

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)**CLIENT**

CONSULTANT

AECOM Limited
Midpoint, Alencon Link
Basingstoke, Hampshire
RG21 7PP
www.aecom.com

LEGEND

-  Borough Boundary
 Main River
 Ordinary Watercourse
 Main River Culvert
 Ordinary Watercourse Culvert

LiDAR Topographic Survey (m AOD)

-  > 50m
 > 45 to 50m
 > 40 to 45m
 > 35 to 40m
 > 30 to 35m
 > 25 to 30m
 > 20 to 25m
 > 15 to 20m
 > 10 to 15m
 > 5 to 10m
 0 to 5m

NO⁺

1. Light and Detection Ranging (LiDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground.
2. The LiDAR Composite DTM (Digital Terrain Model) is a raster elevation model covering >93% of England at 2m spatial resolution.
3. The 2020 LiDAR Composite contains surveys undertaken between 6th June 2000 and 1st September 2020. The DTM (Digital Terrain Model) is produced from the last return LiDAR signal. Surface objects (such as vegetation) are removed from the Digital Surface Model (DSM), using bespoke algorithms and manual editing of the data, to produce a terrain model of just the surface.

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ISSUE PURPOSE

SFRA REPORT

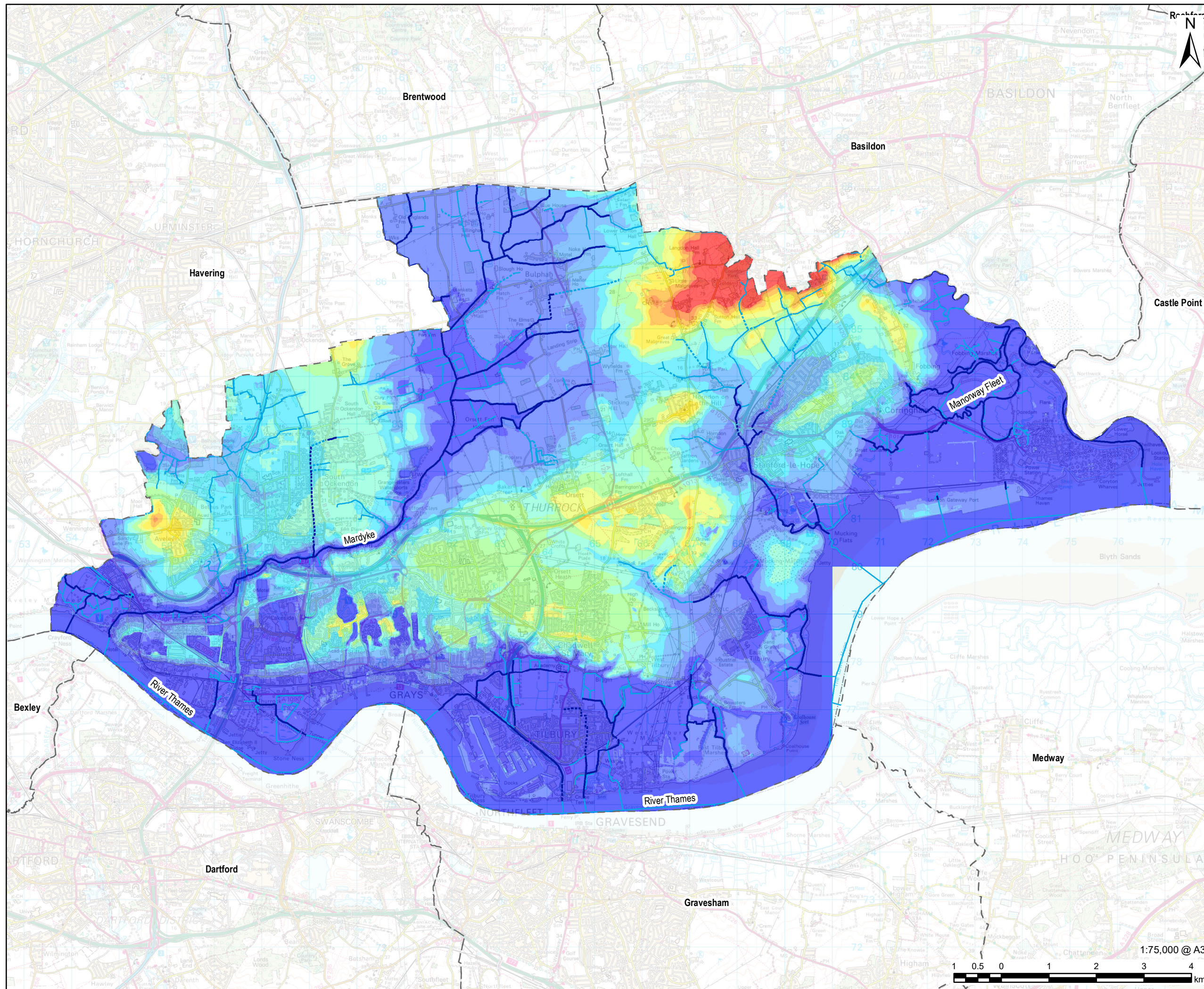
PROJECT NUMBER

60689110

FIGURE TITLE
TOPOGRAPHY

FIGURE NUMBER

Figure 2





PROJECT

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LEGEND

- ## NOTES

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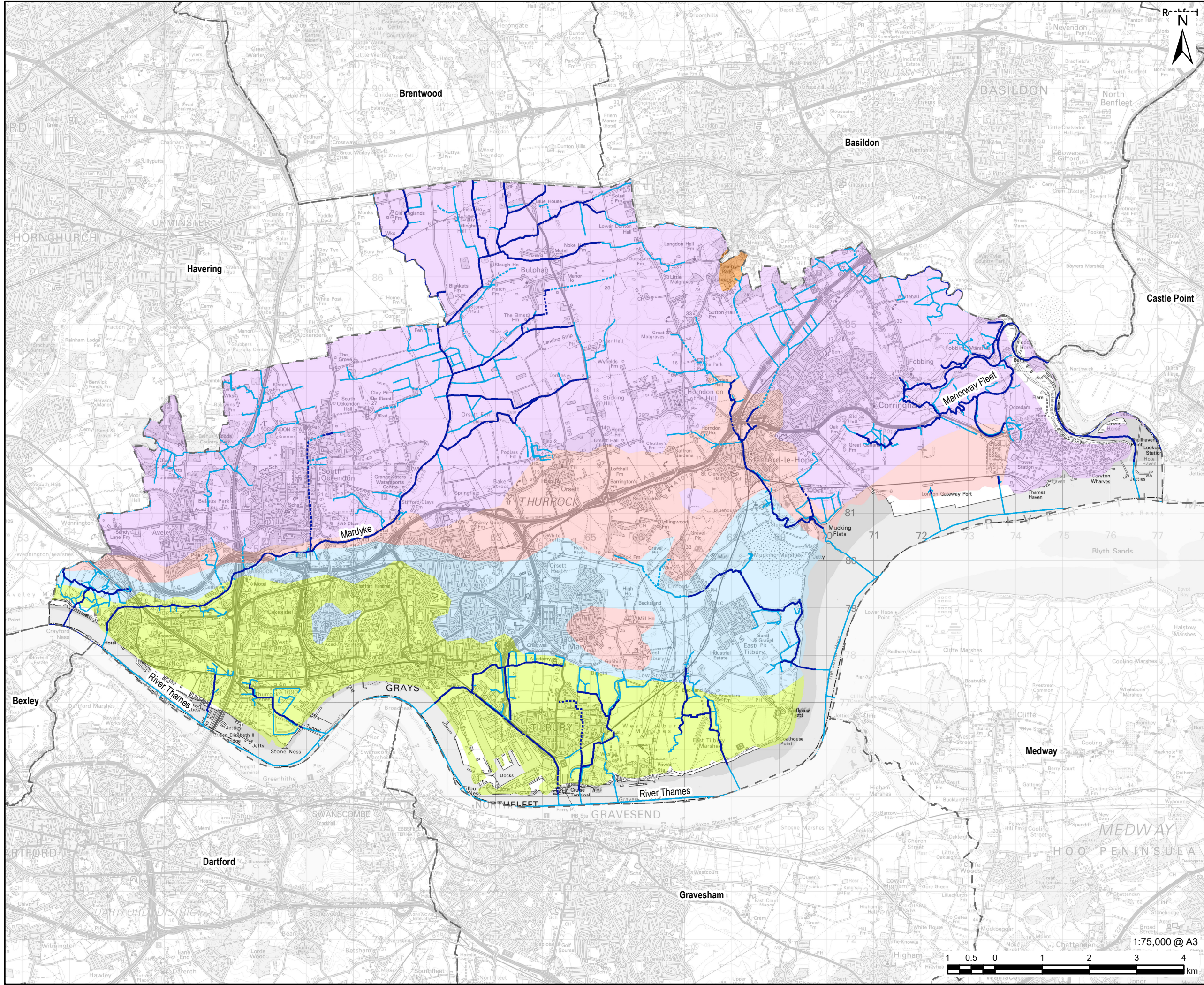
PROJECT NUMBER

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FIGURE TITLE
SUPERFICIAL GEOLOGY

FIGURE NUMBER

Figure 3



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Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert

Bedrock Geology

- Bracklesham Group and Barton Group (Undifferentiated) - Sand, Silt and Clay
- Thames Group - Clay, Silt, Sand and Gravel
- Thanet Sand Formation - Sand, Silt and Clay
- Lambeth Group - Clay, Silt, Sand and Gravel
- White Chalk Subgroup - Chalk

NOTES

1. The British Geological Survey (BGS) data at the 1:625,000 scale as illustrated on this map is generalised and geological interpretation should be used only as a guide to geology at a local level. Detailed site investigations are required to provide site specific geological data.

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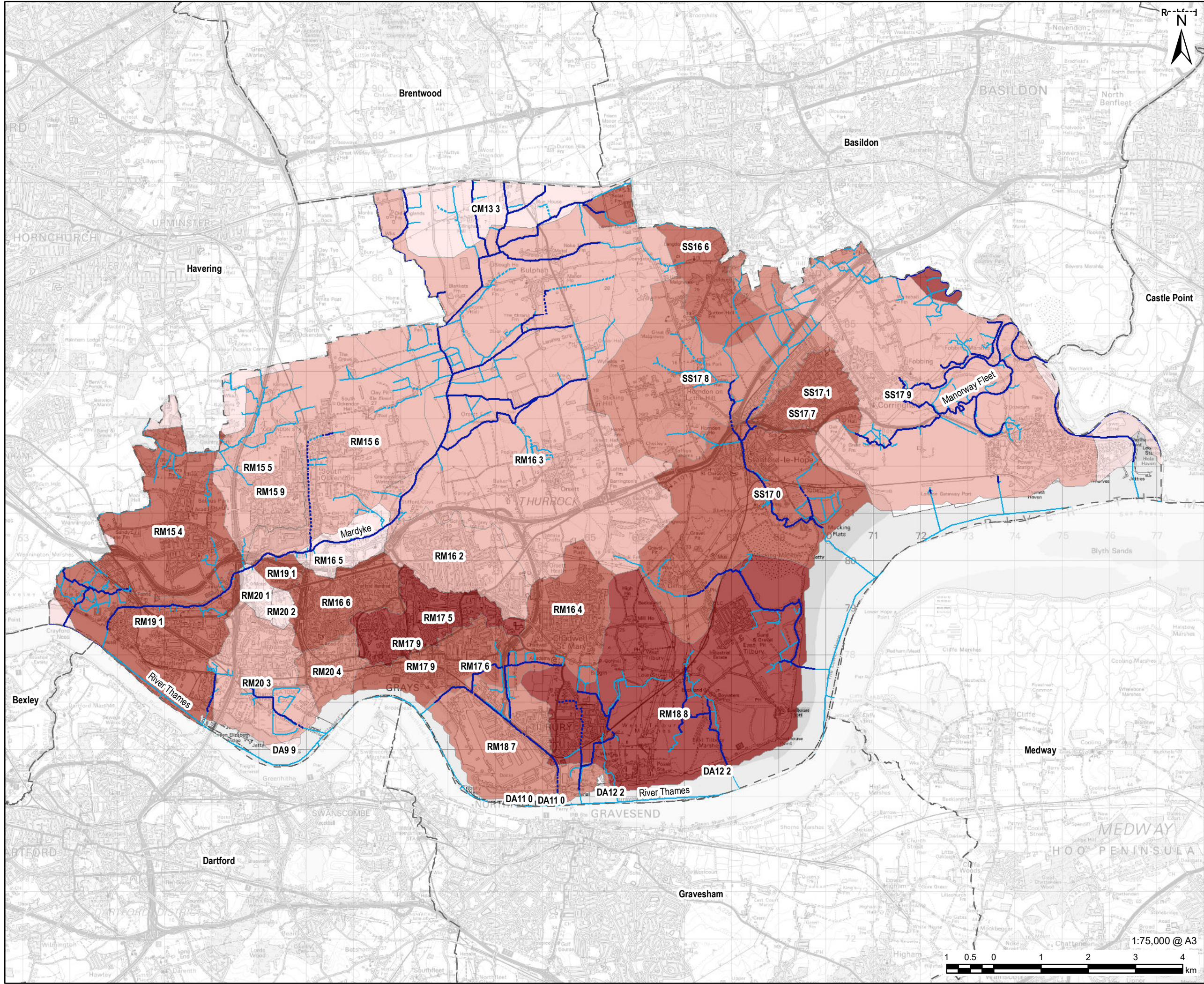
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FIGURE TITLE

