ENVIRON

19 August 2009

Dean Rezzougui
Environment Agency
Waterside House
Waterside North
Lincoln
Lincolnshire

LN2 5HA

Our Ref: NS/CD/L_UK1214701_1_DR.doc

Dear Dean,

SPALDING ENERGY EXPANSION – FLOOD RISK ASSESSMENT

Further to your recent letter dated 04 August 2009 regarding the Food Risk Assessment (FRA) for the Spalding Energy Expansion (SEE) project, please find enclosed the additional information requested.

Table 1 – Summary of Additional Information and Actions

Item	Description	Response
1	Further information concerning surface water drainage. If planning permission in granted, it is likely that the EA will request a condition ensuring that a surface water drainage strategy is carried out prior to the commencement of the development.	As acknowledged by the EA, this information will be provided at a later stage. We understand that the EA does not object to the FRA on the basis of the proposed conceptual surface water drainage system.
2	A more detailed cross section showing West Marsh Road, the substation and more vulnerable buildings.	A revised cross section is attached. Please note that the substation is indicated on the cross section and is referred to as 'Proposed SEE Switch Yard'. The exact location of potentially vulnerable buildings has not yet been determined. No buildings on-site will be used for 'more vulnerable' uses under the definitions of PPS25, Table D.2. All buildings which will commonly be used by personnel will be within the Proposed SEE Power Station which is shown on the cross section.
3	A more detailed breach analysis. The breach modelling should use a breach depth to ground level behind the defences on the landward side. Revised calculations should be submitted indicating the potential implications for site safety.	Clarification was sought with Emma Kirk and Andrew Woodliffe on the issue of the breach analysis methodology. Further breach modelling has been undertaken in accordance with EA requirements for hazard mapping in the Anglian Region, Northern Area. Email correspondence (attached) confirms the agreed modelling parameters. Further information on the revised breach modelling work is provided below. A revised Flood Warning and Evacuation Plan (FWEP) is attached.

REVISED BREACH MODELLING

The outputs from the revised modelling suggest that, should a deeper breach in the flood defences occur, the extent of flooding will increase in comparison with the previous modelling results. Whilst the probability of such a breach occurring remains very low, the principal changes in respect of the breach assessment are outlined below:

Breach 1 (a breach immediately adjacent to the site)

- Flood levels do not rise above the Power Station platform level of 6.5 mAOD. The main site will not therefore be impacted by flooding and workers and visitors at the Power Station will remain safe throughout a flood event.
- At the peak of the flood, both potential access/egress routes via Gate A or Gate C will be flooded.
- The flood hazard[1] along the Gate A escape route at the peak of the flood would be a *'Danger to Most'* from approximately 30 minutes after the onset of the breach until approximately 2 hours 15 mins after the breach occurred when the hazard would be a *'Danger to Some'* (the elderly, infirm and children).
- The flood hazard along the Gate C escape route at the peak of the flood would be a *'Danger to Most'* from approximately 15 minutes after the onset of the breach until approximately 1 hour 45 minutes after the breach occurred. Otherwise the hazard would be a *'Danger to Some'*.
- Subsequent high tides do not cause significant additional flooding through the breach such that the escape routes are rendered more hazardous.
- The recommendations within the FWEP have been updated to reflect these changes. In the event of a breach, the principal emergency procedures would be to proceed with extreme caution when making an escape from the site and, where flood water is encountered on the escape route, the safety of crossing through this water should be assessed prior to proceeding. Where it is not considered safe to proceed, personnel should remain at the site where safe dry refuge is provided.
- It should be noted that the elderly, infirm or children will not ordinarily be present on-site and, according to the breach modelling, flood levels would not therefore cause a danger to site personnel evacuating the site via either of the proposed routes approximately 2 hours 30 minutes after a breach occurred. A hazard rating of *'Danger to Some'* would not, for example, hamper the emergency services in gaining access to the site.

Breach 2 (a breach to the south of the site)

- Flood levels do not rise above the Power Station platform level of 6.5 mAOD.
- At the peak of the flood, the previously proposed access/egress route via Gate A remains dry throughout the 72 hour duration of the flood modelling.
- The FWEP has been updated accordingly.

If a breach of the flood defences occurs, it is unlikely that site personnel will be aware of the exact location and extent of the breach without putting themselves potentially at risk. The FWEP therefore allows for the fact that breaches could occur at any point along the flood defences in the local area and that one potential consequence of this happening is that access/egress routes may be rendered unsafe for a period of time.

[1] As calculated with reference to FD2320 and FD2321.

It is therefore essential that the site is registered with the EA's flood warning service to ensure that site personnel are aware of when the storm surge or high tide has receded. This would ensure that an evacuation of the site could be undertaken, in liaison with the emergency services, at a time when flood risk along the evacuation route would potentially have receded.

To take account of all potential eventualities, evacuation of the site would only be attempted where all evacuees are familiar with the FWEP and exercise extreme caution along the evacuation route. Where conditions are unsafe to proceed, people should remain at the Power Station where safe, dry refuge would be available.

I trust that you find the enclosed helpful, however if you require any further information, please do not hesitate to contact the undersigned.

