RPS



**LONDON SOUTHEND AIRPORT**

**SOUTHEND-ON-SEA, SS2 6YF**

# FLOOD RISK ASSESSMENT

FOR

***STOBART ENERGY***

October 2014

**Our Ref:** RCEF33301-002R

RPS Health, Safety & Environment
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| Report Status: | Final | |
|---|---|---|
| **Project Reference:** | RCEF33301 | |
| | **Name:** | **Signature:** |
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| **Technical Reviewer:** | Matthew Bell | |
| **Date:** | October 2014 | |

*This report has been prepared in the RPS Group Quality Management System to British Standard EN ISO 9001:2008*

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## RPS HEALTH, SAFETY & ENVIRONMENT

### General Notes

1. The following notes should be read in conjunction with the report:

2. This report contains only that available factual data for the site, which was obtained from the sources, described in the text. These data were related to the site on the basis of the location information made available to RPS by the client.

3. The assessment of the site is based on information supplied by the client. Relevant information was also obtained from other sources.

4. The report reflects both the information provided to RPS in documents made available for review and the results of observations and consultations by RPS staff.

5. Where data have been supplied by the client or other sources, including that from previous site audits or investigations, it has been assumed that the information is correct but no warranty is given to that effect. While reasonable care and skill has been applied in review of this data no responsibility can be accepted by RPS for inaccuracies in the data supplied.

6. This report is prepared and written in the context of the proposals stated in the introduction to this report and its contents should not be used out of context. Furthermore new information, changed practices and changes in legislation may necessitate revised interpretation of the report after its original submission.

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# CONTENTS

# 1 INTRODUCTION

1.1 RPS was commissioned to undertake a Flood Risk Assessment of land within London Southend Airport in relation to the proposed solar park development.

1.2 The aim of the Flood Risk Assessment is to outline the potential for the site to be impacted by flooding, the impacts of the proposed development on flooding in the vicinity of the site, and the proposed measures which could be incorporated into the development to mitigate the identified risk. The report has been produced in accordance with the guidance detailed in the National Planning Policy Framework (NPPF). Reference has also been made to the CIRIA SUDS manual (C697), BRE Digest 365 Soakaway Design, the Rochford District Council Strategic Flood Risk Assessment (SFRA) and the South Essex Surface Water Management Plan.

1.3 This report has been produced in consultation with the Partnership and Strategic Overview Team at the Environment Agency.

1.4 The site is not located within an Internal Drainage Board (IDB) District.

1.5 This report considers the existing surface water run-off regime and the post development surface water run-off regime, in order to assess the potential impacts, both on and off site.

1.6 The desk study was undertaken by reference to information provided / published by the following bodies:

- Environment Agency
- Centre for Ecology and Hydrology
- British Geological Survey
- Ordnance Survey
- Anglian Water

# 2 PLANNING POLICY CONTEXT

**National Planning Policy**

2.1 The National Planning Policy Framework (NPPF) released in March 2012, advises of the requirements for a site specific Flood Risk Assessment (FRA) for any of the following cases:

- All proposals (including minor development and change of use) located within the Environmental Agency designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
- All proposals greater than 1ha in area located in Flood Zone 1 (low probability);
- All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the Environment Agency); and
- Where proposed development may be subject to other sources of flooding.

**Local Planning Policy**

2.2 The Rochford District Core Strategy is the main document of the Local Development Framework (LDF) and sets out the overall strategy for the future development of the District and was formally adopted on 13th December 2011. The Core Strategy contains the following policies relating to flood risk and drainage:

**Policy ENV3 – Flood Risk**

*The council will direct development away from areas at risk of flooding by applying the sequential test and, where necessary, the exception test, as per PPS25. The vast majority of development will be accommodated within Flood Zone 1. However, considering the very limited supply of previously developed land in the District, proposed development on previously developed land within Flood Zone 3 will be permitted if it enables a contribution towards the Districts housing requirement that would otherwise require the reallocation of Green Belt land, providing that it passes the exception tests and is able to accommodate the necessary flood defence infrastructure.*

*The Council will continue to work with the Environment Agency to manage flood risk in a sustainable manner through capitalising on opportunities to make space for water wherever possible and through the continued provision of flood defences where necessary.*

**Policy ENV4 – Sustainable Drainage Systems (SUDS)**

*All residential development over 10 units will be required to incorporate runoff control via SUDS to ensure runoff and infiltration rates do not increase the likelihood of flooding.*

*The requirement for SUDS will only be relaxed where there is conclusive evidence demonstrating that the system is not viable on a particular basis.*

2.3 The Rochford District Council Strategic Flood Risk Assessment (SFRA) identifies and maps flood risk from all sources at a borough-wide scale as well as providing guidance on producing site specific FRAs.

2.4 The Rochford District Council Surface Water Management Plan (SWMP) assesses the risk of surface water flooding within the Rochford District and identifies options to manage risk to acceptable level.

2.5 Southend Borough Council and Rochford District Council have prepared an Area Action Plan - 'The London Southend Airport Joint Area Action Plan' (JAAP). Recommendations within the JAAP relating to flood risk and drainage are presented within the SFRA as follows:

***"Sequential Approach***

*All future development should be steered towards Flood Zone 1 in accordance with the sequential approach. No development is permitted within Flood Zone 3b.*

***Finished Floor Levels***

*In areas affected by fluvial flooding, finished floor levels should be set 300mm above the 1 in 100 year flood levels, including allowances for climate change for the lifetime of the development (100 years for residential development).*

***Flood Resilient Design***

*For the buildings located adjacent to the Eastwood Brook, it is recommended that flood resilient construction methods are used up to the 1 in 100 year flood level including allowances for climate change.*

***Floodplain Compensation***

*Any encroachment into Flood Zone 3a that results in loss of storage in the floodplain should be compensated for on a level for level and volume for volume basis.*

***Surface Water Management***

*Future development must make adequate provision for the sustainable management of surface water on the site. Given the proximity of the Eastwood Brook, there may be potential to discharge to this watercourse. It should be noted that if a rainfall event coincides with the Eastwood Brook being in flood, the outfall for the development drainage system may become surcharged leading surface water flooding.*

*Any discharge to this main river will require consent from the Environment Agency and will require attenuation to discharge at a flow rate to be confirmed with the Environment Agency (potentially Greenfield runoff rate). SuDS should be used in order to manage surface water on site to meet the discharge requirements. The geology within this part of the district is River Terrace Deposits, underlain by Thames Group Clay. Infiltration testing will be required to determine the prospect of using infiltration drainage techniques.*

***Emergency Planning***

*The area is covered by the Environment Agency's Flood Warning Service and flood warnings are issued for the Eastwood Brook with a lead time of 2 hours. It is recommended that a Flood Evacuation Plan is prepared for future occupants of the site detailing response procedures and evacuation routes."*

# 3 CONSULTATION

3.1 The Flood Risk Assessment has been produced in consultation with the Partnership and Strategic Overview Team at the Environment Agency. Flood level data has been requested from the Environment Agency for the site in question as well as details of historic flooding and flood defences within the vicinity of the site. The information provided by the Environment Agency is included as Appendix B. Consultation with the Katherine Rivaldo at the Environment Agency has identified the following:

- Solar panels should be raised above the 1 in 100 year plus climate change event level;
- The loss of flood plain storage will be minimal and therefore insignificant;
- The transformer stations as well as dry access and egress should be located within Flood Zone 1;
- Surface water flows should follow the existing drainage pattern within the site; and
- Any flooding that does occur within Eastwood Brook will flow back into the water course north of the site.