BEDROCK GEOLOGY

FIGURE NUMBER

Figure 4



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LEGEND
Borough Boundary
Main River
Ordinary Watercourse
Main River Culvert
Ordinary Watercourse Culvert

Anglian Water DG5: Number of Internal Flood Incidents by Postcode
0 - 5
5 - 32
32 - 51
51 - 77
77 - 126

NOTES
1. This map is intended to provide a strategic overview of historic sewer flooding and should not be used to assess flood risk for individual properties.
2. Records of internal flooding recorded by Anglian Water from their DG5 Register, received December 2022.
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FIGURE TITLE
RECORDS OF SEWER FLOODING

FIGURE NUMBER
Figure 6

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LEGEND

-  Borough Boundary
-  Main River
-  Ordinary Watercourse
-  Main River Culvert
-  Ordinary Watercourse Culvert
-  Reduction in Flood Risk due to Defences
-  Flood Zone 2
-  Flood Zone 3a
-  Flood Zone 3b
-  Mardyke 1% AEP plus 25% climate change
-  Mardyke 1% AEP plus 35% climate change
-  Mardyke 1% AEP plus 70% climate change
-  Stanford Brook 1% AEP plus 25% climate change
-  Stanford Brook 1% AEP plus 35% climate change
-  Stanford Brook 1% AEP plus 70% climate change

NOTES

1. Flood Zone 1: Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b). Flood Zone 2: Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3a: Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea flooding. These Flood Zones ignore the presence of defences.
2. Reduced Flood Risk Defences: a spatial dataset that indicates where areas have reduced flood risk from rivers and sea due to the presence of flood defences.
3. Flood Zone 3b functional floodplain: Land where water from rivers or the sea has to flow or be stored in times of flood. Defined using the 3.3% AEP flood extent for the River Mardyke and Stanford Brook, the tidal Thames on the riverward side of the defences, and the Tilbury Road Storage.
4. Flood extents for the River Mardyke are provided from the PDU4 River Mardyke Hydraulic Model, Mott MacDonald, May 2019.
5. Flood extents for the Stanford Brook are provided from the Stanford Brook Hydraulic Model, CH2MHill, May 2017

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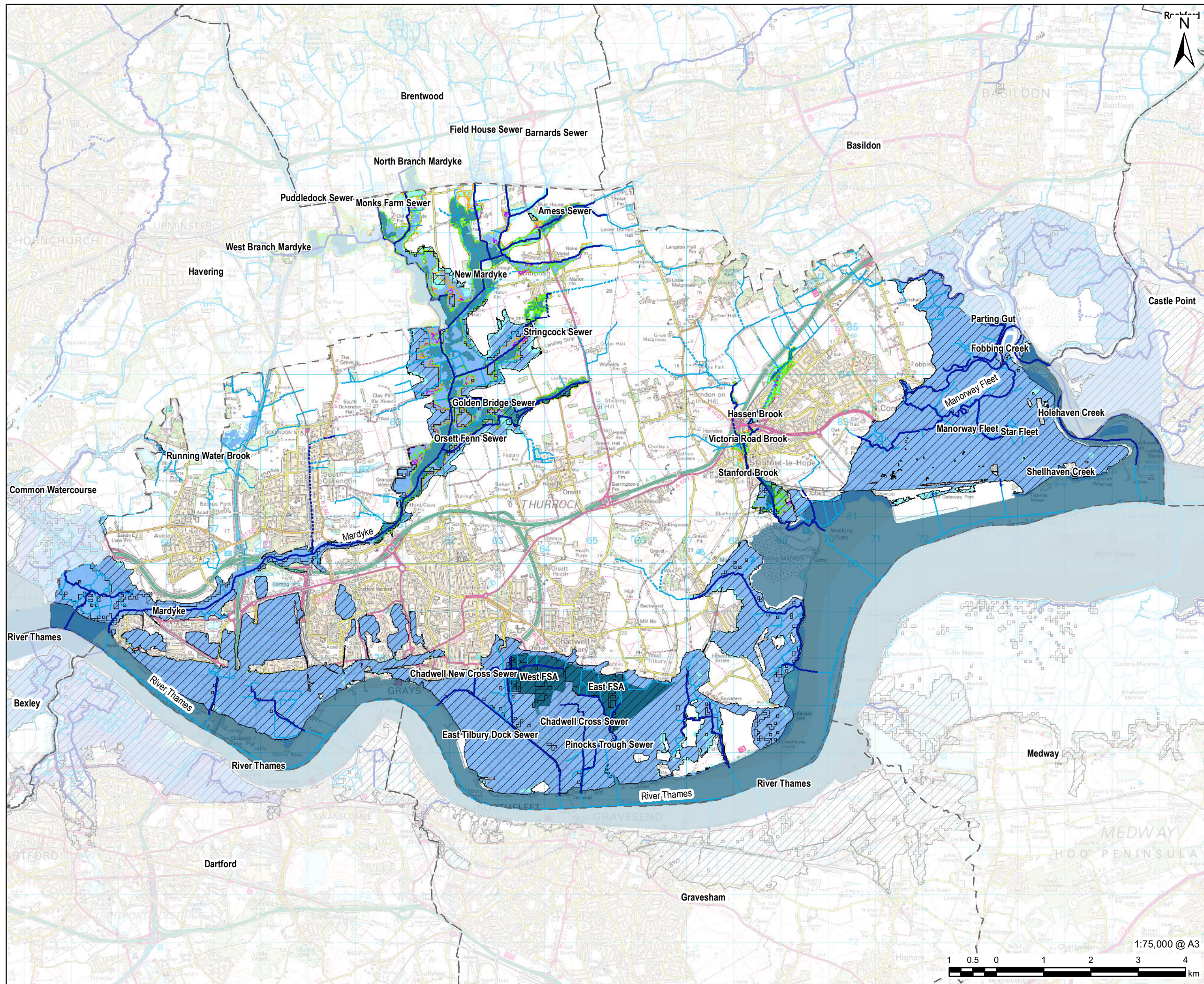
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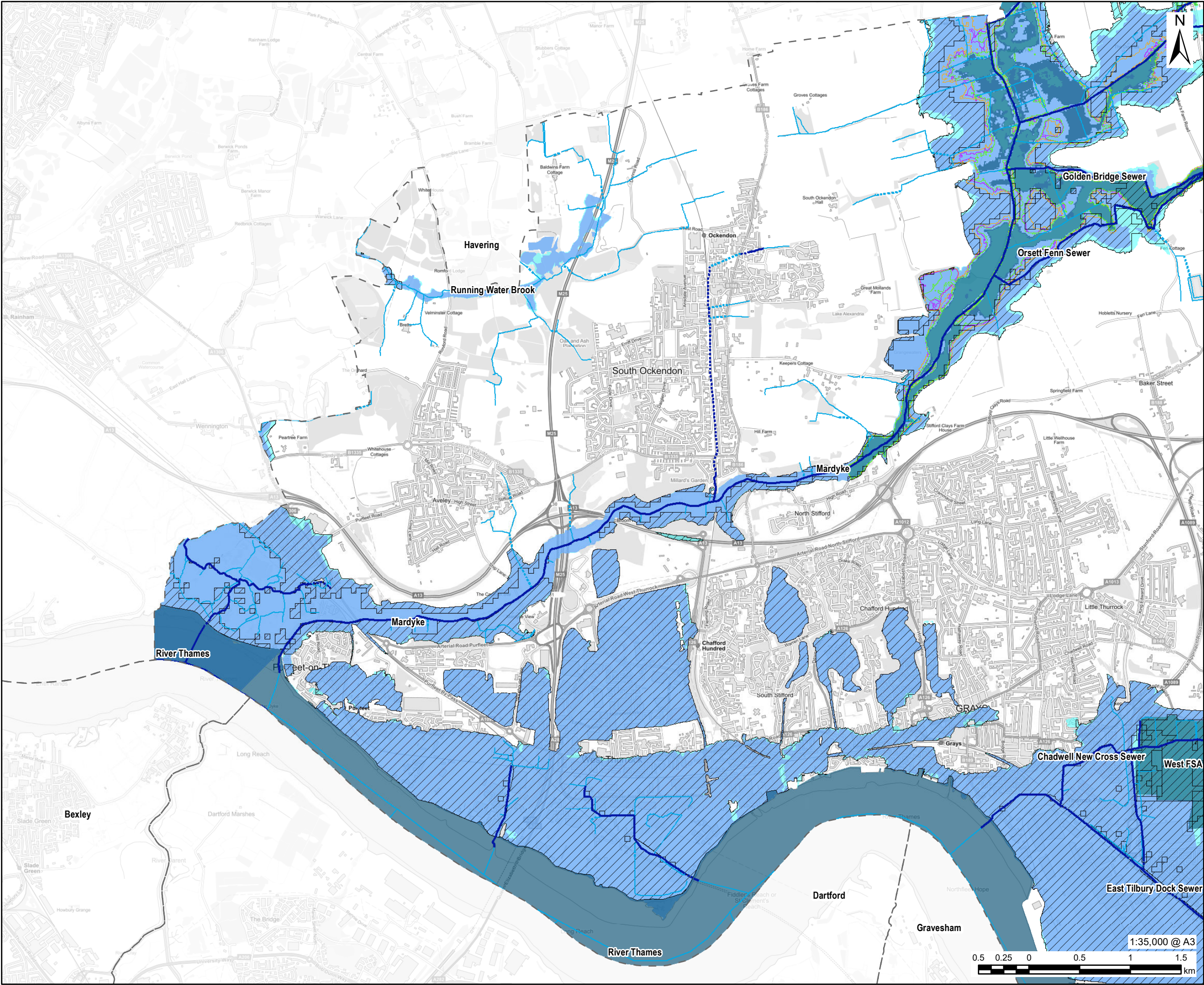
FIGURE TITLE

RISK OF FLOODING FROM RIVERS AND SEA

FIGURE NUMBER

Figure 7





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PROJECT

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Reduction in Flood Risk due to Defences
- Flood Zone 2
- Flood Zone 3a
- Flood Zone 3b
- Mardyke 1% AEP plus 25% climate change
- Mardyke 1% AEP plus 35% climate change
- Mardyke 1% AEP plus 70% climate change
- Stanford Brook 1% AEP plus 25% climate change
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NOTES

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- Flood extents for the Stanford Brook are provided from the Stanford Brook Hydraulic Model, CH2MHill, May 2017.