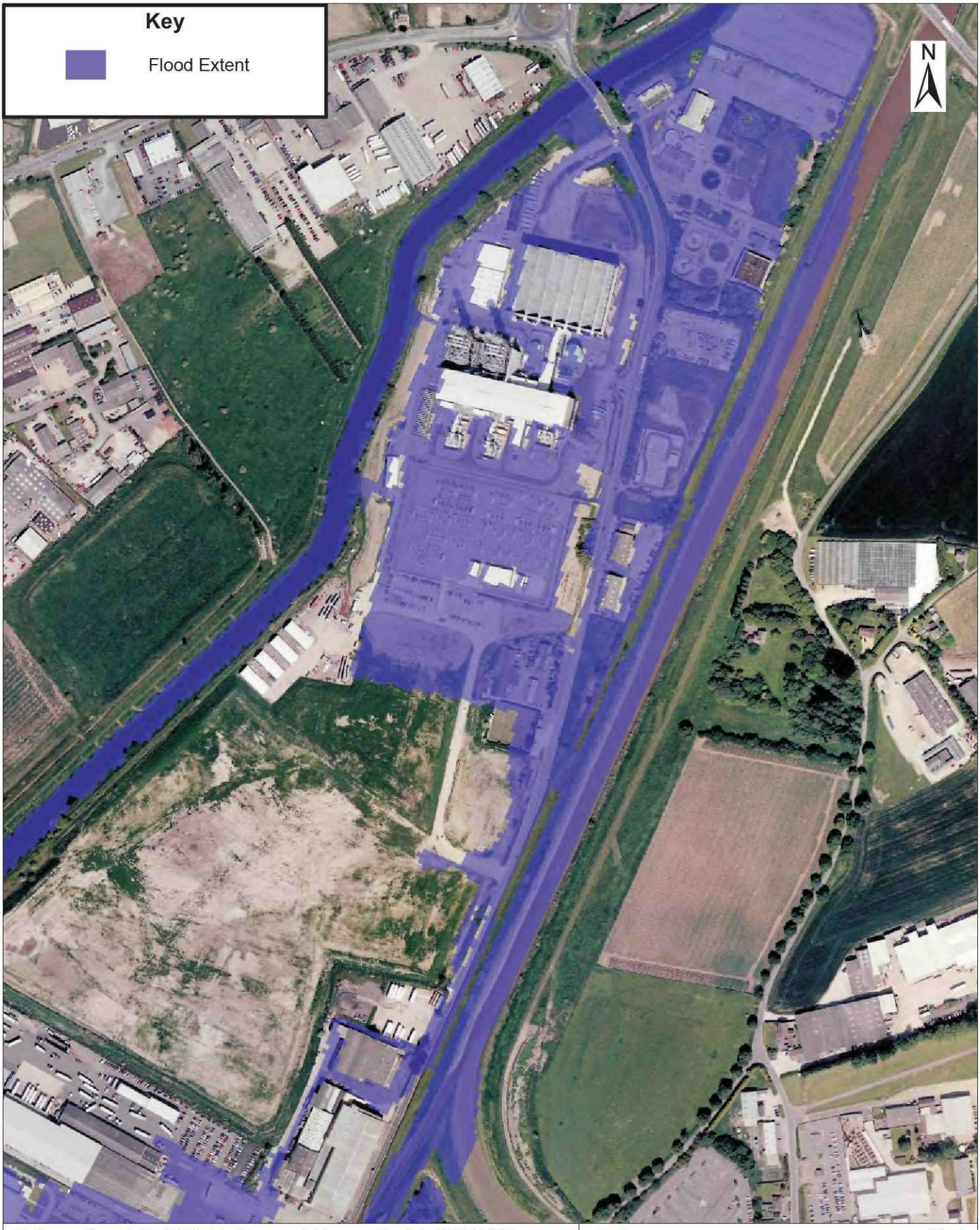
Yours sincerely

Nathan Swankie

Nathan Swankie
Manager

Enc Figures
Appendix A – Draft Flood Warning & Evacuation Plan
Appendix B – SEE Cross-section

cc:	Neil Anderson	InterGen UK Ltd.
	Keith Dalton	Dalton Warner Davis
	Emma Kirk	Environment Agency
	Andrew Woodliffe	Environment Agency
	Gary Mohammed	Department of Energy and Climate Change



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Scale **NTS**

Title	**Figure 1: Maximum Flood Extent Breach 1**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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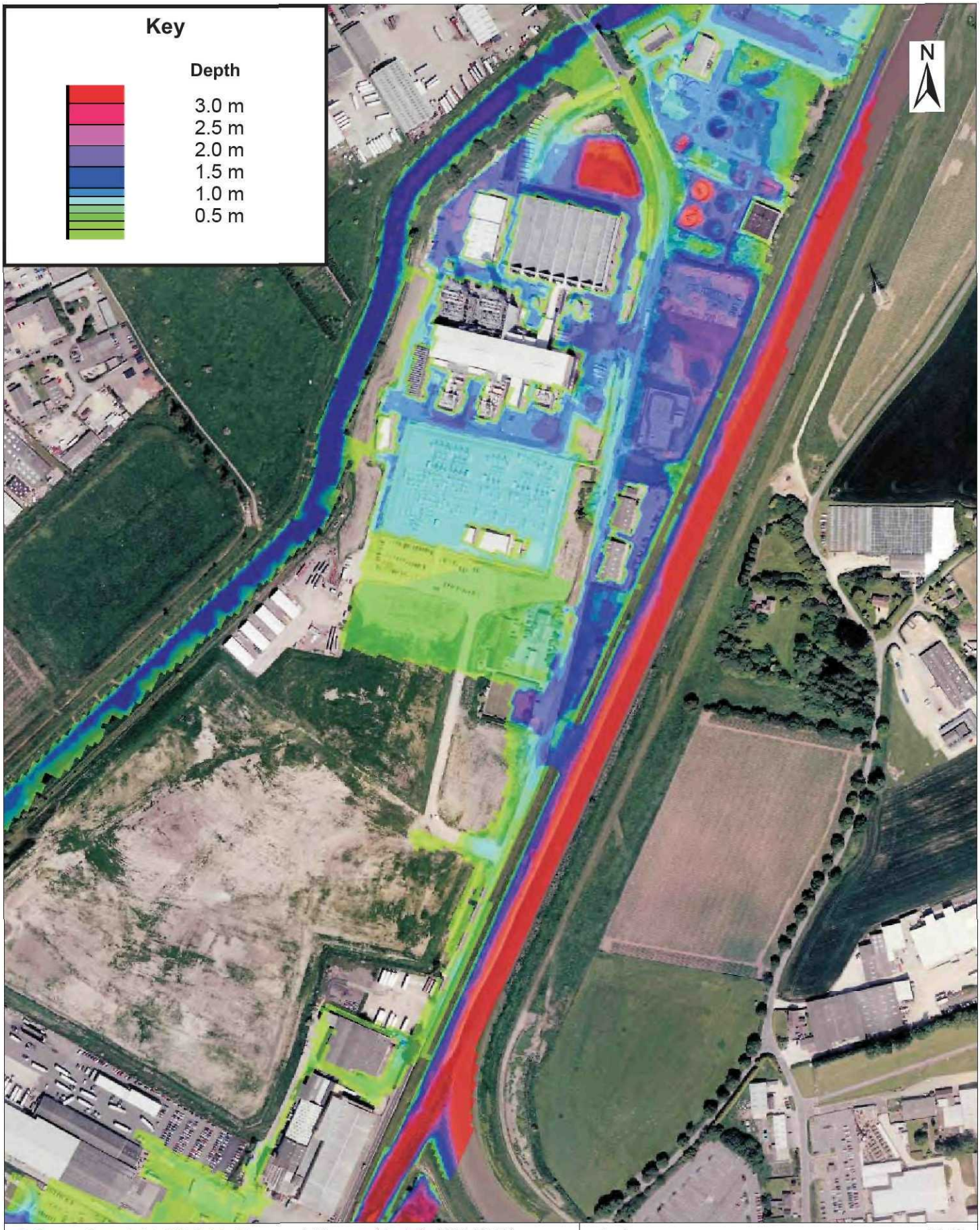
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Scale **NTS**