3.2 The site is not located within an Internal Drainage Board (IDB) District.

3.3 The Lead Local Flood Authority is Essex County Council.

# 4 SITE DESCRIPTION

**Site Description**

4.1 The site is located at National Grid Reference 586698, 189548. It is irregular in shape, occupying an area of approximately 3.2 hectares. A site location plan is provided in Figure 1.

4.2 Vehicular access to the site is currently provided via Aviation Way. The road passes through existing airport hangars before leading to a series of buildings located upon the eastern boundary of the site.

4.3 At present, the site is wholly occupied by undeveloped grassland.

**Surrounding Land Uses**

4.4 The site is located within London Southend Airport. The immediate surrounding land comprises agricultural land to the north, the airport runway to the east, aircraft hangars to the south and Eastwood Brook which forms the western boundary of the site. The wider area in which the site is located comprises mixed land use including agricultural and residential uses as well as the wider London Southend Airport site.

4.5 The site is located over 1km to the west of the River Roach Estuary which is designated as both a Special Area of Conservation (SAC) and a Special Protection Area (SPA). The site is bounded to the west by Eastwood Brook which discharges to the River Roach approximately, 400m north east of the site.

**Topography**

4.6 At this stage a full topographic survey is not available. LiDAR data was obtained for the site in order to determine the nature of the topography of the site. The elevation profile of five cross sections through the site is shown in Figure 2. The cross sections identify the following:

- Cross section 1 – located at the southern end of the site shows the bed level is 8.00m AOD. The proposed solar panel area varies in height between 8.50m and 8.55m AOD;
- Cross section 2 – identifies that the level of the channel is 7.63m AOD. The proposed solar panel area varies in height between 8.35m and 7.97m AOD;
- Cross section 3 – identifies that the level of the channel is 7.23m AOD. The proposed solar panel area varies in height between approximately 8.10m and 7.90m AOD;
- Cross section 4 –identifies that the level of the channel is 6.83m AOD;

- Cross section 5 – identifies that the site slopes downwards in a northerly direction; and
- The gradient of the site has been calculated as approximately 0.5%. The LiDAR data shows that due to the nature of the topography of the site, surface water is drained in a northerly direction, eventually discharging into Eastwood Brook north of the site

# 5 PROPOSED DEVELOPMENT

5.1 The proposed development comprises the development of 3.2 hectares of land along the north-western boundary of London Southend Airport which includes the construction of a solar park. Development plans are shown in Appendix B.

5.2 The solar panel site (approximately 3.2 hectares) will remain a grass covered field but the addition of the frames housing the solar panels above. The legs of the frames will be driven into the ground. The minimum height of the solar panels will be 1 m above ground level to the bottom of the panels and 3.07m above ground level to the top of the panels. These are subject to the modelled flood levels to ensure that the panels are above the 1 in 100 plus climate change level. The final levels will be confirmed at the detailed design stage. The solar panel will rest on a 20 degree angle. The surface ground covering of grass across this development area will be maintained as grassland.

5.3 An 8m standoff between Eastwood Brook and the western edge of solar panels is included as part of the proposed development.

5.4 Vehicular access to the site will follow the existing access road which off Aviation Way.

5.5 Access to the solar panels will be via an internal road that will extend across the northern, eastern and southern boundaries. The internal access road will be 2m wide and constructed from gravel.

5.6 The transformer container will be located within a 10m by 3m container that will be situated in the part of the site that is located within Flood Zone 1.

5.7 The proposed use of the site is classified as 'essential infrastructure' within the NPPF.

# 6 HYDROLOGICAL SETTING

**Nearby Watercourses**

6.1 Reference to Ordnance Survey mapping indicates that the nearest surface watercourse is Eastwood Brook which forms the western boundary of the site. The brook flows in a northerly direction before discharging into the River Roach approximately 400m north east of the site.

6.2 No artificial watercourses / features (e.g. canals, reservoirs) have been identified within 1km of the site.

**Flood Risk Classification**

6.3 Reference to the Environment Agency's online flood map indicates that the site is predominantly located within Flood Zone 3b whereby the annual probability of flooding is classified as greater than 1 in 100 (1%). The site is partially located within Flood Zone 2. This is classified as having between a greater than 1 in 1000 (0.1%) but less than 1 in 100 (1%) annual probability of flooding. The site is also partially located within Flood Zone 1 whereby the annual probability of flooding is classified as less than 1 in 1000 (0.1%). The Environment Agency Flood Map is provided in Figure 3.

6.4 Reference to the Environment Agency's online risk of surface water flooding map indicates that the site is predominantly at a medium risk of surface water flooding where LiDAR data shows the land within the site to be lower. Smaller areas at a high risk of surface water flooding are present where there are small depressions in the ground. The eastern and western boundaries of the site are shown to be at a low risk of surface water flooding.

6.5 Reference to the Environment Agency's online risk of flooding from reservoir map indicates that the site is located in an area that is not at risk of reservoir flooding.

6.6 Modelled flood levels have been provided by the Environment Agency for the proposed site. The information provided by the Environment Agency is shown in Appendix B.

6.7 A summary of the modelled flood levels is shown below.

***Table 1: Modelled flood levels***

| Node | 1%(1:100) (m AOD) | 1% (1:100)+CC (m AOD) | 0.1% (1:1000) (m AOD) |
|---|---|---|---|
| EA051_EAST_01_605 | 8.75 | 8.81 | 9.03 |
| EA051_EAST_01_493 | 8.35 | 8.39 | 8.57 |
| EA051_EAST_01_425 | 8.11 | 8.15 | 8.31 |
| EA051_EAST_01_167 | 7.48 | 7.50 | 8.22 |

6.8 The Environment Agency has advised that they have no maintained defences in this area, only natural channels.

6.9 The Environment Agency has advised they have no record of flooding in the area in which the site is located.

# 7 HYDROGEOLOGICAL SETTING

7.1 Reference to the British Geological Survey online mapping (1:50,000 scale) indicates that the site is underlain by superficial deposits of Alluvium (comprising Clay, Silt, Sand and Gravel) and River Terrace deposits (comprising Clay and Silt). The underlying bedrock geology is identified as the London Clay Formation which is comprised of Clay, Silt and Sand.