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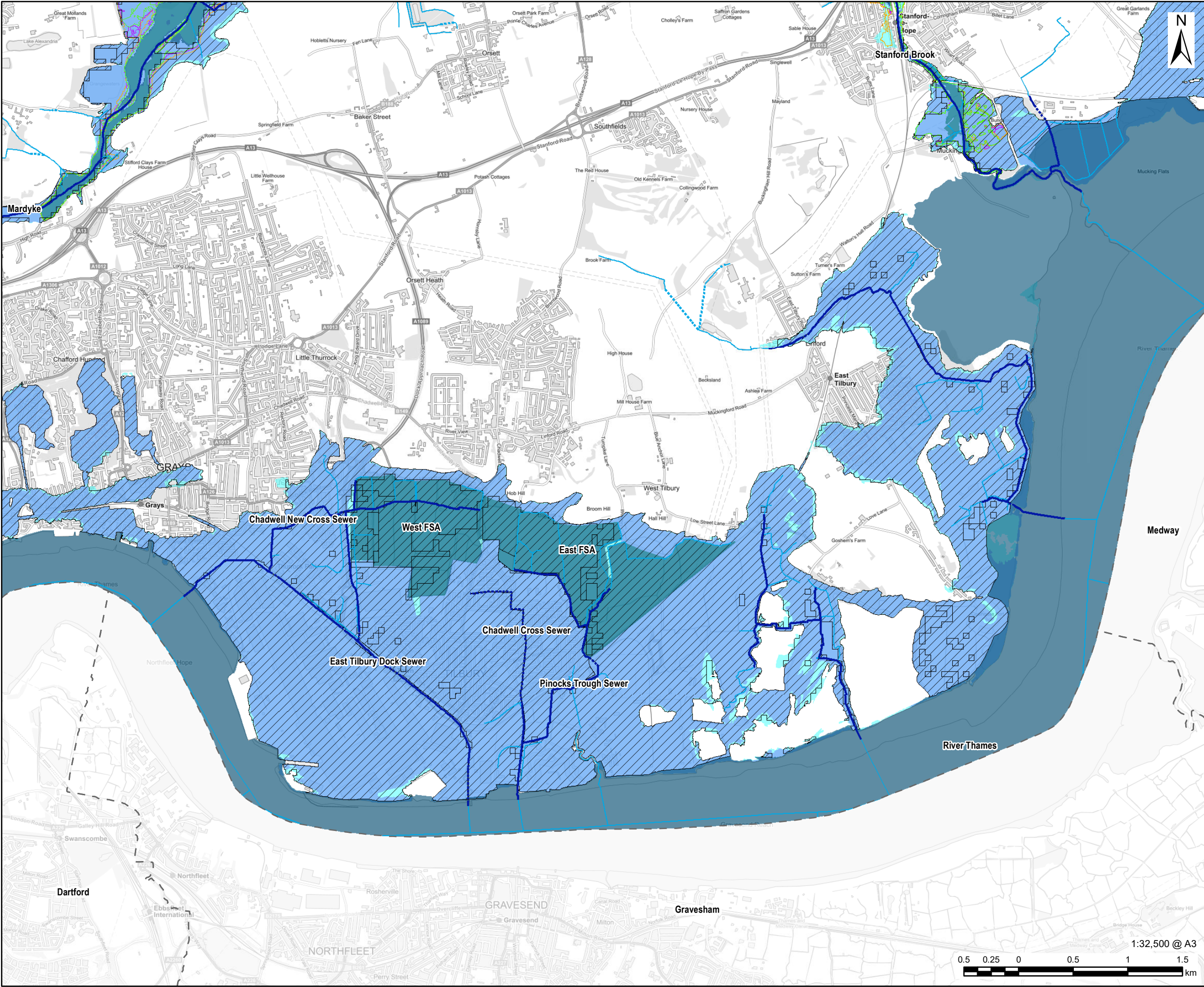
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FIGURE TITLE

RISK OF FLOODING
FROM RIVERS AND SEA

FIGURE NUMBER

Figure 7A



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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Reduction in Flood Risk due to Defences
- Flood Zone 2
- Flood Zone 3a
- Flood Zone 3b
- Mardynke 1% AEP plus 25% climate change
- Mardynke 1% AEP plus 35% climate change
- Mardynke 1% AEP plus 70% climate change
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- Stanford Brook 1% AEP plus 35% climate change
- Stanford Brook 1% AEP plus 70% climate change

NOTES

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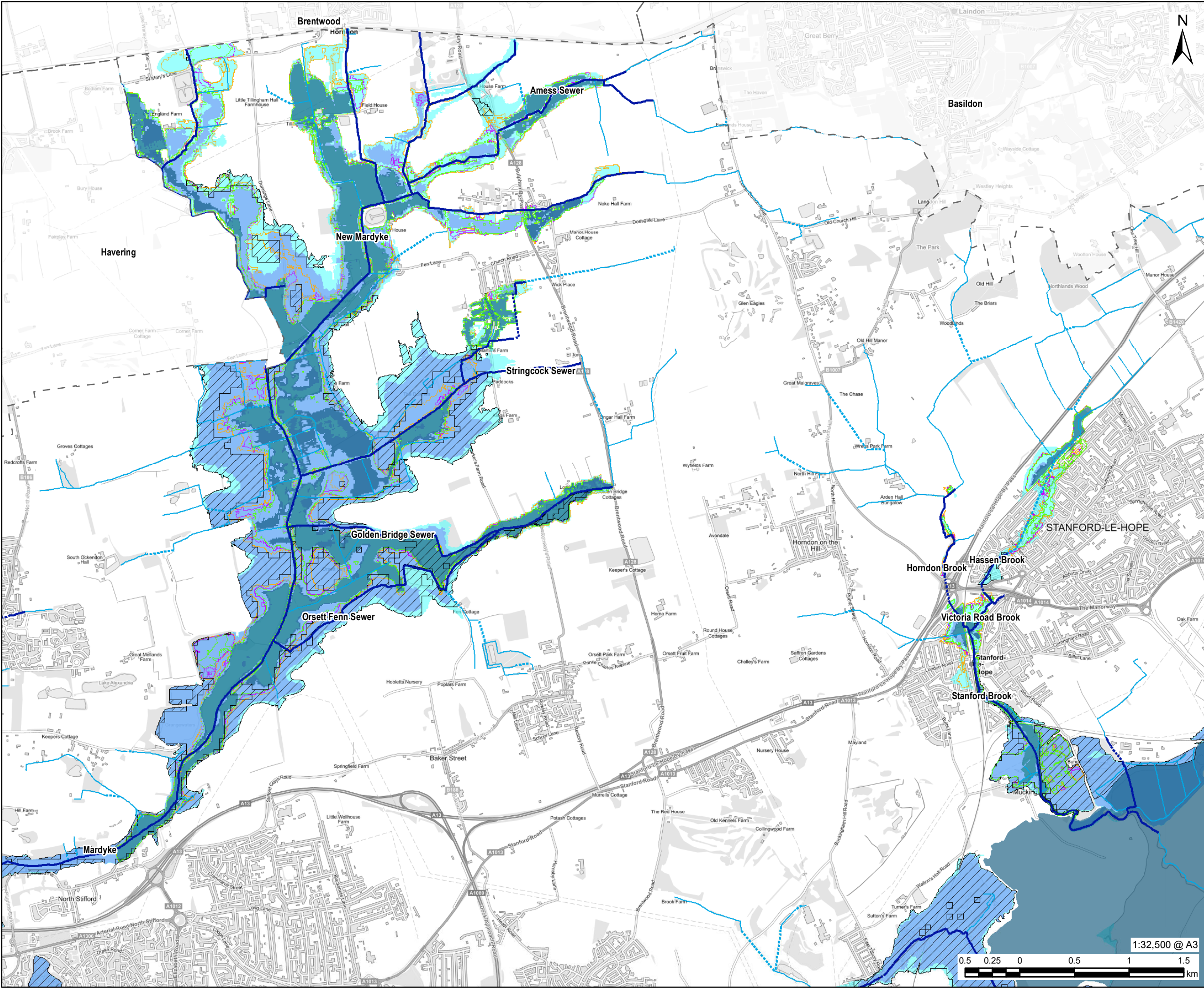
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FIGURE TITLE

RISK OF FLOODING
FROM RIVERS AND SEA

FIGURE NUMBER

Figure 7B



PROJECT

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Reduction in Flood Risk due to Defences
- Flood Zone 2
- Flood Zone 3a
- Flood Zone 3b
- Mardyke 1% AEP plus 25% climate change
- Mardyke 1% AEP plus 35% climate change
- Mardyke 1% AEP plus 70% climate change
- Stanford Brook 1% AEP plus 25% climate change
- Stanford Brook 1% AEP plus 35% climate change
- Stanford Brook 1% AEP plus 70% climate change

NOTES

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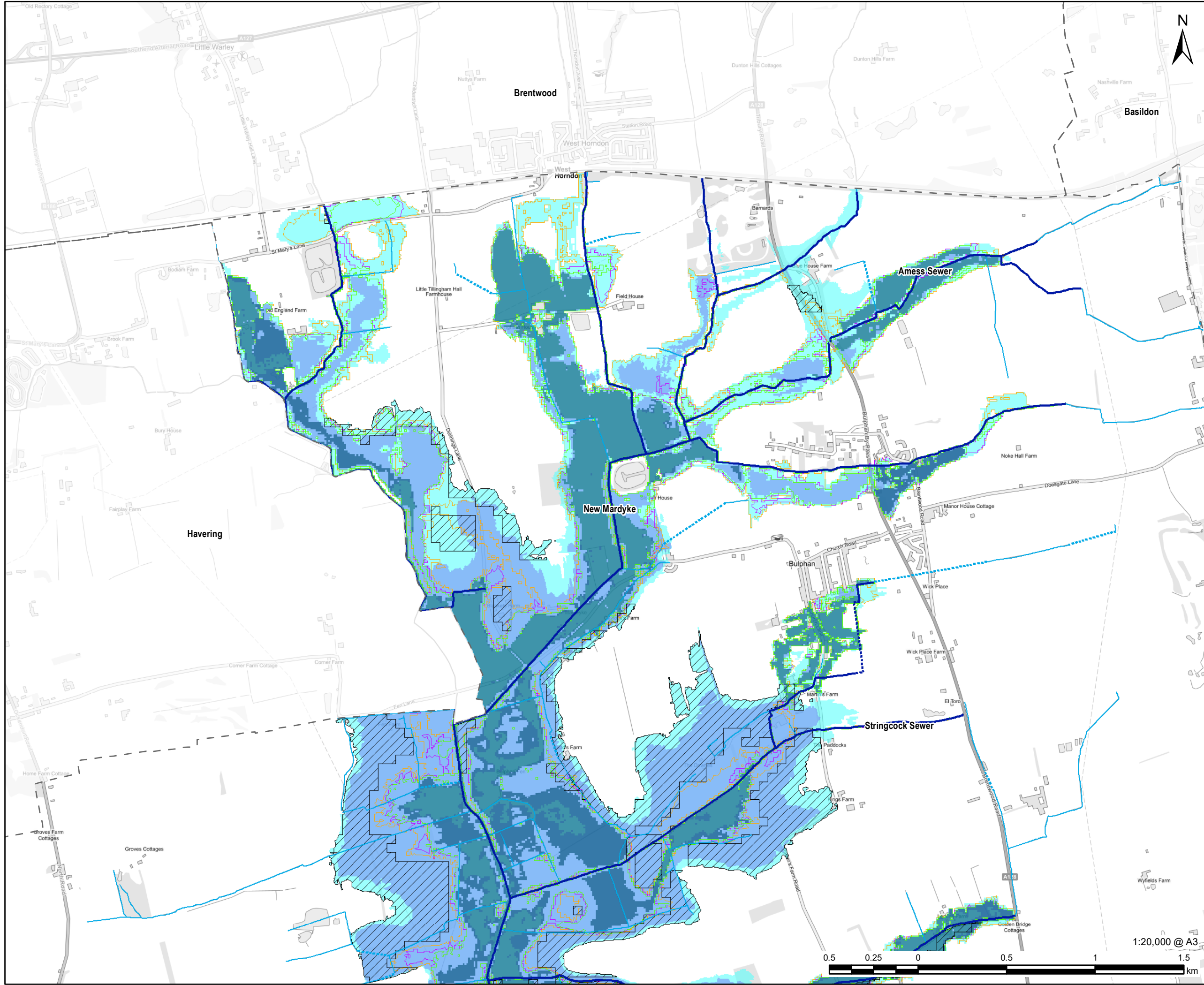
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FIGURE TITLE

