



FLOOD RISK ASSESSMENT

RE-LANDSCAPING AND PUBLIC REALM ENHANCEMENT,
ST ANDREWS GARDENS,
GRAVESEND,
KENT

JAN. 2026 | PROJECT REF: 25304

DOCUMENT CONTROL SHEET

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CONTENTS

1. INTRODUCTION 1

2. SITE LOCATION AND DESCRIPTION.....2

3. EXISTING HYDROLOGY.....3

4. FLOOD RISK ASSESSMENT.....4

5. LEVELS, LAYOUT AND FLOOD COMPATIBILITY.....8

6. DESIGN RATIONALE AND FLOOD DEFENCE INTEGRATION.....9

7. CONCLUSIONS AND RECOMMENDATIONS.....10

APPENDICES

APPENDIX A – ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

APPENDIX B – ENVIRONMENT AGENCY FLOOD DEFENCE AND BREACH MODELLING
INFORMATION (PRODUCT 4). CUSTOMER REFERENCE G865CJ9G887A

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1.0 INTRODUCTION

- 1.1 This report has been prepared by MBA Consulting for the exclusive use of Mei Loci, appointed advisors, and the local planning authority.
- 1.2 The report has been prepared to support the Local Planning Authority and the Environment Agency in assessing flood risk associated with the proposed works, in accordance with the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG).
- 1.3 The proposed development comprises landscape and public realm improvements, including new steps, ramps, terraced seating, amphitheatre-style seating, planting terraces, and new hard landscaping. No residential, commercial, or vulnerable development is proposed.
- 1.4 The site lies within Environment Agency Flood Zone 3, associated with tidal flooding from the River Thames. As such, a site-specific Flood Risk Assessment is required to demonstrate that the proposals are appropriate, safe, and will not increase flood risk elsewhere.



FIGURE 1.0 – SOUTHEASTERN APPROACH TO THE GARDENS

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 St Andrews Gardens is a public open space located on the southern bank of the River Thames in Gravesend, Kent, adjacent to the town centre and St Andrews Art Centre. The gardens can be located at Ordnance Survey Grid Reference (OSGR) TQ 64856 74431.
- 2.2 The site is bounded to the north by the River Thames and an existing tidal flood defence wall, which forms part of the Thames Estuary flood defence system. The site sits at low-lying riverside levels characteristic of the defended Thames frontage.
- 2.3 The gardens currently comprise areas of grass, hard landscaping, existing steps, paths, seating, planting, and memorial features. The existing steps are steep and difficult to access, and there are underutilised areas that currently contribute to antisocial behaviour.
- 2.4 The proposals seek to improve accessibility, safety, usability, and visual connection with the river, while retaining the gardens as public open space.
- 2.5 The existing site covers an area of approximately 2563.00m².