7.2 There are no BGS borehole logs present within the vicinity of the site.

7.3 According to the Environment Agency's online Groundwater Vulnerability Mapping, the superficial Alluvium is classified as unproductive strata. These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The River Terrace deposits are classified as a Secondary B aquifer. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

7.4 Reference to the Environment Agency's online groundwater Source Protection Zone maps indicates that the site is not located within a groundwater Source Protection Zone.

# 8 EXISTING DRAINAGE / WATER MAINS

8.1 Reference to Anglian Water plans of public sewers (shown in Appendix C) indicates that the site is not served by any surface water or waste water sewers. A 450mm diameter foul sewer is located to the east of the site as it runs beneath the western boundary of the site, orientated in a north westerly direction.

# 9 FLOOD RISK AND MITIGATION

9.1 The key sources of flooding that could potentially impact the site are discussed below:

**Fluvial / Tidal Flooding**

9.2 The Environment Agency Flood Map (see Figure 2) indicates that the site is located within Flood Zone 3. The annual probability of flooding is classified as greater than 1 in 100 in the absence of any defences. The site is also partially located within Flood Zone 2 whereby the annual probability of flooding is classified as between less than 1 in 100 and greater than 1 in 1000 in the absence of any defences. A small part of the site, located upon the eastern boundary of the site is shown to be located within Flood Zone 1 whereby the annual probability is classified as less than 1 in 1000 in the absence of any defences.

9.3 The modelled flood level and the height of the solar panel above the flood level, based on the ground level and the modelled flood level is shown below.

***Table 2: Flood Levels and Depth of Flooding***

| Cross section no. | Lowest Ground Level (m) | Flood Level 1 in 100 plus CC (m) | Height of panel base above ground level (m) | Height of panel base above flood level (m) |
|---|---|---|---|---|
| 1 | 8.54 | 8.81 | 9.54 | 0.73 |
| 2 | 7.98 | 8.39 | 8.98 | 0.59 |
| 3 | 7.55 | 8.15 | 8.55 | 0.40 |
| 4 | 7.19 | 7.76 | 8.19 | 0.43 |

9.4 The container housing the transformer has been sequentially located within Flood Zone1.

*Proposed Mitigation*

9.5 The finished floor level of the electrical infrastructure should be raised above the surrounding ground levels.

9.6 The base of the solar panels should be raised a minimum of 1m above ground level. As shown in Table 2, the base of the solar panels will be raised above the 1 in 100 year plus climate change flood level.

9.7 Due to the raised solar panels and the location of the transformer station within Flood Zone 1, no flood compensation is required as the displacement of flood water is minimal.

**Flooding from sewers**

9.8 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.

9.9 Anglian Water has confirmed that there are no sewer assets located within the boundary of the site.

*Proposed Mitigation*

9.10 No mitigation is required.

**Surface water flooding (overland flow)**

9.11 This can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.

9.12 Reference to the Environment Agency's online risk of flooding from surface water maps indicates that the site has a low to high risk of surface water flooding.

9.13 LiDAR data shows that the site slopes downwards in a northerly direction and therefore surface water will flow in this direction.

9.14 Surface water flooding from on-site sources is considered in Section 10 of this report.

9.15 The internal access road will be constructed from gravel which allows surface water to permeate through to the soft ground beneath.

*Proposed Mitigation*

9.16 The transformer container should be raised between 100 – 200mm above the surrounding ground level in order to prevent the ingress of surface water.

9.17 The solar panels will be raised a minimum of 1m above ground level and where required, will be raised further above the flood level.

**Groundwater flooding**

9.18 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures. BGS mapping indicates that the site is underlain by superficial deposits of Alluvium and River Terrace Deposits. This is further underlain by the London Clay Formation.

9.19 The Level 1 and 2 SFRA states that there is limited information available regarding flooding due to groundwater.

9.20 The site is not considered to be at a significant risk of groundwater flooding.

*Proposed Mitigation*

9.21 No mitigation is required.

**Other Sources**

9.22 No other significant sources of flooding have been identified within close proximity to the site,

*Proposed Mitigation*

9.23 No mitigation measures are required.

**Event Exceedence and Residual Risk**

9.24 The mitigation measures proposed as part of the development scheme are considered appropriate to mitigate against any residual risks or event exceedence scenarios.

# 10 SURFACE WATER MANAGEMENT

**Introduction**

10.1 The area of the proposed development is currently a greenfield site. Due to the nature of the design of the solar panels, there will be no significant increase in hardstanding as part of the proposed development.

10.2 The area of solar panels will remain grass-covered but with the addition of the aluminium frames housing solar panels above. The legs of the aluminium frames will be driven into the ground. Therefore, the area will remain grass-covered post development.

10.3 As a result of the construction of the solar panels, some rainfall will be intercepted before reaching the ground level by the surface of the solar panels. This intercepted rainfall will either run down the face of the solar panels due to the angle at which they are positioned and drip onto the ground cover below or will be lost to evaporation from the face of the solar panels.

10.4 Rainfall that does reach ground level will continue to follow the pre-development drainage routes. Some of the rainfall will infiltrate into the ground below whilst some will be conveyed across the site as surface water runoff.

10.5 The proposed development has the potential to introduce small impermeable areas around the site where the land was previously relatively permeable. This could potentially increase runoff rates across the site, which could in turn increase the flood risk to adjacent sites. The solar panels themselves do not have a significant impact on runoff volumes, peak flows or times to peak. However, where design decisions or lack of maintenance lead to bare ground then the peak discharge may increase significantly requiring storm water management. Therefore the following mitigation measures are recommended:

- Because the gradient of the site is approximately 0.5%, all developed areas of the site should maintain a vegetation cover, managed by mowing, to act as a level spreader/ energy dissipator along the leading edge of the panel rows to promote low erosivity sheet flow during the operational lifetime of the development.
- Where construction has resulted in soil compaction, and where practicable, the areas between panel rows should be ploughed and then re-seeded with vegetation.

**Event Exceedence**

10.6 Event exceedence planning will be undertaken as part of the final design process. Essentially any water will pond on the site and drain back into the watercourse mimicking the natural surface water drainage regime of the site.

# 11 SEQUENTIAL TEST AND EXCEPTION TEST

**Sequential Test**

11.1 The NPPF requires the Local Authority to apply the Sequential Test in consideration of new development. The aim of the Test is to steer new development to areas at the lowest probability of flooding. If there is no reasonable available site Flood Zone 1 or 2, then energy infrastructure projects can be classified as 'essential infrastructure' and can be located in Flood Zone 3 subject to passing the Exception Test.