Title	**Figure 2: Maximum Flood Extent Breach 2**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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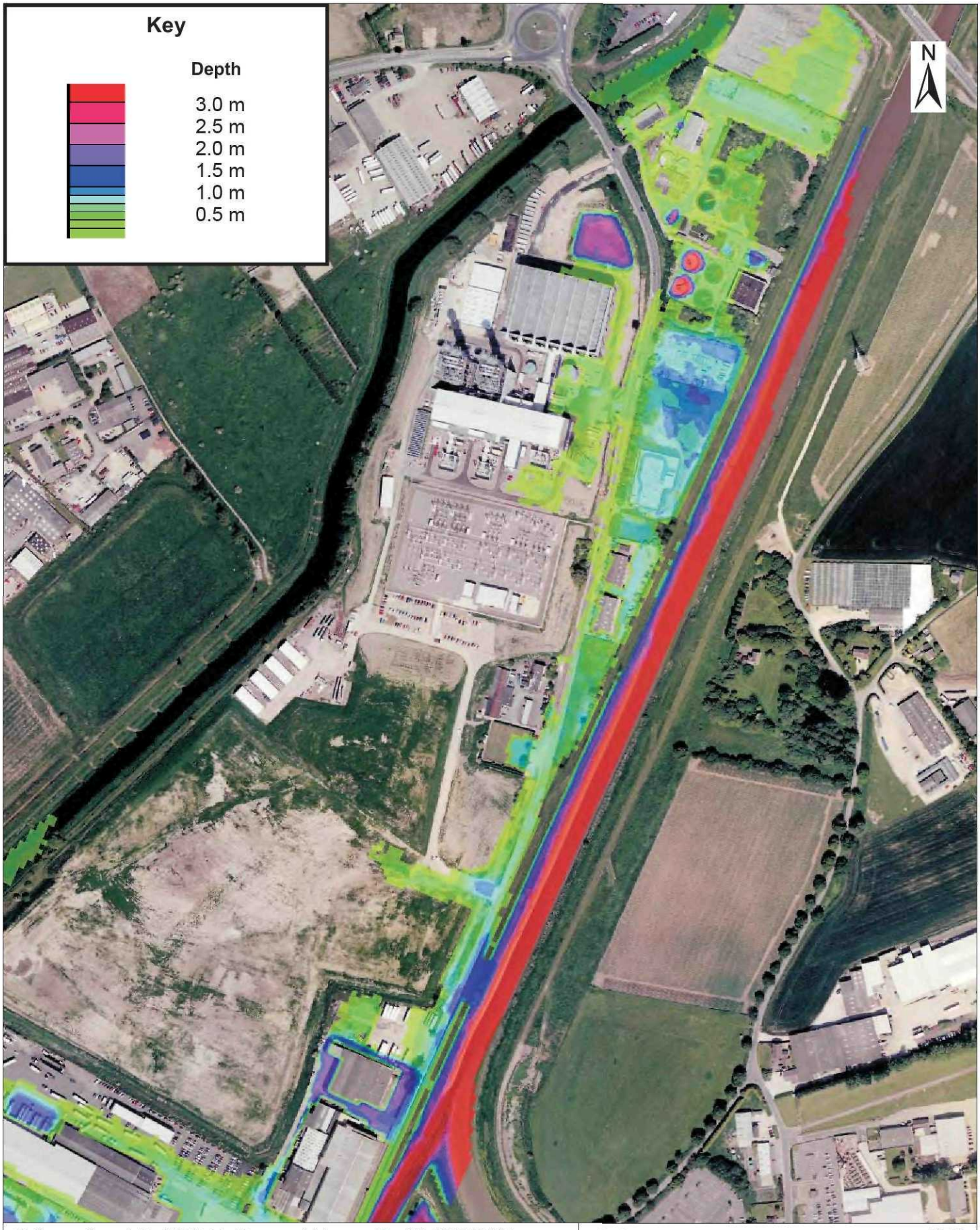
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Scale **NTS**

Title	**Figure 3: Maximum Flood Depth Breach 1**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
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Scale **NTS**

Title	**Figure 4: Maximum Flood Hazard Breach 2**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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Scale **NTS**

Title	**Figure 5: Max Flood Velocity Breach 1**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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Scale **NTS**

Title	**Figure 6: Max Flood Velocity Breach 2**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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Time After Breach

0 mins



75 mins

N



15 mins



90 mins



30 mins



105 mins



45 mins



120 mins



60 mins



135 mins

Key

- Danger for None
- Danger for Some
- Danger for Most
- Danger for All



72 hours

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Scale **NTS**

Title	**Figure 7: Flood Hazard Breach 1**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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Time After Breach

0 mins



75 mins

N



15 mins



90 mins



30 mins



105 mins



45 mins



120 mins



60 mins



135 mins

Key

- Danger for None
- Danger for Some
- Danger for Most
- Danger for All



72 hours

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Scale **NTS**

Title	**Figure 8: Flood Hazard Breach 2**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**RC/NS**

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Katie Johnstone

From: Woodliffe, Andrew [andrew.woodliffe@environment-agency.gov.uk]
Sent: 12 August 2009 14:23
To: Simon Gaskell
Cc: Ray, John; Kirk, Emma
Subject: RE: Spalding Energy Expansion Breaches

Simon,

That all looks acceptable.

Regards

Andrew Woodliffe
Flood Risk Mapping & Data Management - Technical Specialist Environment Agency, Anglian Region, Northern Area

-----Original Message-----
From: Simon Gaskell [mailto:sgaskell@uk.environcorp.com]
Sent: 12 August 2009 14:14
To: Woodliffe, Andrew
Subject: FW: Spalding Energy Expansion Breaches

Andrew,

I spelled your name incorrectly - many apologies. Would you be able to have a look at the emails sent (two in total below)?

Thanks,

Simon Gaskell

From: Simon Gaskell
Sent: Mon 10/08/2009 3:30 PM
To: Andrew.woodcliffe@environment-agency.gov.uk
Cc: Nathan Swankie
Subject: Spalding Energy Expansion Breach Analysis

Andrew,

As discussed earlier, I understand you previously reviewed ENVIRON's FRA work with respect to the breach analysis. We have now reviewed the EA guidance document provided by your colleague Adam Treverton (Requirements for Hazard Mapping in SFRAs/FRAs, version 2). Can you confirm our conversation as follows?

* We are considering only the 200 year event corrected for climate change through the lifespan of the project as discussed with Emma Kirk at the project inception;

* The flood defences adjacent to the site are approximately 1 km long between the upstream River Welland tidal sluice and the downstream A16 road embankment so multiple breaches have not been considered in line with the guidance;

* Location of the breaches (breach 1 adjacent to the site and breach 2 further south) are acceptable;

* Breach depth is currently not acceptable and should be to ground level adjacent to the breach - cross sections for the breaches showing the geometry will be forwarded to you with the rest of the data (I haven't been able to get on the GIS this afternoon);

* Breach should remain open for 72 hours after peak of surge;

* DTM is filtered LiDAR with buildings added as z lines -
post-development platform levels have similarly been added as 2D geometry modifications; and

* Map and GIS grid data will be provided plus animation files of
the complete tidal cycles.

We will therefore provide an addendum note covering the results of the revised modelling work to you and Emma Kirk as soon as possible. Your earliest attention to this would be appreciated given that the Local Authority is aiming to put together their report for Committee before 21st August.