RISK OF FLOODING
FROM RIVERS AND SEA

FIGURE NUMBER

Figure 7D



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Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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Basingstoke, Hampshire
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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Reduction in Flood Risk due to Defences
- Flood Zone 2
- Flood Zone 3a
- Flood Zone 3b
- Mardyke 1% AEP plus 25% climate change
- Mardyke 1% AEP plus 35% climate change
- Mardyke 1% AEP plus 70% climate change
- Stanford Brook 1% AEP plus 25% climate change
- Stanford Brook 1% AEP plus 35% climate change
- Stanford Brook 1% AEP plus 70% climate change

NOTES

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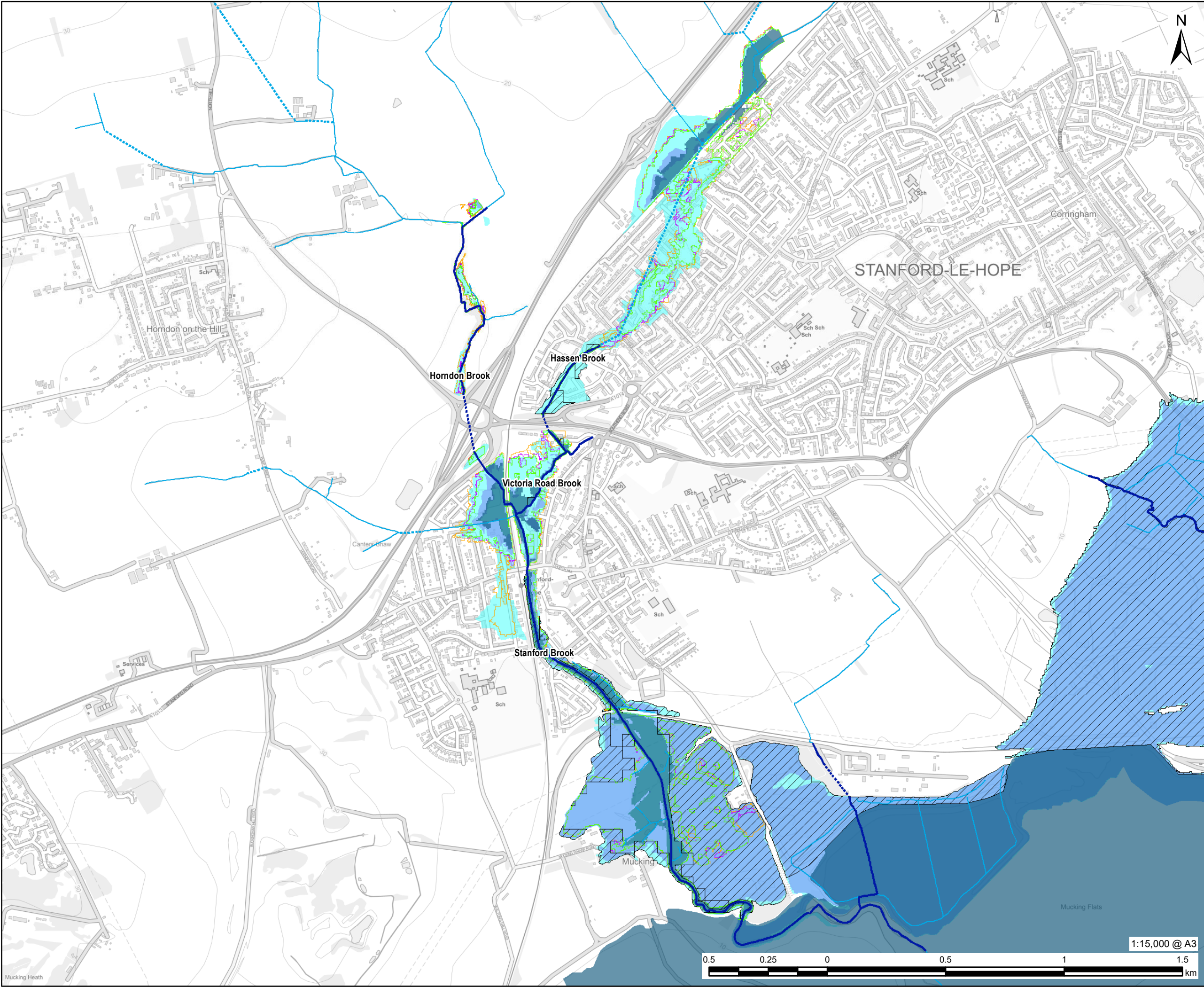
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FIGURE TITLE
RISK OF FLOODING
FROM RIVERS AND SEA

FIGURE NUMBER
Figure 7E





PROJECT
Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND
Borough Boundary
Main River
Ordinary Watercourse
Main River Culvert
Ordinary Watercourse Culvert
Reduction in Flood Risk due to Defences
Flood Zone 2
Flood Zone 3a
Mardyke 1% AEP plus 25% climate change
Mardyke 1% AEP plus 35% climate change
Mardyke 1% AEP plus 70% climate change
Stanford Brook 1% AEP plus 25% climate change
Stanford Brook 1% AEP plus 35% climate change
Stanford Brook 1% AEP plus 70% climate change

NOTES
1. Flood Zone 1: Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b). Flood Zone 2: Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3a: Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. These Flood Zones ignore the presence of defences.
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3. Flood Zone 3b functional floodplain: Land where water from rivers or the sea has to flow or be stored in times of flood. Defined using the 3.3% AEP flood extent for the River Mardyke and Stanford Brook, the tidal Thames on the riverward side of the defences, and the Tilbury Flood Storage Area.
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ISSUE PURPOSE
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PROJECT NUMBER
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FIGURE TITLE
RISK OF FLOODING
FROM RIVERS AND SEA

FIGURE NUMBER
Figure 7F



PROJECT

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

-  Borough Boundary
-  Main River
-  Ordinary Watercourse
-  Main River Culvert
-  Ordinary Watercourse Culvert
-  Records of Surface Water Flooding from Thurrock Highways
-  Area of Critical Drainage
-  Surface Water Flooding from Highways
-  1 in 30 year (3.3% annual probability)
-  1 in 100 year (1% annual probability)
-  1 in 1000 year (0.1% annual probability)

NOTES

1. This map shows the predicted likelihood of surface water flooding based on the Environment Agency's 'Risk of flooding from surface water' data, which may be subject to further analysis in the future.
2. The Risk from Surface Water Flooding is divided into three categories:
 - Low: each year, the chance of flooding is > 1 in 30 (3.3%).
 - Medium: each year, the chance of flooding is between 1 in 30 (3.3%) and 1 in 100 (1%).
 - High: each year, the chance of flooding is < 1 in 1000 (0.1%).
3. The potential impact of surface water flooding can vary according to the depth of water and velocity (speed and direction of flow).
4. Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. This type of flooding can be difficult to predict as it is hard to forecast exactly where how much rain will fall in any storm.
5. Flood records do not refer to internal property flooding, rather area that have been susceptible to flooding in the past. Further detail is included in Appendix A of this report.
6. This map is intended to provide strategic overview of susceptibility to surface water flooding, and should not be used to assess flood risk for individual properties.
7. Area of Critical Drainage are based upon the Local Flood Risk Management Strategy.
8. The red outline polygon identifies the area which has been updated by the Tilbury Integrated Flood Strategy. Here the modelling approach considered the interaction of the full drainage arrangement, producing a more confident surface water flood map.

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FIGURE TITLE

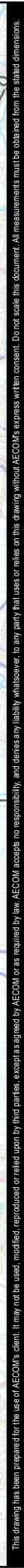
RISK OF SURFACE WATER

FLOODING

FIGURE NUMBER

Figure 8





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LEGEND

- ## NOTES

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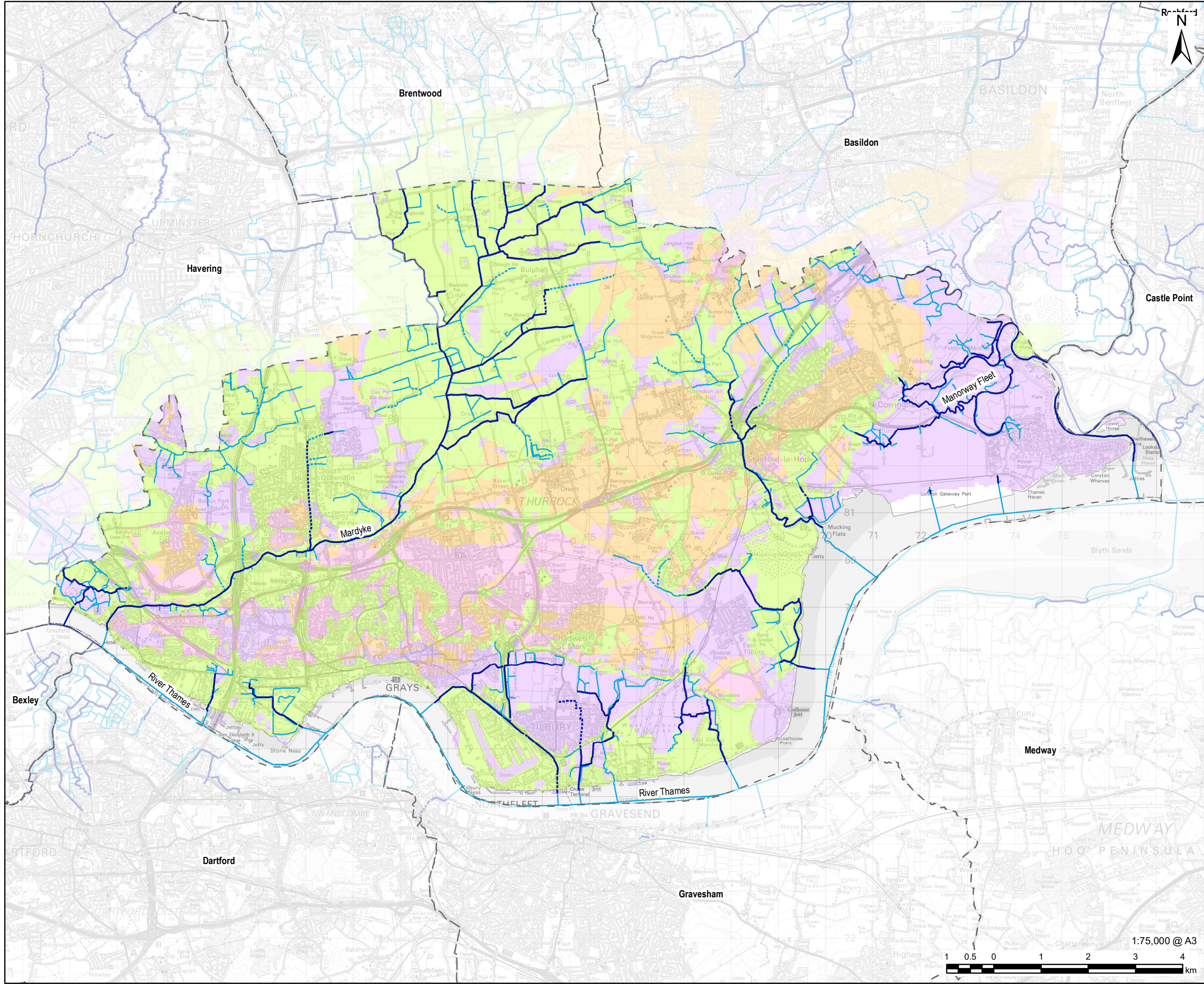
60689110

FIGURE TITLE

RISK OF FLOODING FROM
RESERVOIRS

FIGURE NUMBER

Figure 10



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Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Highly compatible for infiltration SuDS
- Opportunities for bespoke infiltration SuDS
- Probably compatible for infiltration SuDS
- Very significant constraints are indicated

NOTES

1. The 1:50,000 scale digital map data is generalised and the groundwater flood risk interpretation should only be used as a guide to risk at a local level, not as a site specific assessment of risk which should be based on more detailed site specific information. Descriptions of each of the categories are as follows:

- Highly compatible for infiltration SuDS : The sub-surface is likely to be suitable for free draining infiltration SuDS.
- Probably compatible for infiltration SuDS : The sub-surface is probably suitable for infiltration SuDS, although the design may be influenced by ground conditions.
- Opportunities for bespoke infiltration SuDS : The subsurface is potentially suitable for infiltration SuDS, although design will be influenced by the ground conditions.
- Very significant constraints are indicated : There is a very significant potential for one or more geohazards associated with infiltration.