**The Exception Test**

11.2 The NPPF advises that 'essential infrastructure' development can be considered appropriate in Flood Zone 3, following satisfactory application of the Exception Test. The Exception Test aims to ensure that more vulnerable property types are not allocated to areas at high risk of flooding. For the Exception Test to be passed:

a. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared;

b. A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

11.3 The National Planning Policy Framework (NPPF) sets out policy to support the development of renewable and low carbon energy with the following:

11.4 Paragraph 93 states: *'Planning plays a key role in helping shape places to secure radical reduction in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development.'*

11.5 Paragraph 95 states: *'plan for a new development in locations and ways which reduce greenhouse gas emissions'.*

11.6 The development of a Solar Farm will contribute to the local and national governments mandate to increase output from low carbon forms of energy generation.

11.7 With reference to point (b) above, this Flood Risk Assessment demonstrates that the development will be safe, without increasing flood risk elsewhere, and surface water management will mimic the existing situation.

11.8 It is considered that the development passes the Exception Test.

# 12 SUMMARY AND CONCLUSIONS

12.1 The aim of the Flood Risk Assessment is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been produced in accordance with the guidance detailed in the NPPF. Reference has also been made to the CIRIA SUDS manual (C697), the Strategic Flood Risk Assessment and the Surface Water Management Plan and following consultation with the Environment Agency's Partnership and Strategic Overview Team.

12.2 The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in the table below:

***Table 3: Summary of Flood Risks***

| Source of flooding | Identified Risk | | | Mitigation proposed | Residual risk | | |
|---|---|---|---|---|---|---|---|
| | L | M | H | | L | M | H |
| Fluvial | | ✓ | | The finished floor level of the electrical infrastructure should be raised above the surrounding ground levels. The base of the solar panels will be raised above the 1 in 100 year plus climate change flood level. The displacement of flood water is minimal and therefore no flood compensation is considered necessary. | ✓ | | |
| Tidal | ✓ | | | None required. | ✓ | | |
| Sewers | ✓ | | | None required. | ✓ | | |
| Surface Water | | | ✓ | The transformer container should be raised between 100-300mm above the surrounding ground level in order to prevent the ingress of surface water. The solar panels will be raised a minimum of 1m above ground level. | ✓ | | |

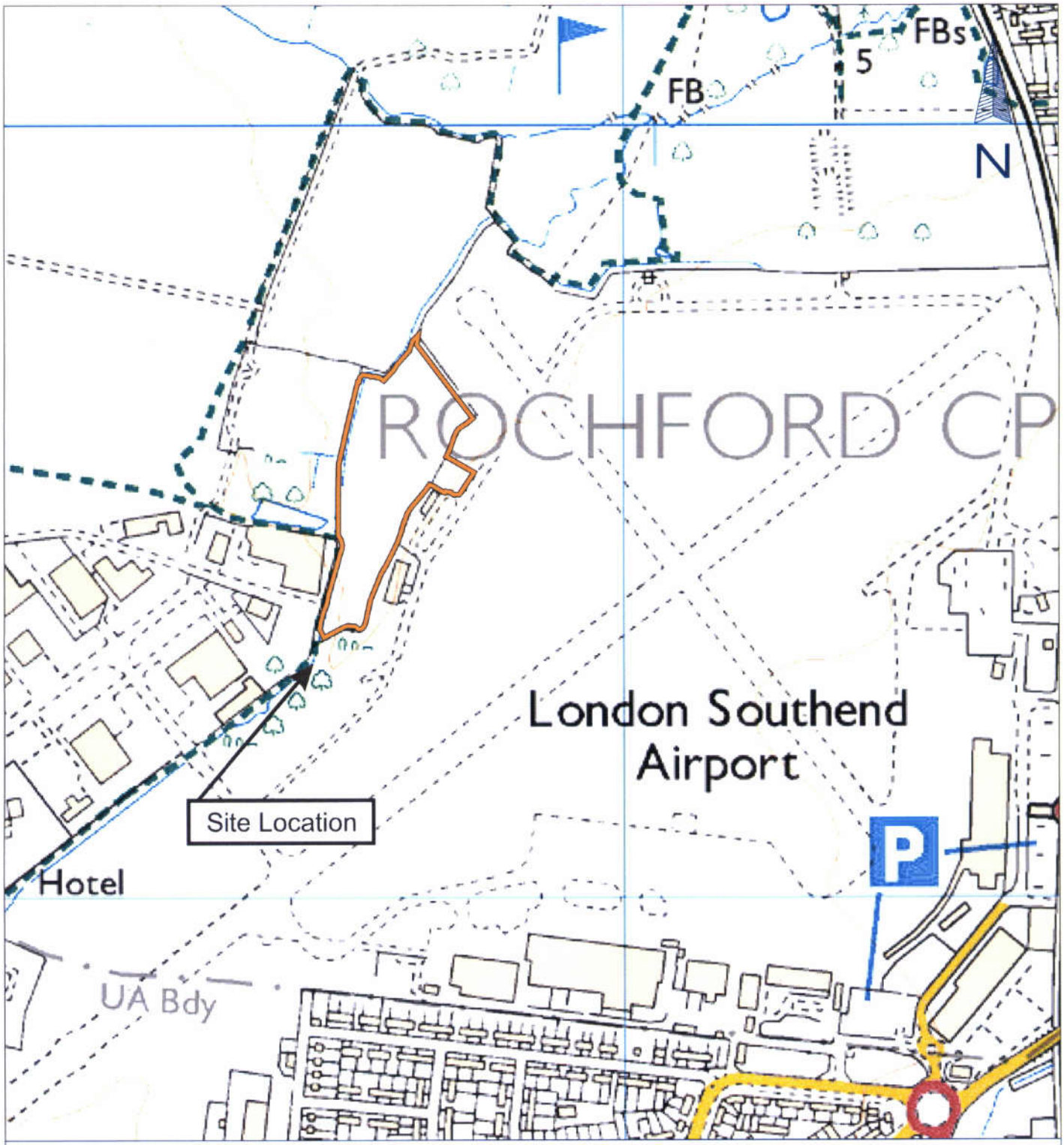
| Source of flooding | Identified Risk | | | Mitigation proposed | Residual risk | | |
|---|---|---|---|---|---|---|---|
| | L | M | H | | L | M | H |
| Groundwater | ✓ | | | None required. | ✓ | | |
| Other Sources (e.g. reservoirs, water mains) | ✓ | | | None required. | ✓ | | |