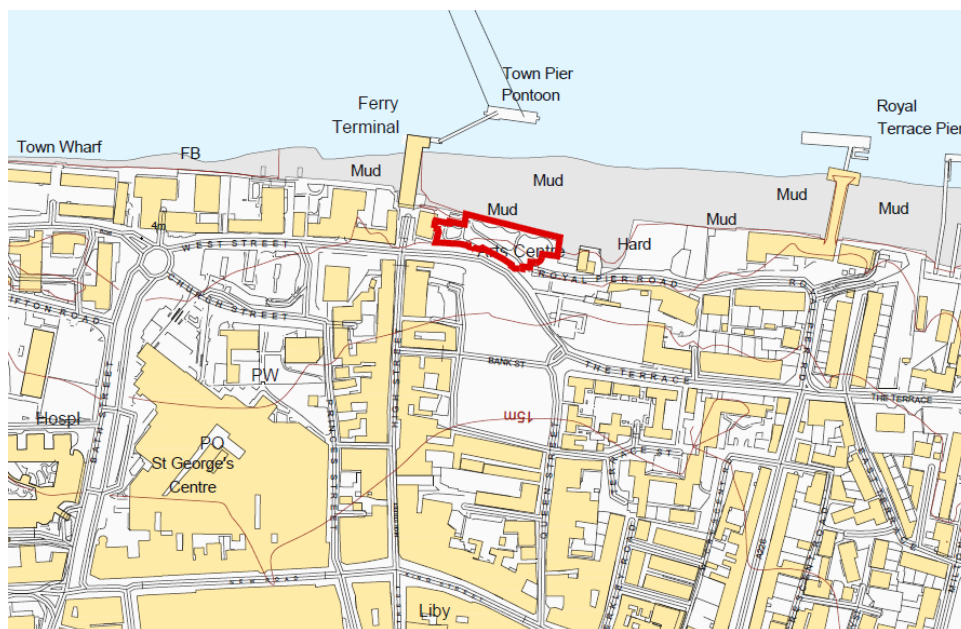


FIGURE 2.0 – SITE LOCATION

3.0 EXISTING HYDROLOGY

- 3.1 The site is located within the defended tidal Thames frontage as identified in the Gravesham Strategic Flood Risk Assessment (SFRA), where flood risk is primarily associated with residual breach or exceedance scenarios rather than regular tidal inundation
- 3.2 The site lies within Flood Zone 3, defined by the Environment Agency (Appendix A) as having a high probability of flooding from tidal sources in the absence of defences.
- 3.3 The site benefits from an existing Thames tidal flood defence wall, which provides protection against regular tidal flooding. This defence is an established and critical piece of infrastructure.
- 3.4 Environment Agency flood defence asset information (Appendix B) confirms that the site is protected by a series of tidal flood walls maintained by the Environment Agency, with recorded crest levels ranging between approximately 6.18 m AOD and 6.76 m AOD. The defences provide a standard of protection of up to the 1 in 1,000 year tidal event and are recorded as being in fair to good condition.
- 3.5 No alterations, lowering, removal, or penetration of the flood defence wall are proposed as part of the development. The defence will remain fully operational throughout and following completion of the works.
- 3.6 Flood risk to the site is therefore dominated by residual risk, primarily associated with:
- Extreme tidal events exceeding the standard of protection; and
 - A theoretical breach or failure of the tidal flood defences.

4.0 FLOOD RISK ASSESSMENT

4.1 This assessment considers all potential sources of flooding in line with the PPG:

- Flooding from rivers and the sea
- Surface water flooding
- Groundwater flooding
- Sewer flooding
- Flooding from artificial sources

4.2 Flood Risk Vulnerability Classification

4.3 In accordance with Table 2 of the Planning Practice Guidance, public open space and outdoor recreation are classified as Water-Compatible Development.

4.4 Water-compatible development is appropriate in Flood Zone 3, subject to demonstrating that:

- Flood risk is not increased elsewhere;
- Users can remain safe; and
- Flood defence infrastructure is not compromised.

4.5 Flooding from Rivers and the Sea (Tidal Flood Risk)

4.6 The site is located adjacent to the tidal River Thames and within Flood Zone 3. The probability of flooding without defences would be high.

4.7 The presence of the existing flood defence wall significantly reduces the likelihood of frequent flooding. The proposals:

- Do not alter defence crest levels;
- Do not increase loading on the defence;
- Do not restrict inspection or maintenance access.
- Do not lose floodplain storage at SFRA scale.
- Do not redirect flood flows towards adjacent streets or town centre areas.

4.8 The proposed cut-and-fill regrading maintains existing floodplain storage volumes and does not alter strategic flood flow routes identified in the Gravesham SFRA. Flood routing during extreme events would remain consistent with existing conditions.

-
- 4.9 Residual flood risk from a potential breach of the Thames tidal defences has been assessed using the Environment Agency's Thames Estuary Breach Assessment. This strategic modelling:
- Considers breach scenarios along the Thames tidal defence line between the Thames Barrier and Gravesend;
 - Includes modelling of flood extents, depths, hazard and velocities for a range of tidal events and epochs;
 - Is the accepted evidence base used by the Environment Agency to inform site-specific Flood Risk Assessments in defended tidal areas.
- 4.10 The site lies within the geographic coverage of this assessment and is therefore subject to residual breach risk under extreme tidal conditions.
- 4.11 Detailed breach modelling outputs are held by the Environment Agency and are not appended, in accordance with EA guidance that Product 4 outputs are not a direct planning requirement.
- 4.12 The design does not seek to resist or exclude floodwaters during breach scenarios. Instead, it accepts periodic inundation as an inherent characteristic of the Thames riverside environment, with all elements designed to remain structurally resilient and safely usable following flood events.
- 4.13 Given the nature of the proposals as open, flood-compatible landscape works, the consequences of flooding are limited. No buildings or enclosed structures are proposed that would increase flood damage or risk to life.
- 4.14 Flooding from Surface Water**
- 4.15 The proposed layout includes new hard landscaping associated with seating, terraces, and accessible routes. Some existing grassed areas will be replaced with hardstanding to create flexible event space.
- 4.16 Surface water will be managed through:
- Permeable resin-bound surfacing;
 - Extensive planted terraces designed to capture and slow runoff;
 - Graded landforms directing surface water away from key access routes and towards landscaped areas.