Many thanks,

Simon Gaskell

Senior Hydrologist
ENVIRON UK Ltd. | www.environcorp.com <http://www.environcorp.com/>

Box House | Box | Wiltshire | SN13 8AA
Tel: 01225 748420 | Mob: 07894 585 978 | Fax: 01225 748421| sgaskell@uk.environcorp.com
<mailto:sgaskell@uk.environcorp.com>

From: Simon Gaskell
Sent: Tue 11/08/2009 5:09 PM
To: Andrew.woodcliffe@environment-agency.gov.uk
Subject: Spalding Energy Expansion Breaches

Andrew,

Further to my email of Monday, below are cross sections of the proposed breaches to show you how we will take out the whole of the defence embankment when running the model again. Breach 1 is the one adjacent to the site and Breach 2 is the one to the south. Can you please let me know whether you are happy with the method we have outlined?

Many thanks,

Simon Gaskell

Senior Hydrologist
ENVIRON UK Ltd. | www.environcorp.com <http://www.environcorp.com/>

Box House | Box | Wiltshire | SN13 8AA
Tel: 01225 748420 | Mob: 07894 585 978 | Fax: 01225 748421| sgaskell@uk.environcorp.com
<mailto:sgaskell@uk.environcorp.com>

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Appendix A

Report



Flood Warning and Evacuation Plan Spalding Energy Expansion

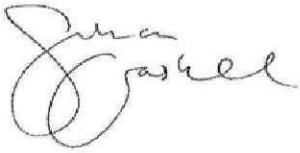
Prepared for:

Spalding Energy Expansion Limited

Prepared by:
ENVIRON
Bath, UK

Date:
August 2009

Project or Issue Number:
UK12-14701

Contract/Proposal No:	UK12-14701
Issue:	2
Author	Simon Gaskell
(signature):	
Project Manager/Director	Nathan Swankie
(signature):	
Date:	August 2009

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Version Control Record

Issue	Description of Status	Date	Reviewer Initials	Author Initials
A	First Draft	01/07/09	NS	SG
B	Second Draft	09/07/09	NS	SG
C	Third Draft	15/07/09	NS	SG
D	Fourth Draft	15/07/09	NS	SG
E	Fifth Draft	16/07/09	NS	SG
1	Draft for EA Comment	21/07/09	NS	SG
1A	First Revision	19/08/09	NS	SG
2	Second Draft for Comment	19/08/09	NS	SG

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1 Introduction

1.1 Background

InterGen proposes to expand its existing power station operation in Spalding, Lincolnshire, by constructing a 900 MW CCGT power station. The proposed power station will be known as the Spalding Energy Expansion (SEE) or the 'proposed SEE'. The proposed SEE to be constructed adjacent to the existing power station, will be owned and operated by Spalding Energy Expansion Limited (SEEL), an affiliate of InterGen.

ENVIRON has completed an Environmental Statement (ES) and Flood Risk Assessment (FRA) for the proposed SEE, on which the Environment Agency (EA) has provided comments. The EA has requested that in addition to the information provided in the Flood Risk Assessment (February 2009) a Flood Warning and Evacuation Plan (FWEP) be produced to address the matters raised in the EA letter of 27 May 2009.

The proposed SEE is currently at the planning stage and final details about the site layout and operational procedures are not yet available. Nevertheless, this draft FWEP has been prepared, based on information available at the present time, demonstrating that potential flood risks and necessary resilience measures have been appropriately considered and will be incorporated into the planned development.

The draft FWEP has been prepared using all currently available information for the site and some information such as final roles, responsibilities and identities for the proposed SEE will be finalised as the development progresses. This document will be kept 'live' through revisions and updates as further information becomes available at key stages of the project lifecycle.

1.2 Policy Context and Consultation

1.2.1 PPS25 states the following in Annex G with respect to FWEPs:

"The receipt of and response to warnings of floods is an essential element in the management of the residual risk of flooding. Particular attention should be given to the communication of warnings to vulnerable people including those with impaired hearing or sight and those with restricted mobility. Attention should also be given to the communication of evacuation plans and warnings to transient occupants of camp sites, caravan sites and holiday facilities. Evacuation plans should be in place for those areas at an identified risk of flooding and should take into account that the occupiers are likely to lack local knowledge. The mobility of occupants also needs to be considered. Those proposing developments should take advice from the emergency services when producing an evacuation plan for the development as part of the FRA. Local Resilience Forums (see Annex H) should ensure that flood risk is fully considered as part of their activities, including the resilience of emergency infrastructure required to operate during floods."

The type of proposed development will be subject to a range of Health & Safety requirements which will ensure that site staff are familiar with the local area and hazards associated with the power station itself.

Consultation has been undertaken with the Local Authority on the content and detail of the FWEP for the proposed SEE. A response is anticipated before the end of August 2009.

1.3 Site Location

The proposed SEE site is located approximately 2 km to the north-east of Spalding town centre, Lincolnshire at National Grid Reference (NGR) TF 259 249 (Figure 1.1). The existing SECL power station is located adjacent to the northern site boundary of the proposed SEE.

Primary access to the SECL site, and in turn the SEE site, is from Gate A on West Marsh Road to the north, immediately before it bridges Vernatt's Drain. A secondary (emergency) access road will be provided to the south of the proposed SEE onto West Marsh Road, allowing a southern access route (Gate C). This will not be the main access point but will be available in the event of flooding.

1.4 Responsibilities

Responsibilities for maintaining and updating this FWEP and the hierarchy for ensuring its proper implementation and tasks identified by it are yet to be determined. These will be finalised in due course, prior to the proposed SEE becoming operational.

The FWEP has been prepared by ENVIRON on behalf of SEEL. The report has been appropriately reviewed in accordance with ENVIRON's Quality Management System (QMS) procedures. ENVIRON is an ISO 9001 company.

Final implementation and updates to the FWEP both prior to and following the proposed SEE becoming operational will be the responsibility of SEEL.

2 Aims and Objectives

2.1 Overview

This document has been prepared in draft only, being a live document that will be updated and revised when the required Section 36 consent for the proposed SEE has been obtained and during both construction and operational phases of the project.

The primary objective of the FWEP is to ensure the safety of all staff, contractors and visitors to the proposed SEE in the event of flooding occurring in the Spalding area which could impact on the site. The FWEP aims to provide plans and procedures so the need for assistance or intervention by the emergency services and/or EA and potential environmental impacts associated with flooding of the site will be minimised as far as practicable.

2.2 FWEP Aims and Objectives

The aims of the FWEP are to:

Inform all staff, contractors and visitors to the proposed SEE of the flood risk to the area;

- Ensure all staff, contractors and visitors are warned and informed when there is a risk that flooding may occur in the area;
- List appropriate actions to be taken by operational staff to ensure the safety of staff, contractors and visitors in the event of a Flood Warning being received or should flooding occur without warning including evacuation procedures; and
- Inform local Category One Responders (the local authority and the 'blue light' emergency services) of the procedures in place and actions to be implemented in the event of Flood Warnings being received or flooding occurring.

