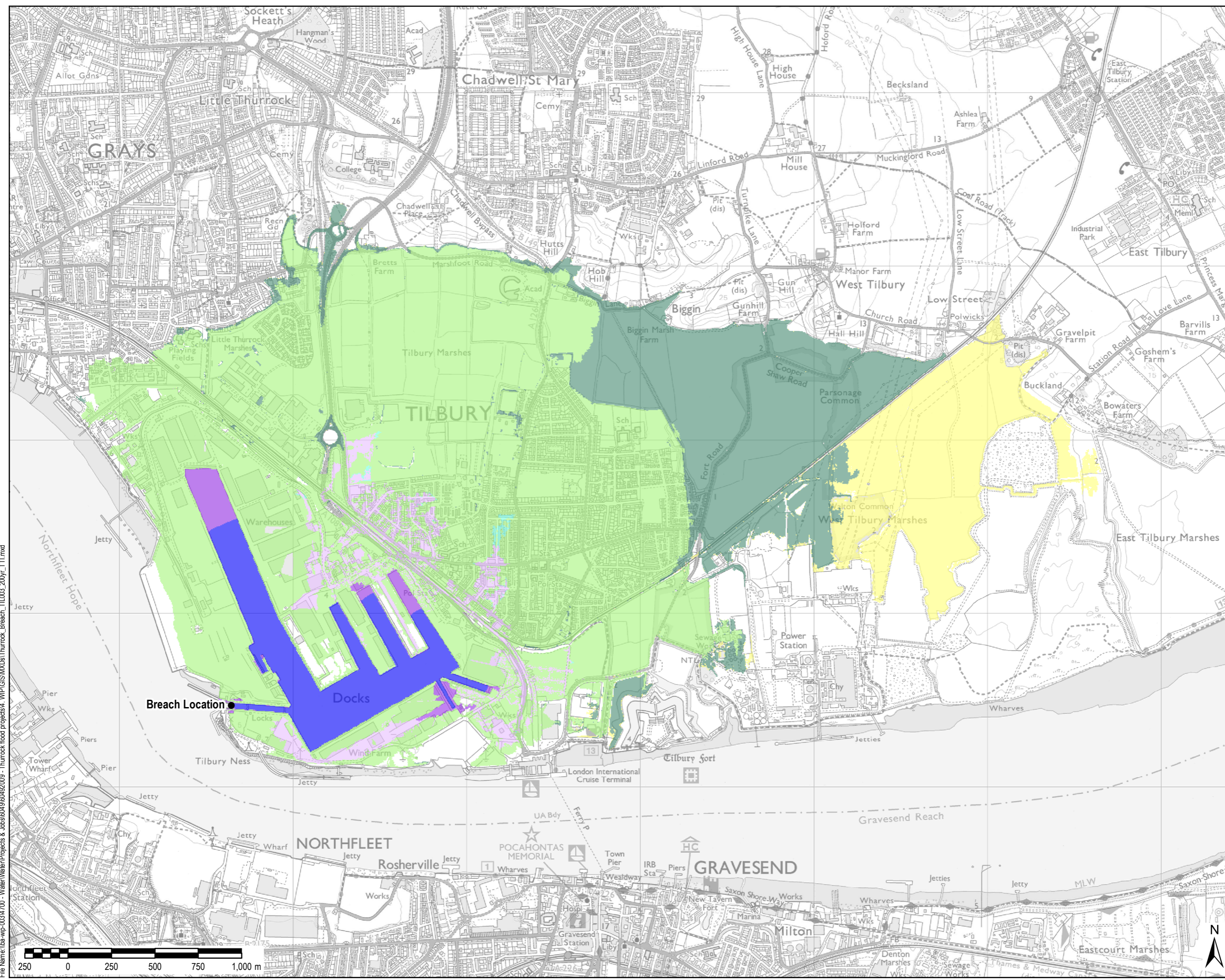
Drawing Title **TIME TO INUNDATION MODELLED FROM A BREACH AT TIL003 IN A 0.5% (1 IN 200 +CC YEAR) AEP EVENT IN 2116**

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Drawing Number
A001 TIL003 200YR + CC (2116) TTI



File Name: lba-wip-003700 - Water/WaterProjects & Jobs/049160492009 - Thurrock flood projects/4 - WIP/SIMXDs/Thurrock_Breach_TIL003_200yr_TTI.mxd

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LEGEND

- Breach Location

Maximum Modelled Flood Depth(m)

- 0m to <= 1m
- > 1m to <= 2m
- > 2m to <= 3m
- > 3m to <= 4m
- > 4m to <= 5m
- > 5m

NOTES

Hydraulic modelling has been undertaken using 2D hydraulic modelling software TUFLOW (ver.2016-03-AD-IDP-w64) to assess the effect of breaches at specified points and / or overtopping of defences. Breaches have been modelled to be 'open' for the duration of three tidal cycles (36 hours).