4.17 Terraced planting in front of the flood wall reinforces the contemporary design approach while also functioning as a SuDS-style feature, capturing rainfall and reducing the rate of surface water runoff.

4.18 Surface water management is achieved entirely through above-ground SuDS measures integrated into the landscape design, with no new piped discharges to the public sewer or River Thames

4.19 The development will not increase surface water runoff rates beyond existing conditions and will not increase flood risk off-site.

4.20 Flooding from Groundwater

4.21 The Environment Agency mapping identifies parts of Gravesend as potentially susceptible to groundwater emergence during extreme conditions.

4.22 The proposals involve shallow re-grading and cut-and-fill earthworks only, with no deep excavations. As such, the development is not expected to intercept groundwater or alter groundwater flow paths.

4.23 The risk of flooding from groundwater is therefore considered low.

4.24 Flooding from Sewers

4.25 No foul drainage infrastructure is proposed as part of the development. The scheme does not introduce new buildings, toilets, or connections to the public sewer network.

4.26 Surface water is managed above ground through permeable and landscaped solutions, and no reliance on sewer capacity is introduced.

4.27 The development will not increase the risk of sewer flooding.

4.28 Flooding from Reservoirs, Canals and Other Artificial Sources

4.29 Environment Agency mapping indicates that while large areas of the Thames corridor fall within reservoir inundation extents, the likelihood of such an event is extremely low.

4.30 Reservoirs are subject to stringent inspection and maintenance regimes under the Reservoirs Act 1975 and Flood and Water Management Act, making failure highly unlikely.

-
- 4.31 Given the open nature of the site and absence of buildings, the consequences of such an event would be limited.
- 4.32 In the unlikely event of a burst water main, the site topography, relative to surrounding buildings, there is little potential for flooding of property. Furthermore, the proposals do not introduce any changes to the wider existing potable water infrastructure that could increase this risk.
- 4.33 Based on the above, the risk of flooding from water supply infrastructure is considered to remain negligible both during and after development.

5.0 LEVELS, LAYOUT AND FLOOD COMPATIBILITY

- 5.1 Levels around the proposed amphitheatre seating are raised locally to accommodate tiered seating, with careful grading to maintain accessibility and usability.
- 5.2 A cut-and-fill approach will be used across the site to balance earthworks and ensure no net loss of floodplain storage.
- 5.3 The reconfiguration of levels improves legibility and access while maintaining flood-compatible landforms appropriate to a defended riverside location.
- 5.4 No raised platforms, enclosed structures, or flood-sensitive uses are introduced.

6.0 DESIGN RATIONALE AND FLOOD DEFENCE INTEGRATION

- 6.1 The strong formation lines of the planting terraces along the flood wall are inspired by Tilbury Fort, reflecting the area's defensive and industrial heritage while responding to the existing flood infrastructure in a contemporary manner.
- 6.2 Hard landscape materials, including reclaimed Yorkstone, corten steel, concrete seating, and resin-bound surfacing, have been selected for durability, flood resilience, and compatibility with periodic inundation.
- 6.3 Interpretation and public art are integrated into seating, surfacing, and corten steel elements only. No interpretation is fixed to, or impacts upon, the flood defence wall.
- 6.4 All artwork and interpretation features are flood-compatible and will not obstruct flood flows or compromise flood defence performance.
- 6.5 The existing steps at the western end of the gardens will be removed and reinstated further along an existing internal landscaping wall located wholly within the site and separate from the tidal flood defence. New paving slabs will be laid to form an accessible surface across the top of this landscaping wall.
- 6.6 The introduction of the paving locally increases the finished surface level of the landscaping wall by approximately 150 mm; however, this wall does not form part of the Environment Agency tidal flood defence system and has no flood risk management function.
- 6.7 Removal of the existing steps may require localised aesthetic remediation to the exposed face of the landscaping wall within the site. Any such works will be cosmetic in nature only and will not affect flood flows, flood storage, or the performance of the adjacent tidal flood defence.
- 6.8 No works are proposed within, over, or through the flood defence structure. All interventions are set back from the defence crest and toe, and no changes are proposed that would affect the defence's integrity, inspection, or future maintenance.