2. This map is intended to provide a strategic overview of infiltration SuDS suitability and should not be used to approve or discount infiltration SuDS for individual properties.

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FIGURE TITLE

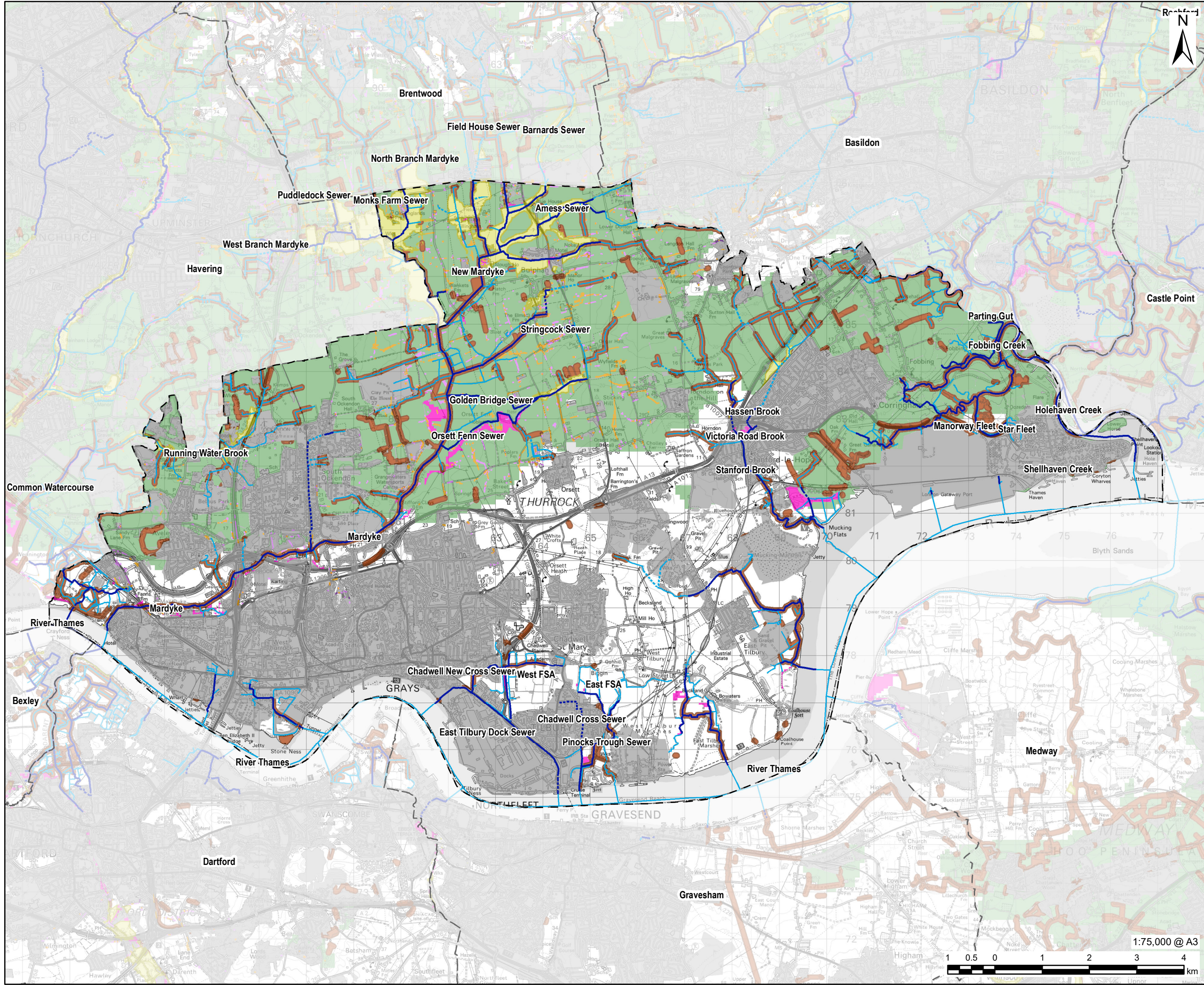
SuDS SUITABILITY

FIGURE NUMBER

Figure 11



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Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)	
CLIENT	
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CONSULTANT	
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LEGEND	
	Borough Boundary
	Main River
	Ordinary Watercourse
	Main River Culvert
	Ordinary Watercourse Culvert
Flood Warning Area	
	Canvey Island north
	The Essex coast at Coalhouse Fort and surrounding marshland
	The Mardyke from North Stifford to Purfleet
	The Thames estuary from Grays to Purfleet, including West Thurrock
	The Thames estuary from Shellhaven, to and including Tilbury
	Tidal Thames from Dartford Creek to Erith High Street East
	Tidal Thames from The Mardyke to Barking Creek
NOTES	
1. The Environment Agency provides a free flood warning service for many areas at risk of flooding from rivers and sea. This can provide advance notice of flooding and provide time to prepare. 2. The Environment Agency issues flood warnings to homes and businesses when flooding is expected. Upon receipt of a warning, residents should take immediate action. © Ordnance Survey Crown copyright. All rights reserved. Environment Agency 100026380 2022. Reproduced from Ordnance Survey digital map data © Crown copyright 2023. All rights reserved. Licence number 0100031673.	
ISSUE PURPOSE	
SFRA REPORT	
PROJECT NUMBER	
60689110	
FIGURE TITLE	
ENVIRONMENT AGENCY FLOOD WARNING AREAS	
FIGURE NUMBER	
Figure 12	



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PROJECT
Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Woodland Constraints
- Working with natural processes
 - Floodplain Woodland Planting Potential
 - Riparian Woodland Planting Potential
- Runoff Attenuation Features 3.3% AEP
 - Runoff Attenuation
 - Gully Blocking
- Runoff Attenuation Features 1% AEP
 - Runoff Attenuation
 - Gully Blocking
 - Floodplain Reconnection Potential
 - Wider Catchment Woodland

NOTES
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ISSUE PURPOSE
SFRA REPORT

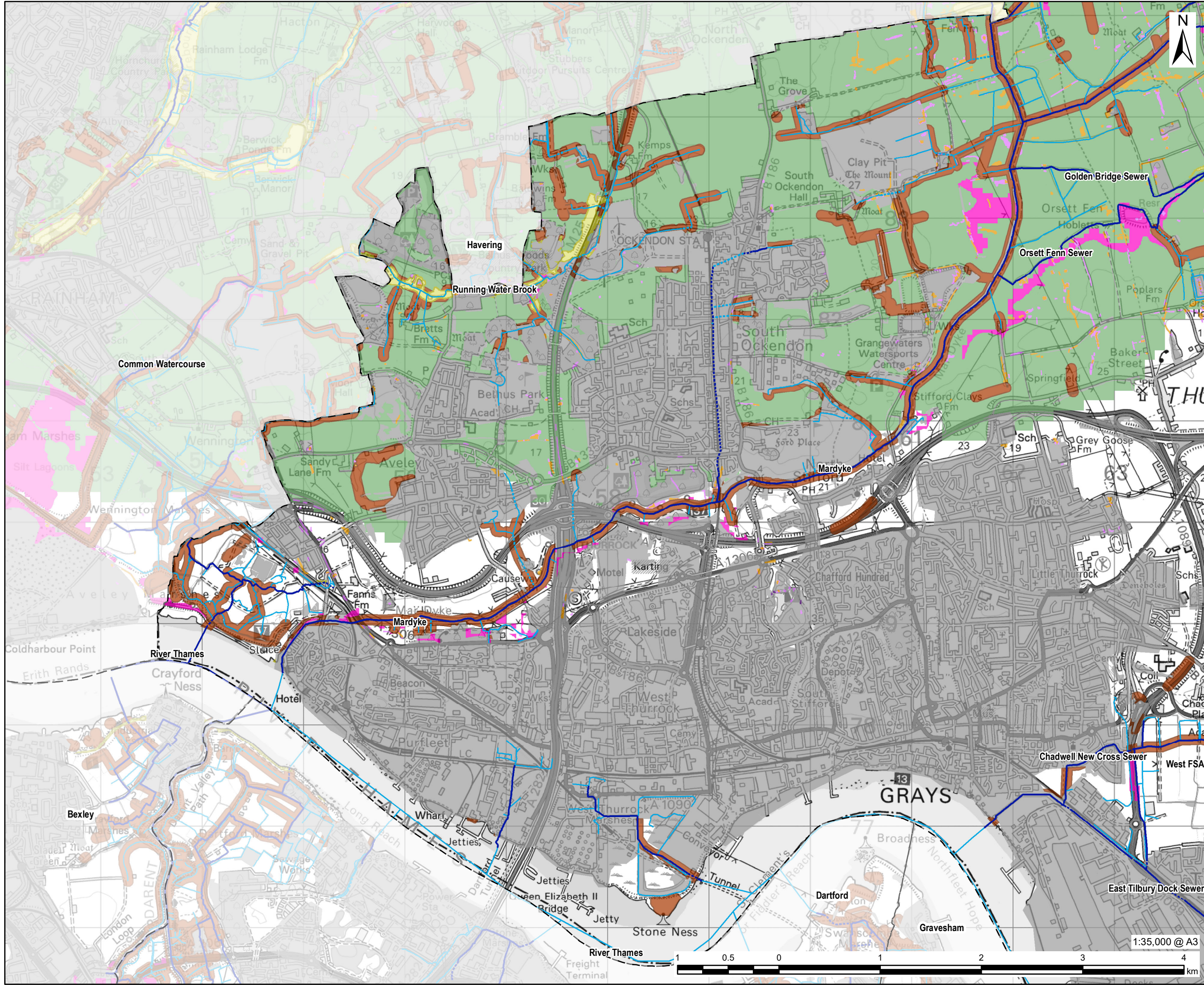
PROJECT NUMBER
60689110

FIGURE TITLE
OPPORTUNITIES TO REDUCE THE CAUSE AND IMPACTS OF FLOODING

FIGURE NUMBER
Figure 13

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Revision: 02 Drawn: BM Checked: BB Approved: SL Date: 2023-03-30
Filename: \\na.aecomnet.com\ifs\EMEA\Basingstoke-UKBAS\Legacy\UKBAS\PFILW00114700 - Water\Water\Projects & Jobs\604904042009 - Thurrock flood projects\900_CAD_GIS\920_GIS\GIS\IM\XDs\SFRA\08022023_Thurrock_SFRA_Figure13a.mxd



PROJECT
Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Woodland Constraints
- Working with natural processes
 - Floodplain Woodland Planting Potential
 - Riparian Woodland Planting Potential
- Runoff Attenuation Features 3.3% AEP
 - Runoff Attenuation
 - Gully Blocking
- Runoff Attenuation Features 1% AEP
 - Runoff Attenuation
 - Gully Blocking
 - Floodplain Reconnection Potential
 - Wider Catchment Woodland