12.3 It has been demonstrated that the development meets the Sequential and Exception Tests imposed under the NPPF.

12.4 Overall, it has been demonstrated that the development would be safe, without increasing flood risk elsewhere.

Figure 1

SITE LOCATION PLAN

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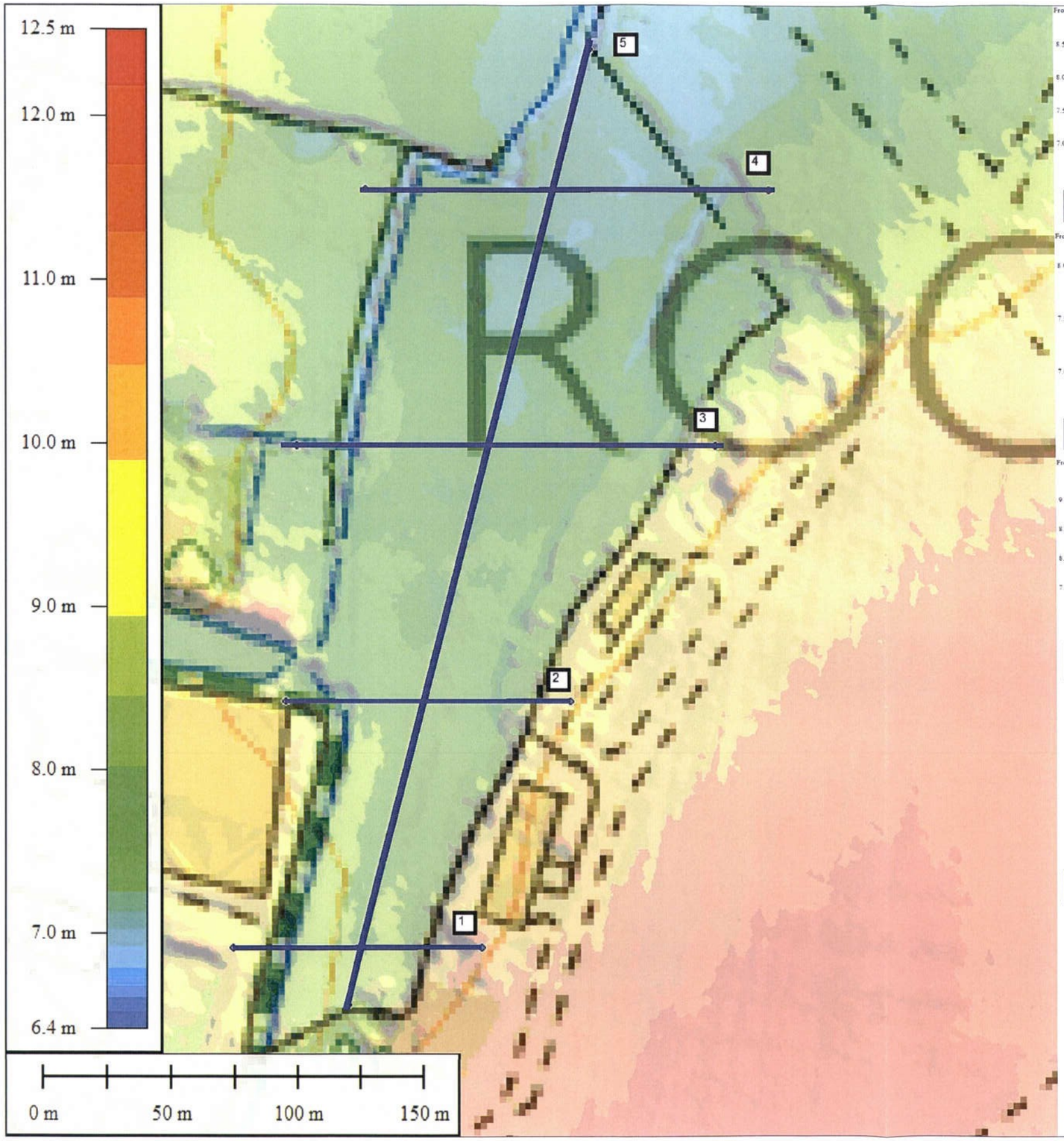
Client: Stobart Energy | Date: 22/10/2014 | Scale: 1:25,000

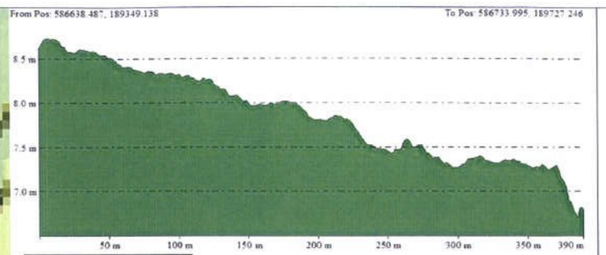
Project: Southend Solar Park | Figure: 01 | Rev: 00

Title: Site Location Plan | Job Ref: RCEF33301

Figure 2

LIDAR CROSS SECTIONS

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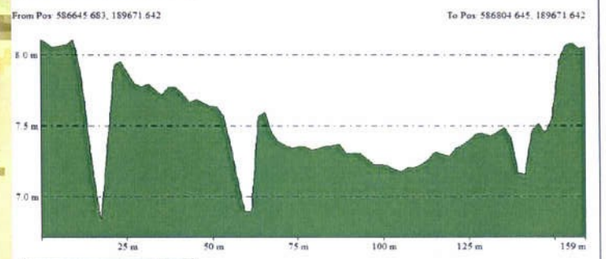
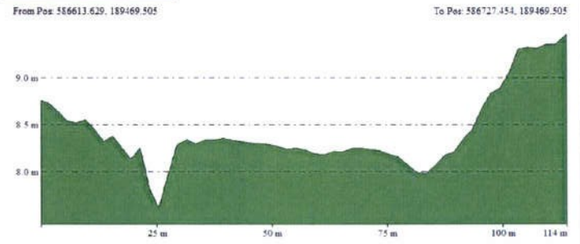
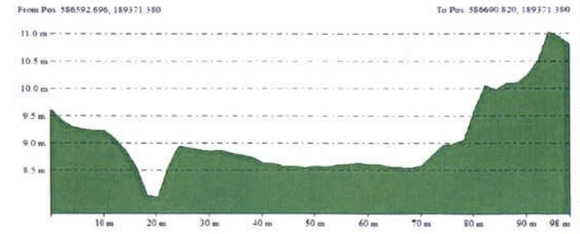



Cross Section 4


Cross Section 3




Cross Section 2




Cross Section 1

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Client: Stobart Energy

Title: Topographical cross sections

Site: Southend Solar Park

Status: Draft Date: 20/10/2014

Scale: NTS Size: A3

Job Number: RCEF33301 Fig: 02 Rev: 00

Figure 3

ENVIRONMENT AGENCY FLOOD MAP


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Client: Stobart Energy | Date: 22/10/2014 | Scale: NTS