7.0 CONCLUSIONS AND RECOMMENDATIONS

- 7.1 This Flood Risk Assessment has been prepared in accordance with the National Planning Policy Framework and Planning Practice Guidance.
- 7.2 The site is located within Flood Zone 3 but is protected by an existing tidal flood defence. The proposed development is classified as water-compatible and is therefore appropriate in flood risk terms.
- 7.3 **Safe Access, Egress and User Safety**
- 7.4 Given the public nature of the space, flood risk to users has been considered:
- The site will remain subject to Environment Agency flood warning services for tidal flooding.
 - New access routes provide clear and legible connections to higher ground, improving egress compared to the existing steep and constrained steps.
 - The open and visible layout increases passive surveillance and reduces hidden or enclosed areas during extreme events.
 - No permanent fixtures are proposed that would create debris or hazards during flood events.
- 7.5 Safe dry access is not relied upon during extreme breach events; however, the proposals improve legibility, permeability, and access to higher ground relative to existing conditions.
- 7.6 The proposed re-landscaping of St Andrews Gardens:
- Is classified as water-compatible development;
 - Is appropriate within Flood Zone 3;
 - Does not increase flood risk on-site or elsewhere;
 - Maintains and respects the existing Thames tidal flood defence;
 - Appropriately considers residual breach risk using the Environment Agency's Thames Estuary Breach Assessment.
- 7.7 The proposals remain appropriate under future climate change scenarios, as they do not rely on fixed flood resistance measures and are inherently resilient to periodic inundation.
- 7.8 The proposals represent a net betterment in flood risk terms by improving accessibility, safety, and flood-compatible public use of a defended riverside space without increasing risk to people, property, or flood defence infrastructure. On this basis, the

proposed re-landscaping of St Andrews Gardens is considered acceptable in flood risk terms and suitable for planning approval.



Signed.....
MARK POWELL Eng. Tech. TMICE
FOR AND ON BEHALF OF
MBA CONSULTING

Dated: Jan. 2026

ST ANDREWS GARDENS,
GRAVESEND
25304



APPENDIX A

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	564843/174435	30 October 2025 12:03

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2025 AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

Unspecified

Location (easting/northing)
564843/174435

Scale
1:2,500

Created
30 Oct 2025 12:04

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area



0 20 40 60m

ST ANDREWS GARDENS,
GRAVESEND
25304



APPENDIX B

Dear Ash,

Re: Request for Flood risk assessment data (product 4). Customer request reference G865CJ9G887A

Thank you for your enquiry which was received on 30 October 2025.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

You have requested a Product 4, please see Appendix 1 below detailing each product.

Your request for a Product 4 falls under the exemption in provision 6(1)(a) and (b) of the Environmental Information Regulations 2004 (EIR), and on this occasion we are not providing the information in the requested format, but in an alternative format. Further detail of the provisions under the EIR can be found in Appendix 2.

Please find below the link containing the Product 5 and 6

Thames Tidal Downriver Breach Inundation Modelling 2018

<https://fcrm.quatrix.it/download/363ce4b0-18ae-4c8e-9298-6723b5efc9fb>

North Kent Coast - Domain 1 2018 <https://fcrm.quatrix.it/download/4cfbcf86-faf6-44b7-8ee0-9fd0780dcdb3>

We have also enclosed Thames Estuary 2100 information.

We are licensing the supplied data to you under the [Environment Agency Conditional Licence](#), details of which are included in the Quatrix link. You must first check this supporting information, to determine if the conditions of use are suitable for your purposes. If the conditions for use are not suitable for your purposes, this information

is not provided with a licence for use, and the data is provided for the right to read only.

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

Requests for flood products in Kent, South London and East Sussex

Please note that we changed our process in December 2019 for responding to flood product data requests. Where appropriate, we supply the data in its raw form (Product 6), as opposed to in the Product 4 and/or 8 PDF format. This is to improve efficiency within our area of the Environment Agency, and to provide customers with a more rapid and flexible response. Where customers are unable to use the Model Output Data (Product 6), or if the data is particularly complex, we will continue to produce Product 4 and 8 formats.

The Product 4 itself is not a direct requirement in the planning process, but the data that goes into the Product 4 is required to inform your Flood Risk Assessment. This data can be extracted from the Product 6 data provided in the ShareFile link and in open data sources listed below. Instructions on how to use the appropriate data are provided on the ShareFile link.