NOTES
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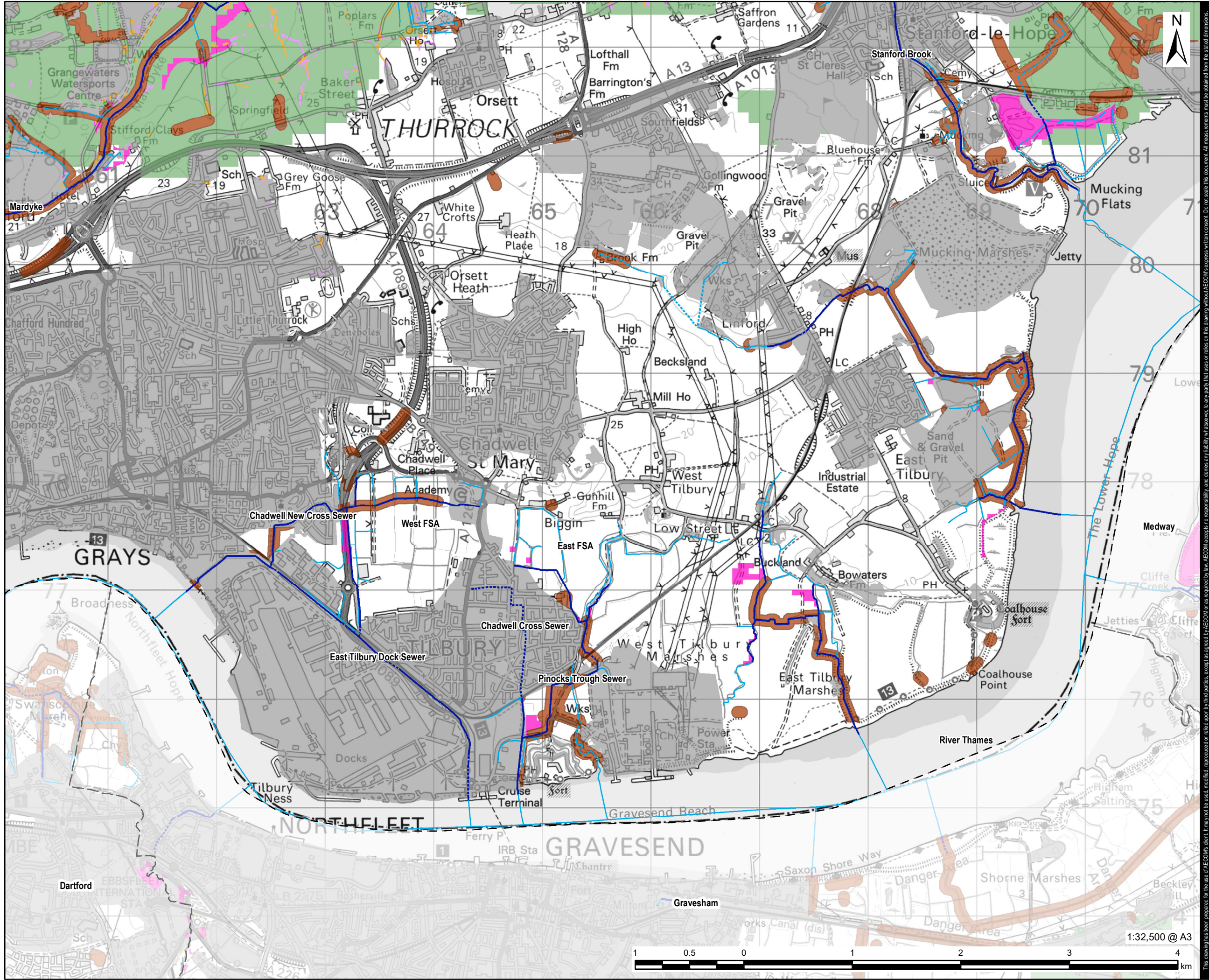
ISSUE PURPOSE
SFRA REPORT

PROJECT NUMBER
60689110

FIGURE TITLE
OPPORTUNITIES TO REDUCE THE CAUSE AND IMPACTS OF FLOODING

FIGURE NUMBER
Figure 13a

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PROJECT
Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Woodland Constraints
- Working with natural processes**
- Riparian Woodland Planting Potential
- Runoff Attenuation Features 3.3% AEP**
- Runoff Attenuation
- Runoff Attenuation Features 1% AEP**
- Runoff Attenuation
- Floodplain Reconnection Potential

NOTES

These datasets are from the Working with Natural Processes Project (Environment Agency and Flood and Coastal Risk Management R&D Programme 2021) and identify locations in the country where natural flood management methods can be applied. Refer to the accompanying SFRA Report for details of the datasets and purpose of their use. Refer to the SFRA report for details of other opportunities to reduce the causes and impacts of flooding not shown on this map.

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ISSUE PURPOSE
SFRA REPORT

PROJECT NUMBER
60689110

FIGURE TITLE
OPPORTUNITIES TO REDUCE THE CAUSE AND IMPACTS OF FLOODING

FIGURE NUMBER
Figure 13B

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

-  Borough Boundary
 Main River
 Ordinary Watercourse
 Main River Culvert
 Ordinary Watercourse Culvert

Working with natural processes

-  Floodplain Woodland Planting Potential
-  Riparian Woodland Planting Potential
-  Floodplain Reconnection Potential
-  Wider Catchment Woodland

NOTES

These datasets are from the Working with Natural Processes Project (Environment Agency and Flood and Coastal Risk Management R&D Programme 2021) and identify locations in the country where natural flood management methods can be applied. Refer to the accompanying SFRA Report for details of the datasets and purpose of their use. Refer to the SFRA report for details of other opportunities to reduce the causes and impacts of flooding not shown on this map.

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ISSUE PURPOSE

SFRA REPORT

PROJECT NUMBER

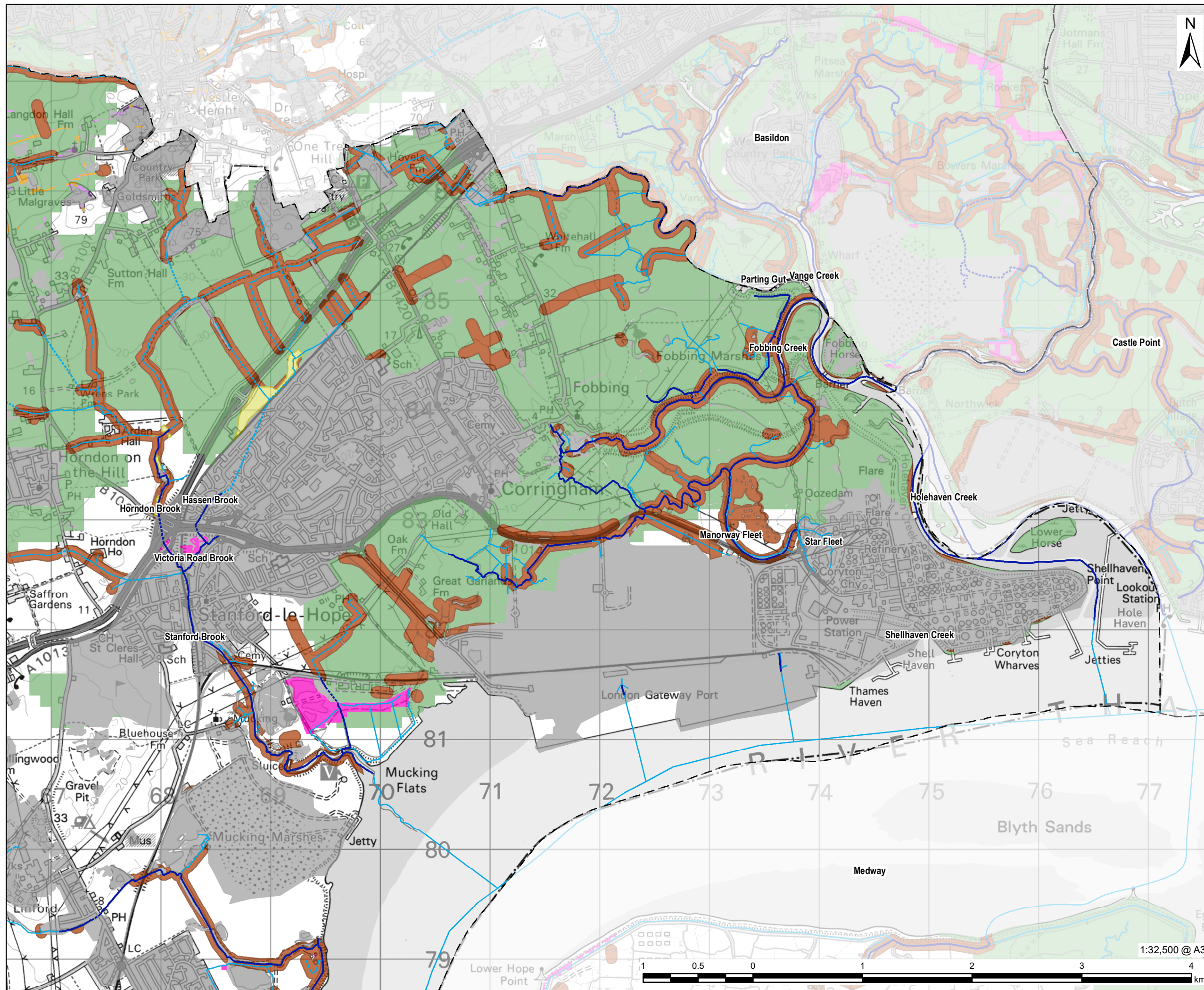
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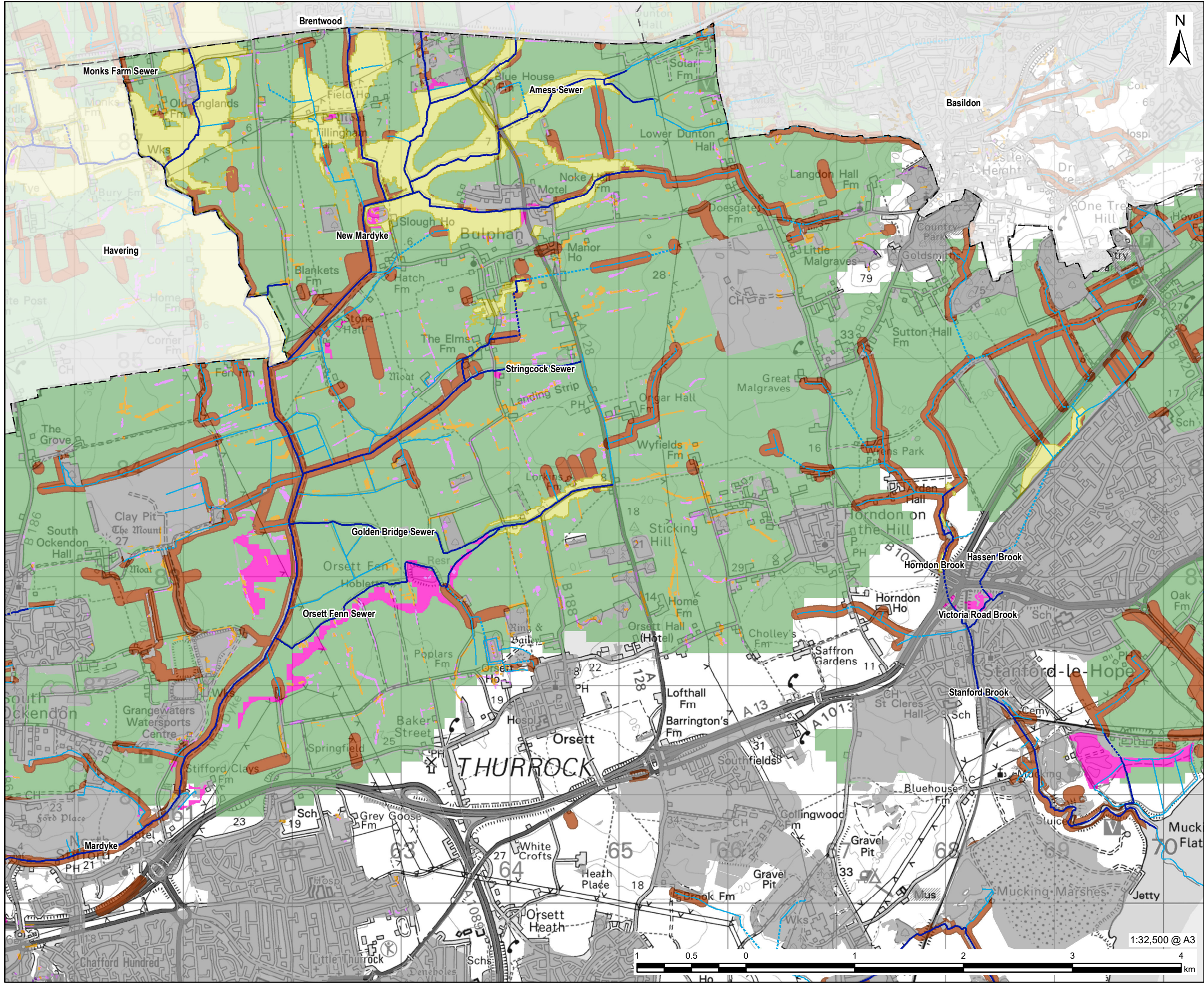
FIGURE TITLE