2.3 The FWEP aims to achieve these aims by:

- Identifying in detail the potential flood risks in relation to the proposed SEE location and layout;
- Ensure Flood Warning communications are appropriately set up and maintained both to the site (from the EA) and within the site (to all staff, contractors and visitors);
- Providing procedures to be followed and equipment to be utilised in the event of an evacuation;
- Identifying and describing safe evacuation route(s) from the proposed SEE site;
- Developing further drafts of the FWEP in consultation with the Local Authority, EA and local Category One Responders;
- Providing an outline plan for management of changes to the FWEP and testing the plan; and
- Provide outline actions for communicating issues associated with the FWEP following a flooding event.

3 FLOOD RISKS

3.1 Mechanisms

The ENVIRON FRA has determined that the principle risk of flooding at the site is associated with the tidal River Welland to the east of the proposed SEE. Flood risks from Vernatt's Drain, to the west have been determined to be negligible.

The modelled tidal flood level in the River Welland during an extreme event (assessed in the FRA to be an event with an annual probability of 1 in 200 (0.5%)) corrected for climate change through the lifespan of the proposed SEE, is 6.54 mAOD. The site is currently defended by earth embankments, which are in good condition, to a minimum height of 6.97 mAOD.

Potential flooding of the site has therefore been determined to only occur in the event of tidal flooding in excess of the 1 in 200 year event (i.e. extremely unlikely) or if there is a breach of the tidal flood defences in combination with an extreme flood event. The following description of flood extents and hazards is based on an assessment of flood risk in the event of such a breach.

3.2 Flood Extent and Hazard

The probability of inundation is considered to be very low as the defences are known to be in good condition. However, potential post-development breach scenarios have been considered as follows:

- Breach 1: a breach of the flood defences immediately adjacent to the proposed SEE site; and
- Breach 2: a breach of the flood defences to the south of the proposed SEE site.

Breach modelling and hazard analysis have been undertaken in accordance with EA guidance[1] and agreed with the EA. A map of flood hazard during both breach scenarios is presented in Figures 3.1 and 3.2.

Only during Breach 1 will flood water potentially inundate areas of the proposed SEE site. During Breach 2, flood water occurs adjacent to the site but not within the site boundary.

The hazard posed by flooding is a function of the depth of flood water and the velocity at which it flows. Techniques described in Defra/EA advice[2],[3] provide methods for estimating flood hazard.

Flood hazards are categorised in the following danger classifications:

- Danger for None – intrinsically safe for all;
- Danger for Some – includes children, the elderly and infirm;

1 Environment Agency, Anglian Region, Northern Area (2008) Guidance for Hazard Mapping for Flood Risk Assessments
2 /Environment Agency (2005) Flood Risk Assessment Guidance for New Development, R&D Technical Report FD2320
3 Defra/Environment Agency (2005) Flood Risks to People, Guidance Document FD2321

- Danger for Most – includes the general public; and
- Danger for All – includes emergency services.

No children, elderly or infirm adults where this would compromise site safety will be permitted on-site during normal operation.

3.3 Breach 1

At the peak of the flood, the majority of the existing SECL power station site is shown to be liable to inundation by flood waters. The majority of West Marsh Road adjacent to the existing SECL power station site is also shown to be liable to inundation. This includes both the northern access point (Gate A) and southern access point (Gate C) (Figure 4.2). The land between West Marsh Road and the River Welland is also shown to be liable to inundation.

The power station area of the proposed SEE will be located on a platform above 6.5 mAOD. This area is shown to be entirely outside the maximum extent of flooding during the Breach 1 scenario. Peak flood levels adjacent to the power station are approximately 6.25 mAOD. The power station area is at least 250 mm above the flood level and is therefore not at risk of flooding.

The substation area of the proposed SEE is currently proposed to be developed on a platform of 5.3 mAOD, though critical infrastructure may well be located above ground level. There is a significant head loss between the breach location and areas further afield. At the peak of the flood in this area, flood levels reach approximately 5.57 mAOD across the substation area.

During the Breach 1 scenario, flooding adjacent to the site begins immediately after the breach. Access/egress routes are affected 15 minutes after the breach occurs. The following sequences show the progression of flood risks between both the northern access point (Gate A) and southern access point (Gate C) and along West Marsh Road to the north and south respectively:

Table 3.1: Flood Hazard Breach 1 Gate A

Time After Breach	Gate A Access/Egress Route		
	Depth (m)	Velocity (m/s)	FD2320 Flood Hazard
0 mins	-	-	Danger for None
15 mins	0.33	0.34	Danger for Some
30 mins	0.42	1.14	Danger for Most
45 mins	0.78	0.34	Danger for Most
60 mins	0.96	1.29	Danger for All
75 mins	0.97	1.31	Danger for All
90 mins	0.93	0.92	Danger for All
105 mins	0.78	0.27	Danger for Most

Table 3.1: Flood Hazard Breach 1 Gate A			
Time After Breach	Gate A Access/Egress Route		
	Depth (m)	Velocity (m/s)	FD2320 Flood Hazard
120 mins	0.58	0.09	Danger for Most
135 mins	0.44	0.08	Danger for Some
150 mins	0.35	0.09	Danger for Some
165 mins	0.29	0.09	Danger for Some
180 mins	0.24	0.09	Danger for None

Table 3.2: Flood Hazard Breach 1 Gate C			
Time After Breach	Gate C Access/Egress Route		
	Depth (m)	Velocity (m/s)	FD2320 Flood Hazard
0 mins	-	-	Danger for None
15 mins	0.48	0.34	Danger for Most
30 mins	0.48	0.38	Danger for Most
45 mins	0.65	0.92	Danger for Most
60 mins	0.68	1.07	Danger for Most
75 mins	0.65	0.93	Danger for Most
90 mins	0.53	0.50	Danger for Most
105 mins	0.36	0.09	Danger for Some
120 mins	0.33	0.02	Danger for Some
135 mins	0.32	0.01	Danger for Some
150 mins	0.31	0.00	Danger for Some
165 mins	0.31	0.00	Danger for Some
180 mins	0.31	0.00	Danger for Some

Further high tides do not significantly overtop the breach and cause subsequent changes to the flood risk presented above up to 72 hours after the breach. Along the Gate A access/egress route, flood hazard exists from between 30 minutes and 2 hours 15 minutes after the breach. Along the Gate C access/egress route, flood hazard exists from between 15 minutes and 1 hour 45 minutes after the breach.

3.4 Breach 2

The existing SECL power station site, in this scenario, remains largely outside the flood extent. Only a small area of the existing SECL power station site adjacent to West Marsh Road is flooded. Some areas of West Marsh Road adjacent to the existing SECL power station site are flooded and land between West Marsh Road and the River Welland is also flooded.

The Gate A access point to West Marsh Road remains free from flooding as does the section of West Marsh road which extends north from this point. The Gate C access point onto West Marsh Road is affected by flooding as is the majority of West Marsh Road adjacent to and south of the proposed SEE site.