Project: Southend Solar Park | Figure: 03 | Rev: 00

Title: Environment Agency Flood Map | Job Ref: RCEF33301

# Appendix A

# DEVELOPMENT PLANS


- USE MARKED DIMENSIONS
- DO NOT ALTER BY HAND
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS STATED OTHERWISE

N

| | | | |
|---|---|---|---|
| PROJECT: LONDON SOUTHEND AIRPORT | DRG NO.: A0M-SYZ-PR1105-SPP2 | | |
| ADDRESS: LONDON SOUTHEND AIRPORT SOUTHEND ON SEA ESSEX, SS2 6YF | SIZE: A0 | SCALE: 1:1500 | SHEET: 1/1 |
| | DRAWN: LJ | ISSUED: APPROVAL | |
| TITLE: LOCATION PLAN - PROPOSED | CHCKD: XX | APPRVD: XX | DATE: 12/10/14 |

SYZYGY RENEWABLES

**Syzygy Renewables**
Suite 18 Swan Court
9 Tanner Street
London
SE1 3LE
Tel: +44 2071 936 040
www.syzygyrenewables.com

Appendix B

# ENVIRONMENT AGENCY CONSULTATION RESPONSE

Environment Agency

Daniel Percival - RPS Group
daniel.percival@rpsgroup.com

**Our ref** CCE/2014/54298
**Your ref**
**Date** 24 October 2014

Dear Daniel

**Provision of Product 4 for site adjacent London Southend Airport, SS2 6YF**

Thank you for your request of 10 October 24, 2014 to use Environment Agency data, Product 4, in the development of the above site. The following information is attached.

- Detailed Flood map showing the Flood Zones (outlines) for the area of the site.
- Modelled Flood Levels *(the type of modelling software used at this location is ISIS and the model node points are 1D).*
- Modelled Flood Levels Location Map.
- Historic Flood Map.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments.

This area falls within Flood Zone 2 and 3, Fluvial.

Flood Zone 1, (i.e. a less than 0.1% annual probability of flooding).

The Flood Zone 2 outline shows a 1 in 1000 chance of flooding at a location in any one given year (i.e., a 0.1% annual probability of flooding).

The Flood Zone 3 fluvial outline shows a 1 in 100 chance of flooding at a location in any one given year (i.e., a 1% annual probability of flooding).

The Flood Zone 3 tidal outline shows a 1 in 200 chance of flooding at a location in any one given year (i.e., a 0.5% annual probability of flooding).

The flood outlines show areas of potential flooding as a direct result of floodwater coming from rivers or sea. They do not show the risk of flooding to individual properties, because we do not hold this data.

**Essex, Suffolk and Norfolk - Iceni House**
Cobham Road, Ipswich, Suffolk, IP3 9JD
General Enquiries: 03708 506506 Fax: 01473 724205
*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls. These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone.*
Email: enquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

## Information Warning

Please be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed. We have worked with Lead local Flood Authorities (LLFAs) to develop a map which incorporates the best local and national scale information on surface water flood risk. These maps can be viewed on our website at the following:-

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=357683&y=355134&scale=2

We have produced a map which shows the extent of flooding if a reservoir was to fail and release the water that it holds. The map shows the worst case scenario. These can be viewed on our website at the following:-

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=reservoir#x=357165&y=355108&scale=2

## Supporting Information

Examinations of our records of historic flooding show that the general area of Rochford was flooded in 1953 and 1968. Please note that these records show flooding to the land and do not necessarily indicate that properties within the historic flood events were flooded internally. It is also possible that the pattern of flooding in this area has changed and that this area would now flood under different circumstances.

There are no Environment Agency defences that benefit this site.

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

Please be aware that we now charge for planning advice provided to developers, agents and landowners. If you would like us to provide you with advice to inform a future planning application for this site then please complete our pre-application enquiry form and email it to our Sustainable Places team. We will initially provide you with a free response identifying the following:

- the environmental constraints affecting the proposal;
- the environmental issues raised by the proposal;
- the information we need for the subsequent planning application to address the issues identified and demonstrate an acceptable development;
- any required environmental permits.

If you require any further information from us (for example a meeting or the detailed review of a technical document) we will need to set up a charging agreement. Further information can be found on our website.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. Please get in touch if you have any further queries or contact us within two months if you would like us to review the information we have sent.

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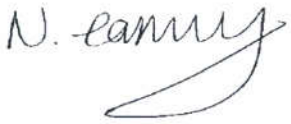
Email: enquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

If you have any queries or would like to discuss the content of this letter further please contact Jo Parkinson (FCRM Officer) 01473 706844 at the Environment Agency.

Yours sincerely



**Nina Earrey**
**Customers and Engagement Officer**

01473 706720

**Essex, Suffolk and Norfolk - Iceni House**
Cobham Road, Ipswich, Suffolk, IP3 9JD
General Enquiries: 03708 506506 Fax: 01473 724205
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Email: enquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Date: 22nd October 2014
Datasheet Reference CCE/2014/54298