OPPORTUNITIES TO REDUCE THE CAUSE AND IMPACTS OF FLOODING

FIGURE NUMBER

Figure 13C





PROJECT
Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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LEGEND

- Borough Boundary
- Main River
- Ordinary Watercourse
- Main River Culvert
- Ordinary Watercourse Culvert
- Woodland Constraints
- Working with natural processes
 - Floodplain Woodland Planting Potential
 - Riparian Woodland Planting Potential
- Runoff Attenuation Features 3.3% AEP
 - Runoff Attenuation
 - Gully Blocking
- Runoff Attenuation Features 1% AEP
 - Runoff Attenuation
 - Gully Blocking
 - Floodplain Reconnection Potential
 - Wider Catchment Woodland

NOTES
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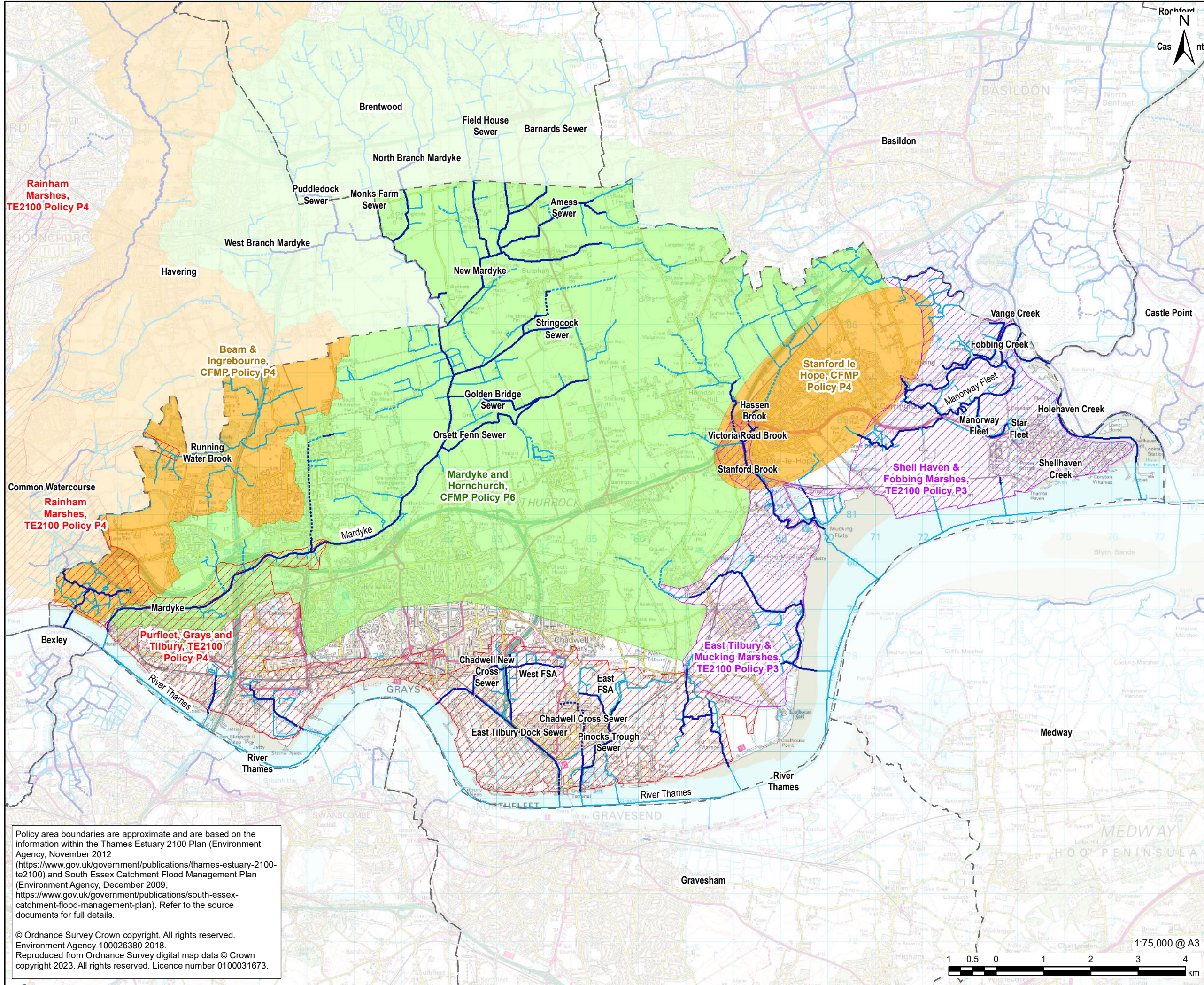
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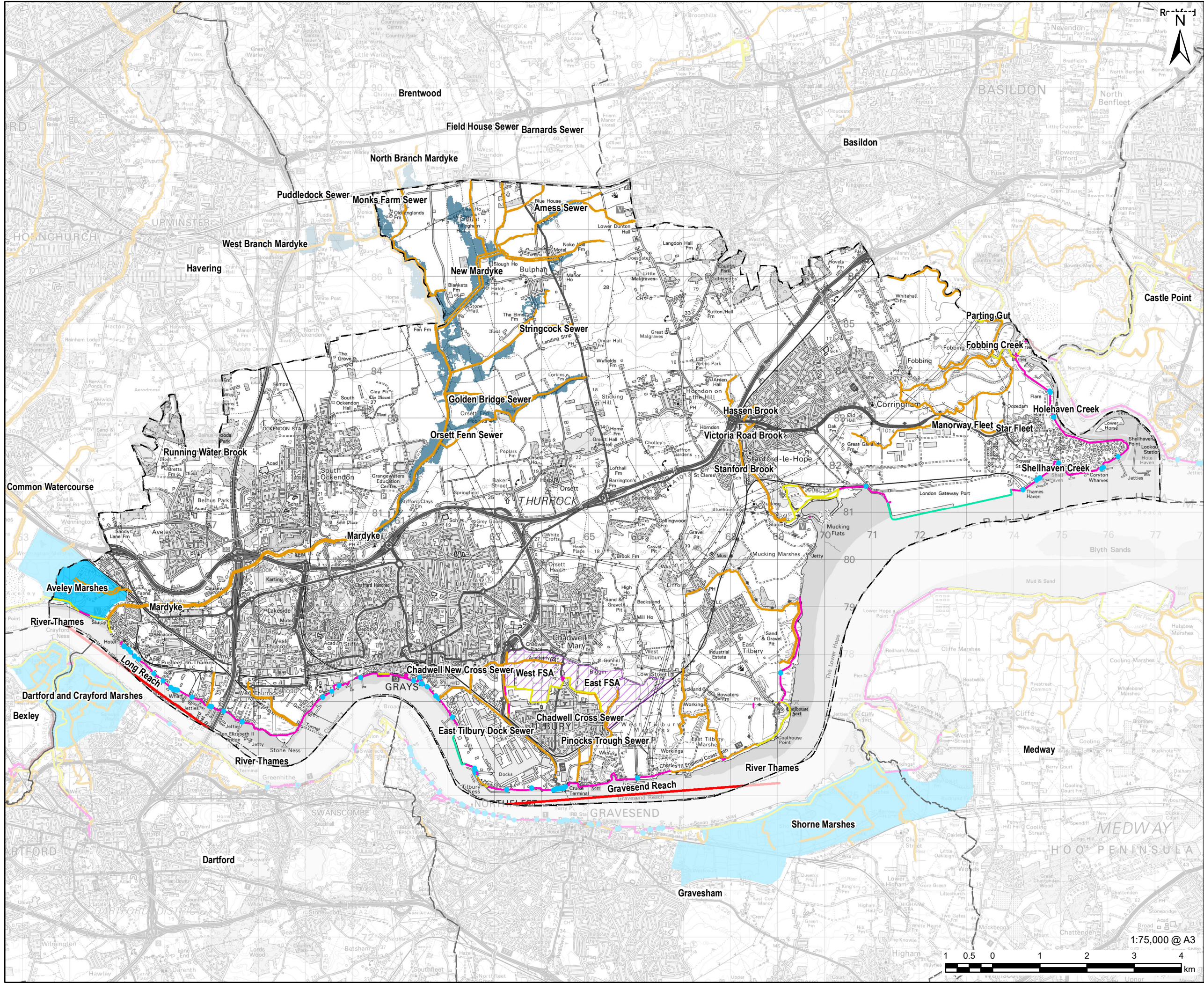
ISSUE PURPOSE
SFRA REPORT

PROJECT NUMBER
60689110

FIGURE TITLE
OPPORTUNITIES TO REDUCE THE CAUSE AND IMPACTS OF FLOODING

FIGURE NUMBER
Figure 13D





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LEGEND

- Borough Boundary
- Flood Storage Area
- Flood Zone 3b

Spatial Flood Defence

- Bridge Abutment
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Quay
- Spillway
- Wall

Potential locations for future barrier and storage (TE2100)

- Potential future barrier reach
- Potential Flood Storage Area

NOTES

This figure displays areas of land that should be safeguarded for flood risk management purposes in Thurrock. This map is not exhaustive. It includes (1) areas of Flood Zone 3b Functional Floodplain, where water from rivers or the sea has to flow or be stored in times of flood. (2) Tilbury Flood Storage Area, the purpose of which is to store and manage flood water. (3) Land within 8m of the bank or flood defence structure adjacent to a main river, or land within 16m of the bank or flood defence structure adjacent to the tidal Thames. Refer to the accompanying SFRA Report for further information on land that should be safeguarded for flood risk management purposes.

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ISSUE PURPOSE

SFRA REPORT

PROJECT NUMBER

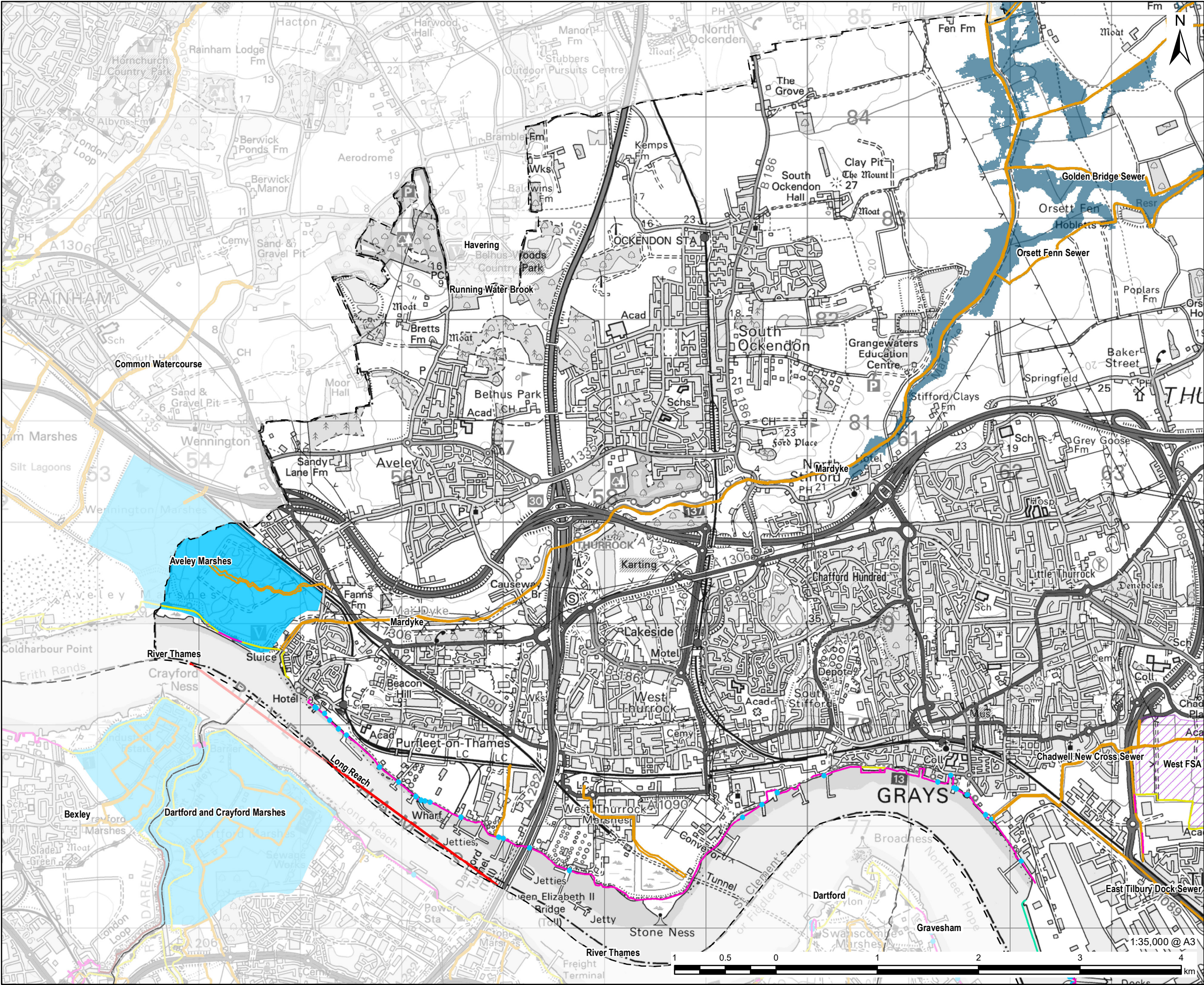
60689110

FIGURE TITLE

LAND THAT NEEDS TO BE SAFEGUARDED FOR FLOOD RISK MANAGEMENT

FIGURE NUMBER

Figure 15



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PROJECT

Thurrock Council Level 1
Strategic Flood Risk
Assessment (SFRA)