The proposed SEE site remains outside the maximum flood extent and is therefore not at risk from flooding. This includes the power station and substation elements of the proposal.

The following sequence shows the progression of flood risks adjacent to the site where flooding occurs along West Marsh Road to the south of the site:

Table 3.2: Flood Hazard Breach 2 Gate C

Time After Breach	Gate C Access/Egress Route		
	Depth (m)	Velocity (m/s)	FD2320 Flood Hazard
0 mins	0.28	0.8	Danger for Most
15 mins	0.59	1	Danger for Most
30 mins	0.66	1.19	Danger for Most
45 mins	0.84	1.48	Danger for All
60 mins	0.88	1.57	Danger for All
75 mins	0.83	1.48	Danger for All
90 mins	0.67	1.15	Danger for Most
105 mins	0.41	0.6	Danger for Most
120 mins	0.34	0.05	Danger for Some
135 mins	0.32	0.00	Danger for Some
150 mins	0.31	0.00	Danger for Some
165 mins	0.31	0.00	Danger for Some
180 mins	0.31	0.00	Danger for Some

As with the Breach 1 scenario, the flood hazard along the Gate C access/egress route remains a Danger for Some until the end of the 72 hour simulation.

3.5 Summary of Flood Risks

The FRA concluded that the proposed SEE site will be protected from all but the most extreme of floods. Even in the event of a flood occurring as a result of a breach, the site itself is extremely unlikely to be affected by flooding.

Although a dry escape route along West Marsh Road may be achievable depending on the location and severity of a breach, the principle issue will be that roads leading to and from the proposed SEE may be impacted over a widespread area and, critically, may be affected close to the proposed SEE site as well. This could impinge on the ability of emergency services staff to gain unrestricted access to the proposed SEE site in the event of a flood. Safe refuge will be provided in the power station, which is raised above potential extreme flood levels by at least 250 mm, in the event that the site cannot be evacuated.

4 ACCESS/EGRESS ARRANGEMENTS

4.1 Site Infrastructure and Personnel

Ground elevations for the proposed SEE are yet to be designed in detail. As a result of the flood modelling, the substation will be constructed with a minimum Finished Floor Level (FFL) of 5.3 mAOD though critical infrastructure may well be located above this level. The power station element of the proposed SEE development will be set at 6.5 mAOD.

At the peak of the flood, during the Breach 1 scenario, flooding is liable to occur along the majority of West Marsh Road and within the existing SECL power station site. As such, evacuation along this route would not be possible for approximately 3 hours after the breach has occurred. Site personnel will be able to remain on-site in safety during this period as the power station element is raised above the maximum extent of flooding by approximately 250 mm.

During the Breach 2 scenario, flooding occurs along the southern side of the site access/egress on West Marsh Road only and would not be possible along this route for up to 2 hours 30 minutes after a breach until flood waters recede. Dry access/egress however remains fully available via Gate A during the Breach 2 scenario.

A drawing showing a parameter block model layout of the site is presented in Figure 4.1. It is likely that there will be approximately 15-20 staff on-site during the operational phase of the project. If the power station is operated on a standalone basis, then nearly 40 staff will be directly employed. Furthermore, there could be a larger number of people (up to an annual equivalent of 28 persons) on-site during regular maintenance shutdowns when contracted engineering staff will be present. The majority of these are considered to be occupied within the main power station – the substation will generally remain unmanned except for specific maintenance operations.

4.2 Evacuation Routes

Two potential evacuation routes have been identified and are presented in Figure 4.2. As the proposed SEE site itself will not be impacted by flooding in either of the breach scenarios discussed here, the proposed SEE will be entirely safe for people to remain in situ until the flood waters recede when the tide falls.

However, due to the residual risk of an extremely unlikely event occurring that would be greater than the flood defences or a breach of the flood defences that could render one or more of the evacuation routes unsafe for a period, internal muster points are recommended to be located within the power station area of the proposed SEE at an elevation above 6.5 mAOD, approximately 250 mm higher than the maximum extent of flooding.

Consultation will be undertaken with the emergency services, EA and Local Authority to determine the evacuation route to be taken from West Mains Road to a position of safety within Flood Zone 1. In the event of an extreme flood event, it is likely that a large number of people will need to evacuate from the area and district-wide planning is needed to ensure that additional problems of congestion and isolation do not occur as a result. Prior to

occupation of the site, evacuation routes beyond the immediate vicinity will have been discussed and agreed and incorporated into a further draft of this FWEP.

4.3 Evacuation Risk

Evacuation of the site can itself present a risk to Health & Safety. In the event of the site being impacted by flooding, the FWEP will only be invoked under extreme circumstances. Close cooperation and communication with the emergency services and EA plus the implementation of the flood warning and emergency procedures outlined in Sections 5 and 6 will allow the site to be properly made safe prior to an orderly evacuation.

Floods are unpredictable in nature and, as such, a precautionary approach to evacuating the site must be taken. Although those areas within the control of the proposed SEE will be dry, it is possible that during a tidal flood event other areas further afield will be inundated for a period of time.

Where it is not possible to make a safe evacuation beyond the immediate locality, staff, contractors and visitors should return to a safe refuge point within the proposed SEE site until such time as flood waters have receded sufficiently to allow safe evacuation. Further information on evacuation procedures are presented in Section 6.

5 WARNING ARRANGEMENTS

5.1 Flood Warning Procedures

The site will register with the EA's Floodline Warnings Direct which will mean that the site receives automated flood warning messages via Automated Voicemail Message (AVM), text and/or email. This will allow the site to be kept informed of changes in the flood warning status for the area.

At this stage, given the lack of detail available regarding personnel with responsibility for various aspects of implementing the FWEP, no flood warning procedure can be formalised. Nevertheless, suggested procedures are provided as follows:

- On receipt of information about a change in the flood warning status, this information will need to be logged and relayed to personnel with responsibility for implementing the FWEP (e.g. Shift Team Leader, Duty Manager);
- Actions to be taken in the event of a change in flood warning status will be implemented as detailed in Section 5;
- All site staff, contractors and visitors should be made aware of the EA Floodline telephone number (0845 988 1188) and the four Flood Warning Codes and their meaning;
- Minimum warning times from the EA for the site are to be provided by the EA to ensure that an appropriate set of emergency actions can be developed in further iterations of the FWEP;
- Training on the flood warning and emergency procedures will be provided to site staff at Health & Safety Briefings – staff will be made aware of evacuation routes, EA Floodline and Flood Warning Codes;
- Site induction at the commencement of employment for any staff working on-site should include awareness of flood warning and emergency procedures; and
- All contractors and visitors to the site should be made aware of flood warning and emergency procedures through a separate site induction procedure.

It should be noted that the receipt of a change in flood warning status does not necessarily mean that the site will flood as this has been assessed to be largely dependent on whether a breach of the flood defences occurs or not. Likewise, the EA is unlikely to be able to provide a warning of a breach before the site becomes aware of it.