Environment Agency

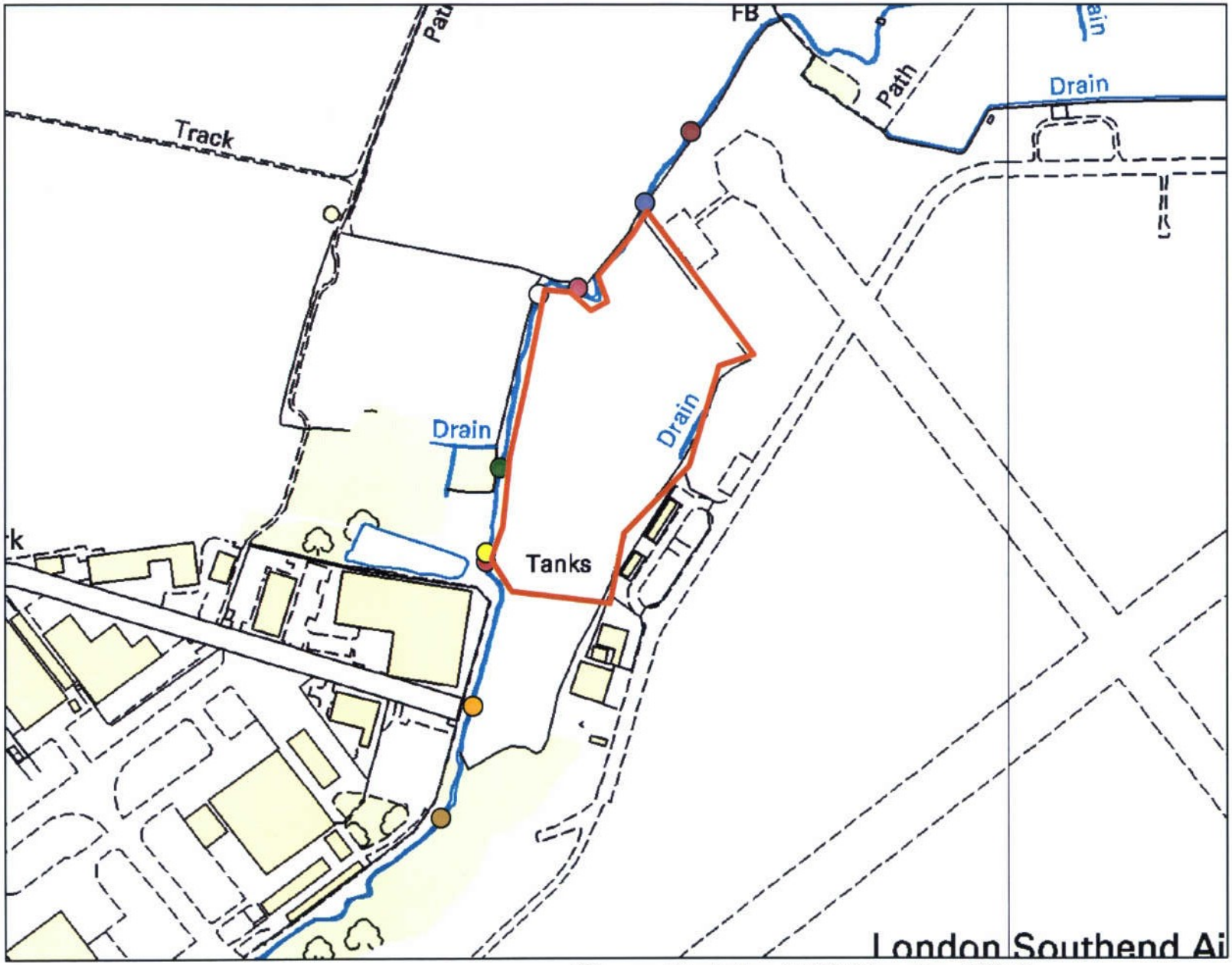
Fluvial flood levels (mAODN)

Undefended Levels

| | | | Annual Exceedance Probability – Maximum water levels (mAODN) | | | | |
|---|---|---|---|---|---|---|---|
| **Node** | **Easting** | **Northing** | **5% (1:20)** | **1.3% (1:75)** | **1% (1:100)** | **1% (1:100) +CC** | **0.1% (1:1000)** |
| EA051_EAST_01_691 | 586592 | 189300 | 8.99 | 9.05 | 9.06 | 9.13 | 9.39 |
| EA051_EAST_01_605 | 586615 | 189380 | 8.69 | 8.74 | 8.75 | 8.81 | 9.03 |
| EA051_EAST_01_493 | 586625 | 189484 | 8.31 | 8.34 | 8.35 | 8.39 | 8.57 |
| EA051_EAST_01_493d | 586625 | 189490 | 8.26 | 8.29 | 8.30 | 8.34 | 8.51 |
| EA051_EAST_01_425 | 586635 | 189551 | 8.08 | 8.11 | 8.11 | 8.15 | 8.31 |
| EA051_EAST_01_297 | 586663 | 189676 | 7.68 | 7.71 | 7.72 | 7.76 | 8.22 |
| EA051_EAST_01_263 | 586691 | 189680 | 7.56 | 7.60 | 7.61 | 7.64 | 8.22 |
| EA051_EAST_01_167 | 586739 | 189741 | 7.40 | 7.46 | 7.48 | 7.50 | 8.22 |
| EA051_EAST_01_105 | 586772 | 189793 | 7.15 | 7.17 | 7.17 | 7.33 | 8.22 |

Source of information: Southend Watercourses Flood Risk Study (2008) by JBA for the Environment Agency

# Modelled Flood Level Location Map centred on Rochford.
# Created 22nd of October 2014. Ref: CCE/2014/54298




Environment Agency

Scale 1:4,000

**Legend**

Site Outline

**Modelled Flood Level Node Points**

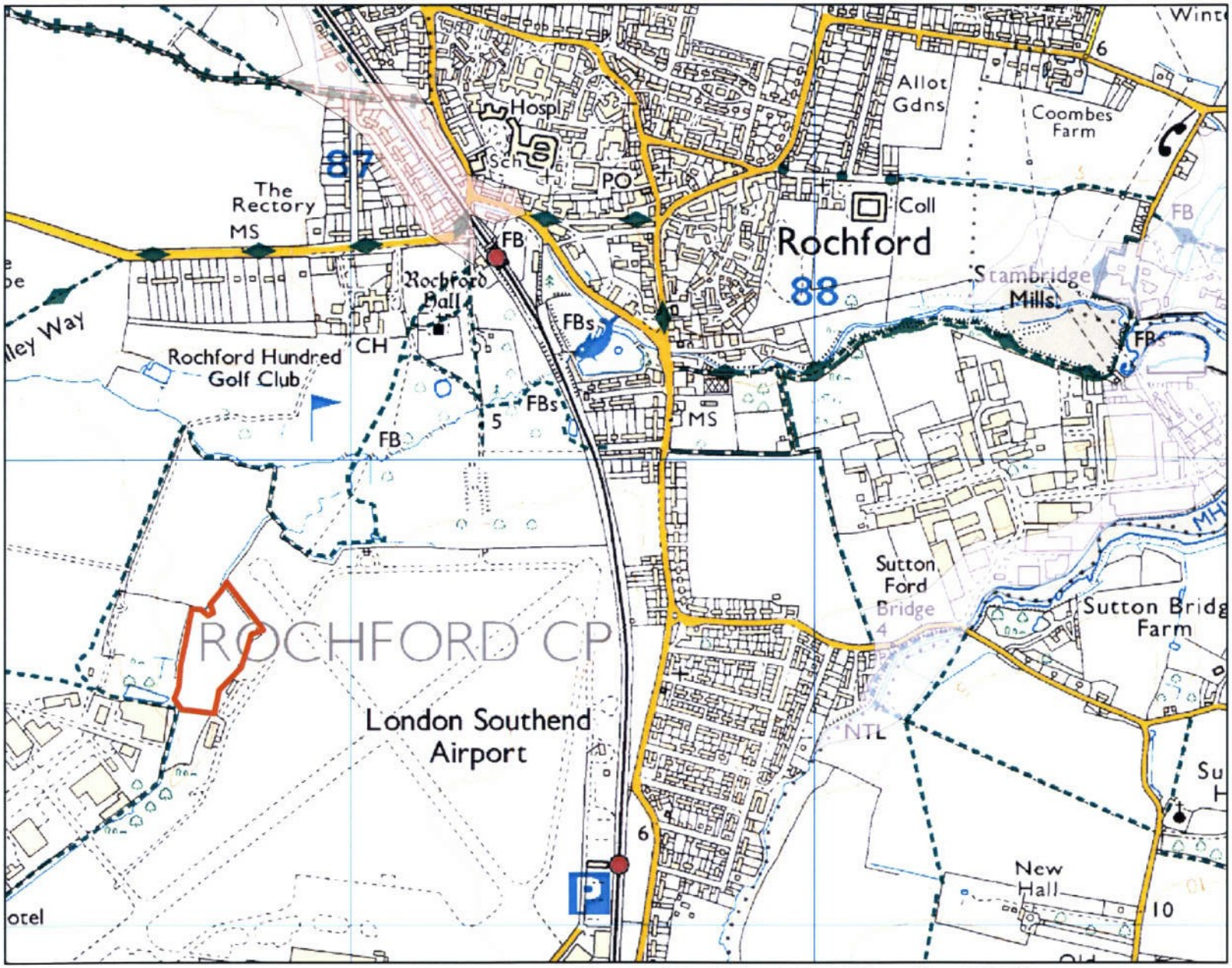
- EA051_EAST_01_105
- EA051_EAST_01_167
- EA051_EAST_01_263
- EA051_EAST_01_297
- EA051_EAST_01_425
- EA051_EAST_01_493
- EA051_EAST_01_493d
- EA051_EAST_01_605
- EA051_EAST_01_691