Other flood data sources

The Flood Map for Planning is available to view and export maps for your site at: <https://flood-map-for-planning.service.gov.uk/>

Flood Zone 3 <https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-3>

Flood Zone 2 <https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-2>

Historic Flood Map <https://data.gov.uk/dataset/historic-flood-map1>

Please note that our historic flood event maps may not be comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at your location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

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. The Lead Local Flood Authority is responsible for surface water flooding issues. Please contact them for further information or for details on groundwater flood risk.

Defence Information

Defence 1

Asset type – Wall

Crest level – 6.18m AOD

Location – North-west boundary of site

Maintainer – Environment Agency

Standard of protection – 1 in 1000 year event

Asset protection type – Tidal

Condition – Fair

Defence 2

Asset type – Wall

Crest level – 6.76m AOD

Location – Centre of site

Maintainer – Environment Agency

Standard of protection – 1 in 1000 year event

Asset protection type – Tidal

Condition – Fair

Defence 3

Asset type – Wall

Crest level – 6.50m AOD

Location – South-east boundary of site

Maintainer – Environment Agency

Standard of protection – 1 in 1000 year event

Asset protection type – Tidal

Condition – Good

Environment Agency planning guidance and pre application service.

1. Planning practice guidance - provides information about planning considerations in areas at risk of flooding <https://www.gov.uk/guidance/flood-risk-and-coastal-change>
1. Planning applications: assessing flood risk - information about completing flood risk assessments <https://www.gov.uk/planning-applications-assessing-flood-risk>
2. Site specific flood risk assessment checklist - a checklist to help ensure you have considered all the relevant factors in your flood risk assessment <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/site-specific-flood-risk-assessment-checklist/>
3. Climate change allowance guidance - <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

We recommend that you discuss your proposals with the Local Planning Authority at the earliest opportunity. They will be able to advise you on a wide range of planning matters in addition to flood risk.

Please see our website for details on how to get planning advice from the Environment Agency, including charged-for discretionary advice <https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals#when-to-consult>. Our planning team can be contacted at kslplanning@environment-agency.gov.uk

If you have a new enquiry or would like us to review the information we have provided under the Freedom of Information Act 2000 and Environmental Information Regulations 2004 please contact us within two months by email at KSLE@environment-agency.gov.uk

Kind regards,

Aidan Anderson

Flood & Coastal Risk Management Officer

Partnership & Strategic Overview - South East London & North Kent

Kent, South London and East Sussex

Environment Agency | □ Orchard House, London Road, Addington, West Malling, ME19 5SH

PSO.SELondonandNKent@environment-agency.gov.uk



Appendix 1

Product 4	Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from hydraulic models (including model extents and 2D flood level data for specific points)
Product 5	Reports, including flood modelling reports, model user logs and guides, hydrology reports, etc
Product 6	Model Output Data, including product 5. • flood outlines usually provided in shapefile format • 2D grids (level (h), depth (d) velocity (v) and hazard ZKU0) usually provided in ASCII or GeoTIFF format • 1D flow and level data Requires GIS software such as ArcGIS, MapInfo, QGIS or similar.
Product 7	Calibrated and Verified Model Input Data (CaVMID), including product 5. Enables customer to re-run and/or make changes to a hydraulic model. Requires specific hydraulic modelling software such as Flood Modeller, TUFLOW, or ICM InfoWorks.
Product 8	Breach Hazard Map Provides a hazard map of breaches in PDF format including, maximum flood depth, maximum flood velocity and maximum flood hazard. Please note product 8 is not available for fluvial models.

Appendix 2

The exemption in provision 6(1)(a) and (b) of the Environmental Information Regulations 2004 (EIR) states that

‘.....6.—(1) Where an applicant requests that the information be made available in a particular form or format, a public authority shall make it so available, unless—

*(a) it is reasonable for it to make the information available in another form or format;
or*

(b) the information is already publicly available and easily accessible to the applicant in another form or format.....’

On this occasion we are not providing the information in the requested format, for the following reasons:

- Complying with the preference would incur a significant cost, which the public authority [The Environment Agency] cannot pass on to the requester;
- Using a Product 5/6/7 allows us to make the information available at a lower cost; and
- The impact on the available resources of the public authority [The Environment Agency], of supplying a Product 5/6/7, is therefore much less.

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