Vigilance must be observed by all site staff, contractors and visitors at all times upon receipt of a Flood Warning Notice. Staff, contractors and visitors should pay particular attention to any indications that a breach of the flood defences has occurred or, following a breach, whether water has encroached towards the site boundary or even low lying areas within the site boundary.

This information must be relayed to personnel with responsibility for implementing the FWEP giving the following details if possible:

- Location and extent of flood water;
- Estimated depth of water in this location (e.g. at least 1 m deep, minor ponding – NB staff, contractors and visitors should not enter the water);
- Indication of flow direction and rate (e.g. moving north, fast flowing, still); and
- Evaluation of whether water is rising or falling (e.g. visual signs of water rise, observed tide marks where water has now fallen).
- Similar information can be provided in the event of a real or potential breach of the flood defences.

This type of information can then be used by those with responsibility for implementing the FWEP to guide subsequent actions to be taken.

5.2 EA Flood Warnings

EA Flood Warnings will be received via the Floodline Warnings Direct service and will update site staff on the flooding status for the area. This will involve relaying information in the form of Flood Warning Codes.

The Four Flood Warning Codes are summarised as follows:



Flooding of low lying land and roads is expected. Be aware, be prepared, watch out.



Flooding of homes and businesses is expected. Act now!



Severe flooding is expected. There is extreme danger to life and property. Act now!



Flood watches or warnings are no longer in force for this area.

5.3 Sources of Information

Flood Warnings are broadcast by Television and Radio networks, usually during weather or traffic reports.

The EA website provides information on current flood warnings (http://www.environment-agency.gov.uk/)

BBC Ceefax – Page 419.

ITV teletext regional weather pages – Page 154.

Calling Floodline on 0845 988 1188 where there are options to listen to recorded information or to speak to an operator for up-to-date information and advice 24 hours a day.

6 EMERGENCY PROCEDURES

6.1 Overview

The FRA has concluded that the site will be protected from all but the most extreme of floods. Even in the event of a flood occurring as a result of a breach, the site itself is extremely unlikely to be affected by flooding. Infrastructure and site operation is therefore not likely to be directly impacted under all but the most extreme circumstances.

Emergency procedures will be subject to change as the project develops. However a suggested series of procedures to be taken are provided in this section.

6.2 Actions on receipt of a Flood Warning

Flood Watch

- Call will be acknowledged and logged.
- Site staff with duty responsibility for site management (e.g. Shift Team Leader) will monitor local news and weather forecasts and inform higher management of situation.
- All staff, contractors and visitors will be instructed of the level of flood warning.
- Necessary preparations will be made to implement the FWEP.
- Communications with on-site and off-site staff with responsibility for management will be checked and maintained.

Flood Warning

Call will be acknowledged and logged.

- Site staff with duty responsibility for site management will continue to monitor local news and weather forecasts and inform higher management of situation.
- All staff, contractors and visitors will be instructed of increased level of flood warning and to be vigilant for indications of flooding in the local area and, in particular, the site.
- Preparations as necessary will be made to implement further stages of the FWEP.
- Communications with on-site and off-site staff with responsibility for management will be regularly maintained.

Severe Flood Warning

- Call will be acknowledged and logged.
- Site staff with duty responsibility for site management will continue to monitor local news and weather forecasts and inform higher management of situation.
- If applicable, a note of predicted high tide/storm surge dates and times will be made.

- All staff, contractors and visitors will be instructed of increased level of flood warning and to be vigilant for indications of flooding.
- If safe to do so, a member of staff will check on water levels in the River Welland to assess the potential risk of flooding and signs of any potential breach – security cameras may also be used to assess water levels.
- Communications with on-site and off-site staff with responsibility for management will be regularly maintained.

In the event that the risk of flooding is not imminent (e.g. a potentially severe storm surge has been predicted with a lead time of over 8 hours and water levels in the River Welland are currently at normal levels), the following actions will be implemented:

- An assessment of the need for a full or partial evacuation and/or temporary shutdown of the site to correspond with predicted flooding extremes will be made by appropriate personnel.
- (where applicable) Staff, contractors and visitors will evacuate using normal routes and exercise vigilance.
- On-site or off-site staff will monitor the situation as it progresses and determine when the level of flood risk has fallen to a lesser Flood Warning Code and (where applicable) the site can be re-occupied.

In the event that the risk of flooding is considered to be real but there is longer than a two hour lead time to that risk being realised (e.g. a potentially severe storm surge has been predicted with a lead time of over 2 hours), the following actions will be implemented:

- An assessment of the need for a full or partial evacuation and/or temporary shutdown of the site will be made by appropriate personnel.
- This will include an assessment of the adjacent flood defences to determine whether and where a breach could occur.
- (where applicable) Staff, contractors and visitors will evacuate using an appropriate route as identified in Section 4 and exercise vigilance.
- It is essential that all staff, contractors and visitors understand which route is to be utilised i.e. Route 1 or Route 2 though this does not preclude the need for all staff, contractors and visitors to exercise vigilance and good judgement when utilising a pre-determined evacuation route.
- On-site or off-site staff will monitor the situation as it progresses and determine when the level of flood risk has fallen to a lesser Flood Warning Code and (where applicable) the site can be re-occupied.

In the event that the risk of flooding is considered to be real and imminent (e.g. a breach has occurred and flood water has begun to inundate areas adjacent to or within the site area), the following actions will be implemented:

- The Power Station will be shut down in a controlled manner including all necessary actions to ensure damage will not occur to site infrastructure and the environment.
- An assessment will be made of the potential for a safe full or partial evacuation of the site along the routes identified in Section 4.

- It is essential that all staff, contractors and visitors understand which route is to be utilised i.e. Route 1 or Route 2 though this does not preclude the need for all staff, contractors and visitors to exercise vigilance and good judgement when utilising a pre-determined evacuation route.
- One route only will be used by all site staff, contractors and visitors who will exercise extreme caution in progressing along the evacuation route.
- If flood risks are deemed to be hazardous at any stage along pre-determined routes, staff, contractors and visitors should return along the same route to the proposed SEE site.
- Safe refuge will be provided within power station buildings at the proposed SEE site.
- On-site or off-site staff will monitor the situation as it progresses and determine when the level of flood risk has fallen to a lesser Flood Warning Code and (where applicable) the site can be re-occupied – this will involve taking external advice on the flooding situation beyond the site boundary.

All Clear

- Call will be acknowledged and logged.
- All staff, contractors and visitors will be instructed of the changed level of flood warning and that flood risk issues have therefore dissipated.
- At an appropriate stage, a review of the actions implemented, potential issues and areas for improvement will be undertaken and the FWEP revised accordingly.