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LEGEND

- Borough Boundary
- Flood Storage Area
- Flood Zone 3b
- Spatial Flood Defence**
 - Bridge Abutment
 - Embankment
 - Engineered High Ground
 - Flood Gate
 - Natural High Ground
 - Quay
 - Spillway
 - Wall
- Potential locations for future barrier and storage (TE2100)**
 - Potential future barrier reach
 - Potential Flood Storage Area

NOTES

This figure displays areas of land that should be safeguarded for flood risk management purposes in Thurrock. This map is not exhaustive. It includes (1) areas of Flood Zone 3b Functional Floodplain, where water from rivers or the sea has to flow or be stored in times of flood. (2) Tilbury Flood Storage Area, the purpose of which is to store and manage flood water. (3) Land within 8m of the bank or flood defence structure adjacent to a main river, or land within 16m of the bank or flood defence structure adjacent to the tidal Thames. Refer to the accompanying SFRA Report for further information on land that should be safeguarded for flood risk management purposes.

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ISSUE PURPOSE

SFRA REPORT

PROJECT NUMBER

60689110

FIGURE TITLE

LAND THAT NEEDS TO BE
SAFEGUARDED FOR FLOOD RISK
MANAGEMENT

FIGURE NUMBER

Figure 15a

PROJECT

Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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Basingstoke, Hampshire
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LEGEND

- Spatial Flood Defence**
- Borough Boundary
 - Flood Storage Area
 - Flood Zone 3b
 - Bridge Abutment
 - Embankment
 - Engineered High Ground
 - Flood Gate
 - Natural High Ground
 - Quay
 - Spillway
 - Wall

Potential locations for future barrier and storage (TE2100)

- Potential future barrier reach
 Potential Flood Storage Area

NOTES

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ISSUE PURPOSE

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PROJECT NUMBER

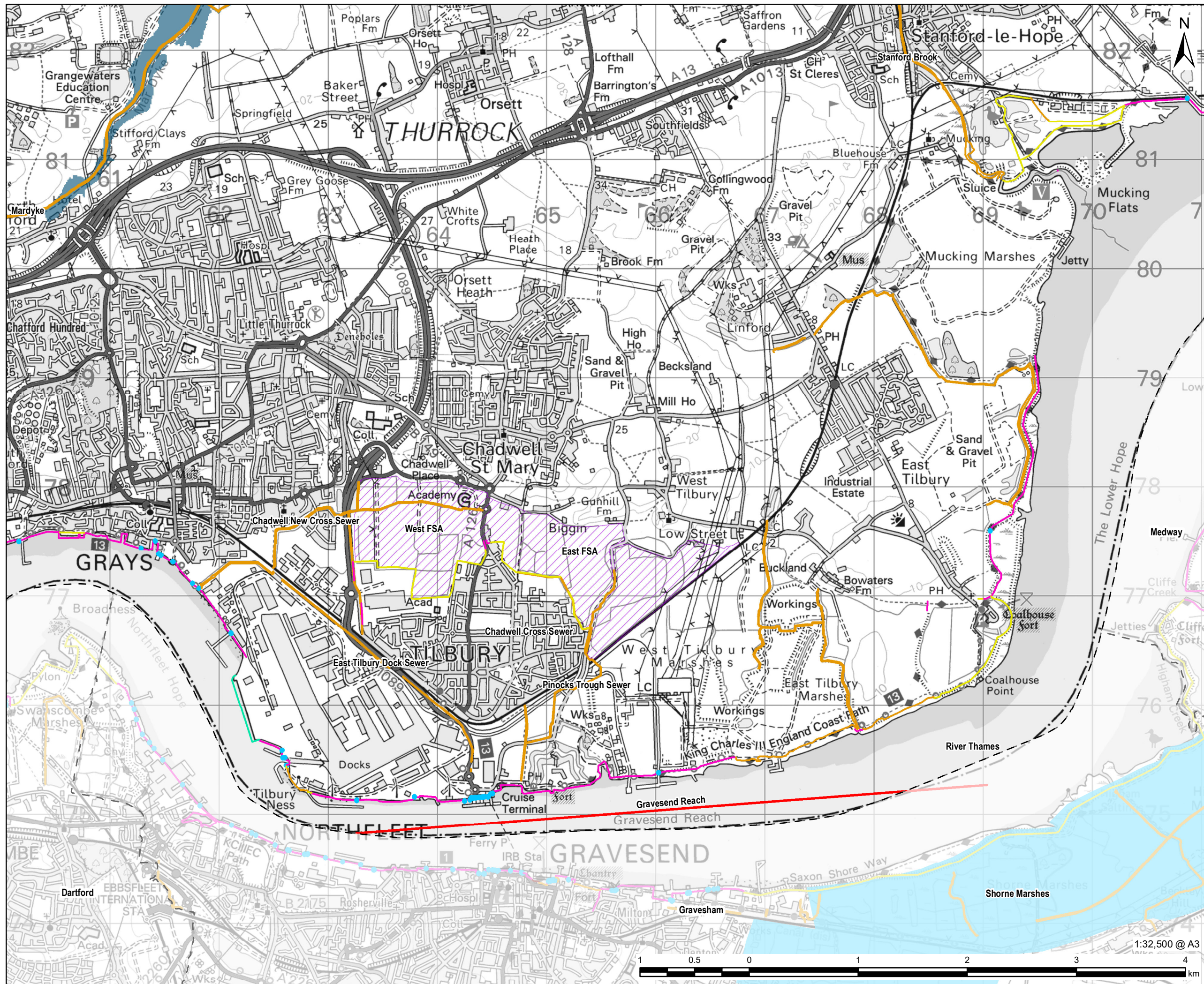
60689110

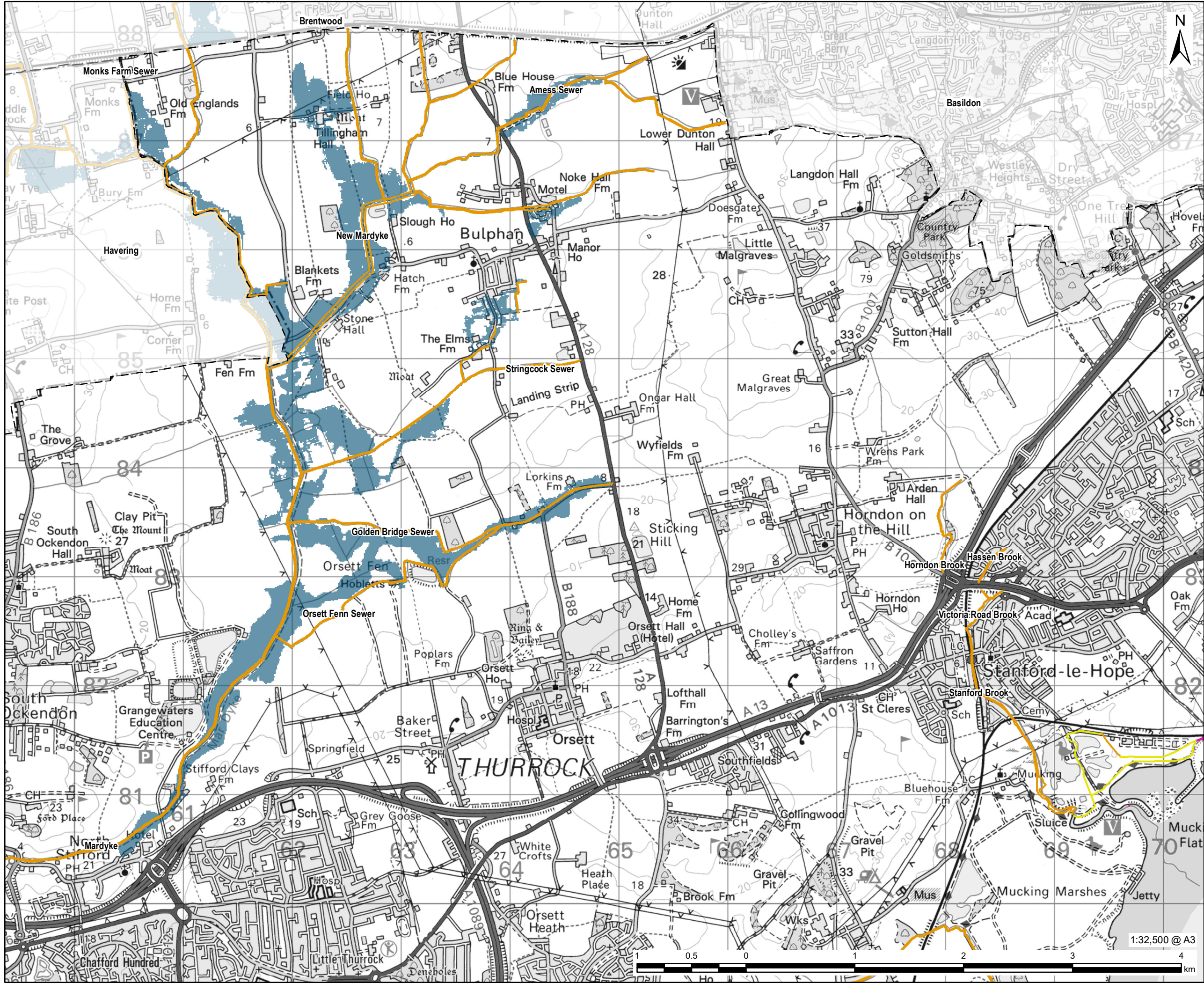
FIGURE TITLE

LAND THAT NEEDS TO BE SAFEGUARDED FOR FLOOD RISK MANAGEMENT

FIGURE NUMBER

Figure 15B





PROJECT
Thurrock Council Level 1 Strategic Flood Risk Assessment (SFRA)

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LEGEND

- Borough Boundary
- Flood Storage Area
- Flood Zone 3b
- Spatial Flood Defence**
 - Bridge Abutment
 - Embankment
 - Engineered High Ground
 - Flood Gate
 - Natural High Ground
 - Quay
 - Spillway
 - Wall
- Potential locations for future barrier and storage (TE2100)**
 - Potential future barrier reach
 - Potential Flood Storage Area

NOTES
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ISSUE PURPOSE
SFRA REPORT

PROJECT NUMBER
60689110

FIGURE TITLE
LAND THAT NEEDS TO BE SAFEGUARDED FOR FLOOD RISK MANAGEMENT

FIGURE NUMBER
Figure 15D