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Project Title
**THURROCK COUNCIL LEVEL 1 SFRA
LEVEL 1 SFRA**

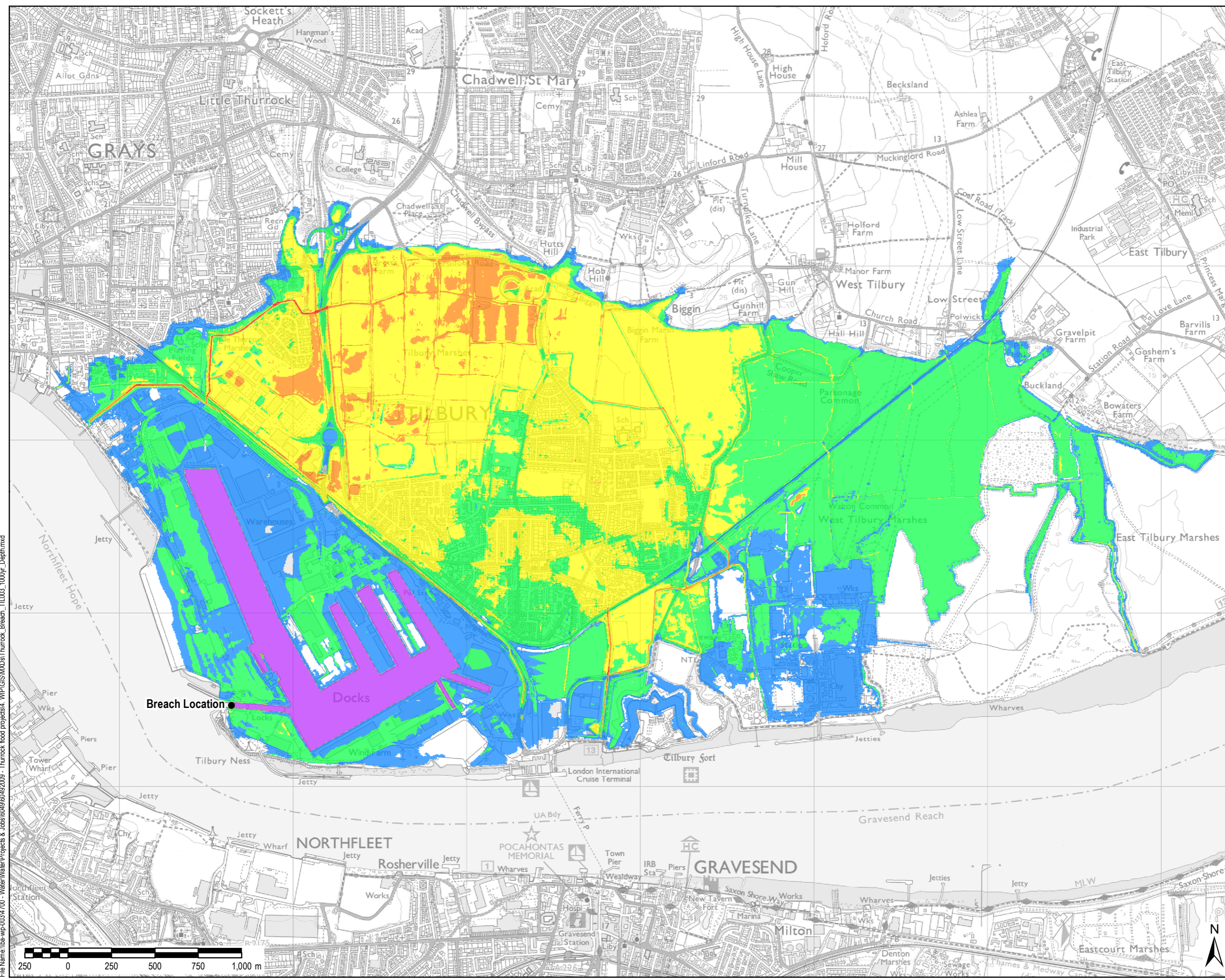
Drawing Title
MAXIMUM MODELLED FLOOD DEPTH FROM A BREACH AT TIL003 IN A 0.1% (1 IN 1000 +CC YEAR) AEP EVENT IN 2116

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Drawing Number
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File Name: \\ba-wip-03\700 - Water\WaterProjects & Jobs\60492009 - Thurrock flood projects\4 - WIP\GIS\MXDs\Thurrock_Breach_TIL003_1000yr_Depth.mxd