N



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Historic Flood Map centred on Rochford.
# Created 22nd of October 2014. Ref: CCE/2014/54298




Environment Agency

Scale 1:12,000

**Legend**

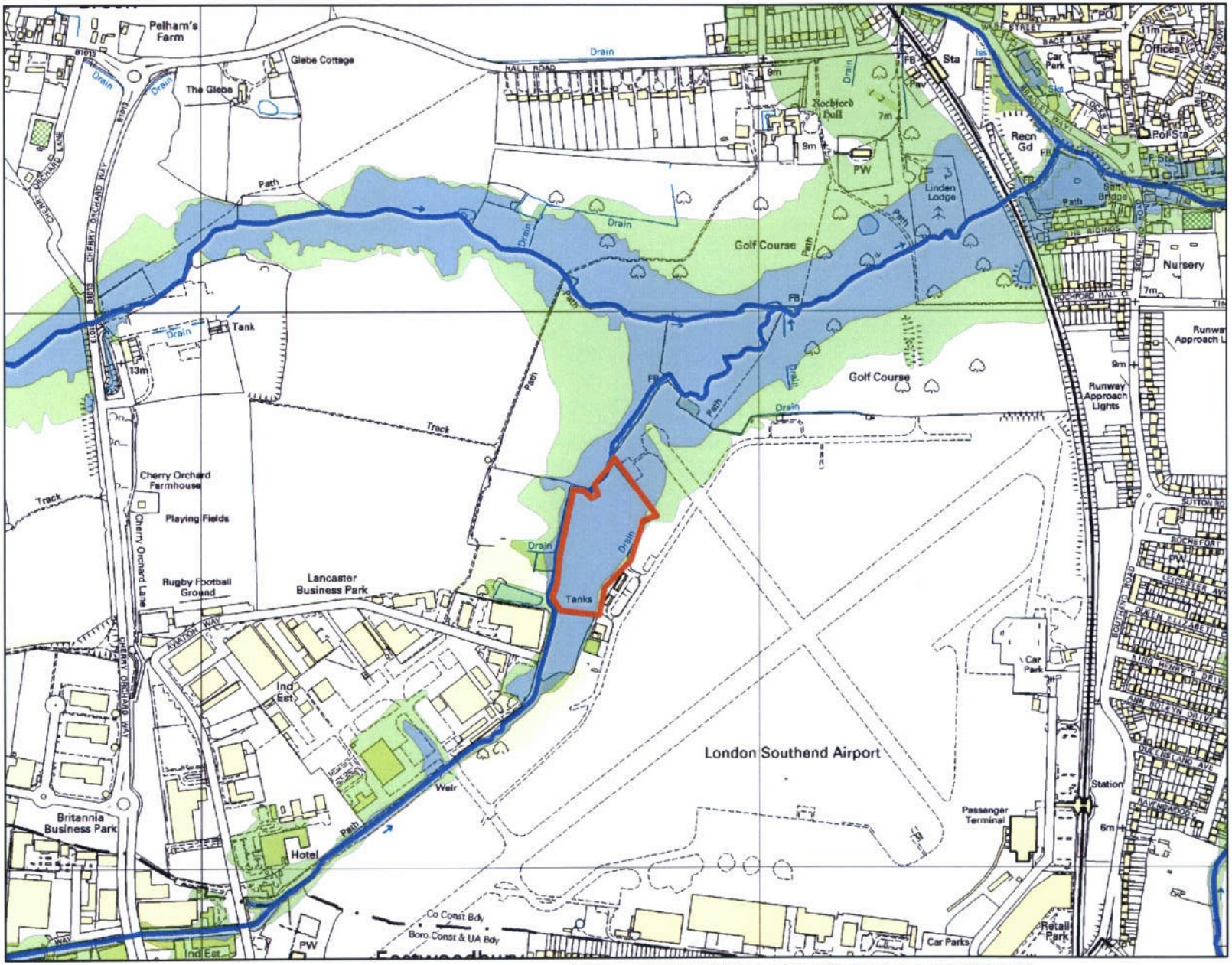
- Site Outline
- 1968 Flood Outline
- 1953 Flood Outline

N



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Detailed Flood Map centred on site adjacent to London Southend Airport, Rochford. Created 22nd of October 2014. Ref: CCE/2014/54298




Environment Agency

Scale 1:10,000

**Legend**

- Site Outline
- Flood Map - Flood Zone 3
- Main River
- Flood Map - Flood Zone 2

N



**Contact Us:** National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

# Appendix C

# ANGLIAN WATER SEWER PLANS




Date: 20/10/14

Scale: 1:1250

Map Centre: 586692,189535

Data updated: 01/09/14

Our Ref: 116489 - 1

Wastewater Plan A2



- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main (Colour denotes effluent type)
- Private Sewer (Colour denotes effluent type)
- Outfall (Colour denotes effluent type)
- Inlet (Colour denotes effluent type)
- Manhole (Colour denotes effluent type)
- Sewage Treatment Works

daniel.percival@rpsgroup.com

Southend Solar Park

asset plans required urgently.

love every drop
anglianwater

| | | | | |
|---|---|---|---|---|
| 7401 | F | - | - | - |
| 8501 | F | 9.02 | 5.63 | 3.39 |
| 8601 | F | 8.61 | 5.18 | 3.43 |