6.3 6Actions Required During an Evacuation

- In the event that a full or partial evacuation of the site is decided upon, specific actions to be taken are as follows:
- Records of all staff, contractors and visitors present on-site at the time of evacuation will be obtained.
- An assessment of those who can and those who should or should not evacuate the site will be made including the ability of those individuals to make a safe evacuation.
- Where people require assistance, this will be provided by duly appointed individuals.
- A record of those who will be evacuating the site will be made and contact details for each person will be logged (e.g. mobile phone numbers).
- Each person evacuating the site will be made aware of the proposed evacuation route and procedures to be undertaken in the event that the evacuation route becomes unusable, taking into consideration the issues identified above.
- Each person leaving the site will take a note of the site's contact details and call to inform any staff, contractors and visitors remaining on-site of any relevant information with respect to the evacuation route (e.g. hazards, blocked roads, traffic congestion).
- If the evacuation is taking place within hours of darkness, portable lighting equipment should be provided to those being evacuated where possible.

6.4 Post Evacuation

Following a full or partial evacuation of the site, the following actions will be required:

- Personnel with responsibility for implementing the FWEP will ensure that relevant Category One Providers are informed that the site has been fully or partially evacuated and the measures taken to render the site safe.
- All staff, contractors and visitors are to be made aware for the duration of the evacuation of the situation with respect to flooding.
- In the event of widespread flooding, it is considered likely that a co-ordinating centre from which the emergency services, EA, Local Authority etc. can manage the situation will have been established.
- Personnel with responsibility for implementing the FWEP will establish and maintain liaison with the co-ordinating centre to obtain situation reports and to determine and agree when it is safe to resume normal operation of the proposed SEE.
- It is essential to understand that whilst the proposed SEE is unlikely to be directly affected by flooding, there may be severe disruption to travel arrangements in the local area which may be subject to separate flood hazards.

6.5 Safe Refuge

- In the unlikely event that the site is affected by flooding without warning and/or evacuation from the site is compromised, all staff, contractors and visitors should be instructed to remain within the proposed SEE site. Details of the site layout are yet to be finalised but, at this stage, it has been assumed that refuge would be provided within the power station area of the site.
- If the site and surrounding area are affected, anyone leaving the site would be exposed to flooding and other hazards. Every effort should be used to persuade anyone that insists on leaving to remain but physical restraint cannot be used.
- Staff, contractors and visitors will remain safe and dry within buildings at the proposed SEE (minimum FFLs for the power station will be set at 6.5 mAOD – well above the potential flood levels modelled during breach analysis).
- Advice and assistance should be sought from the emergency services and, where given, instructions should be followed at all times.
- Further details on provisions for safe refuge will be made during the development of the project.

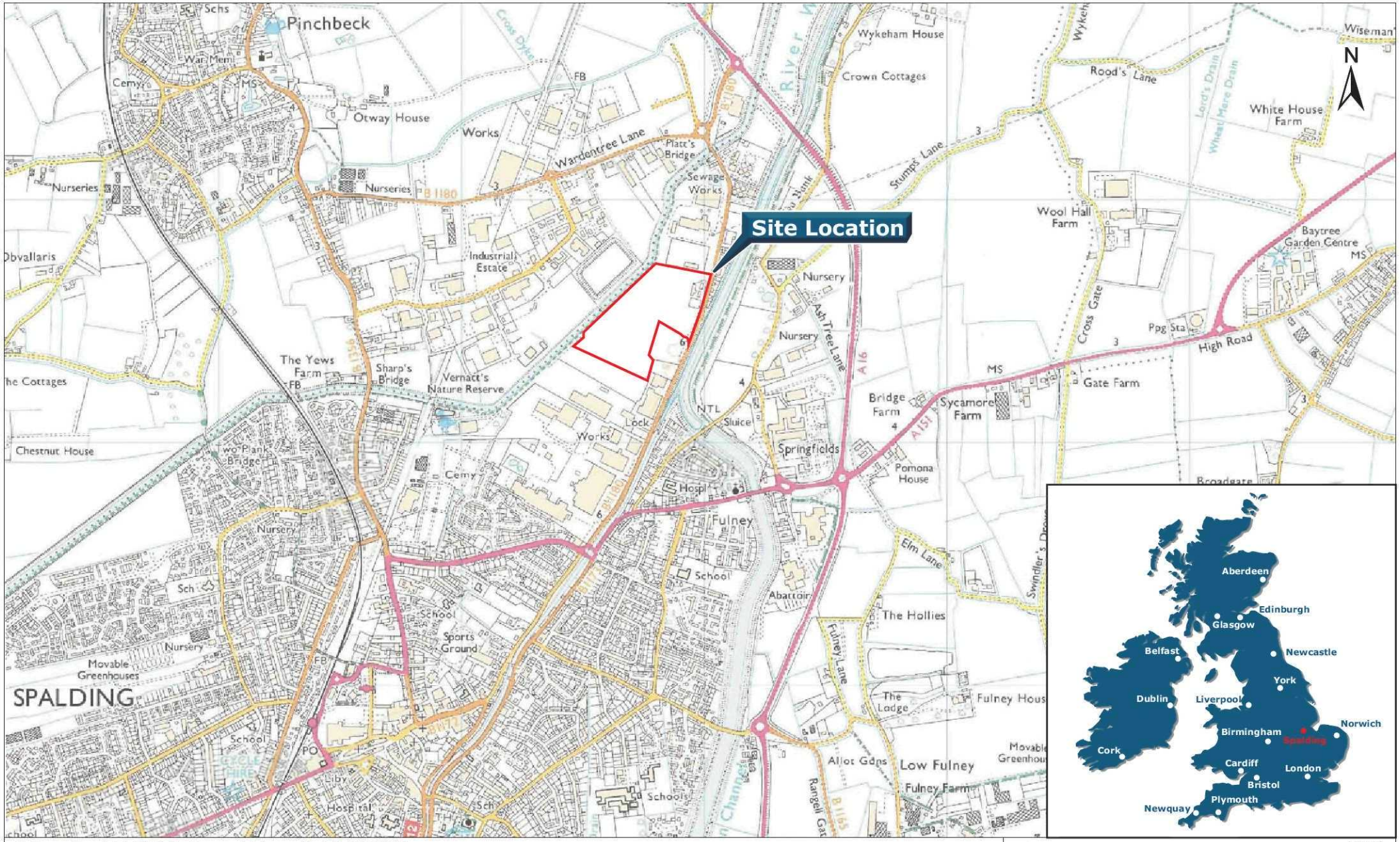
7 Management of Change

Site staff for the proposed SEE and/or external staff for InterGen and affiliates will be responsible for the updates, maintenance and distribution of the FWEP.

The FWEP is a live document and should reflect changes of any kind that occur through the lifespan of the proposed SEE where these will impact on the FWEP.

The FWEP should be tested in exercise and reviewed every 5 years, or sooner should there be a change to flood risks and/or warning systems, in consultation with the EA, Local Authority and other relevant organisations.

- Following revision, the FWEP, including a revision schedule, shall be updated and re-issued. A copy of the FWEP should be made available to the emergency services and the local authority



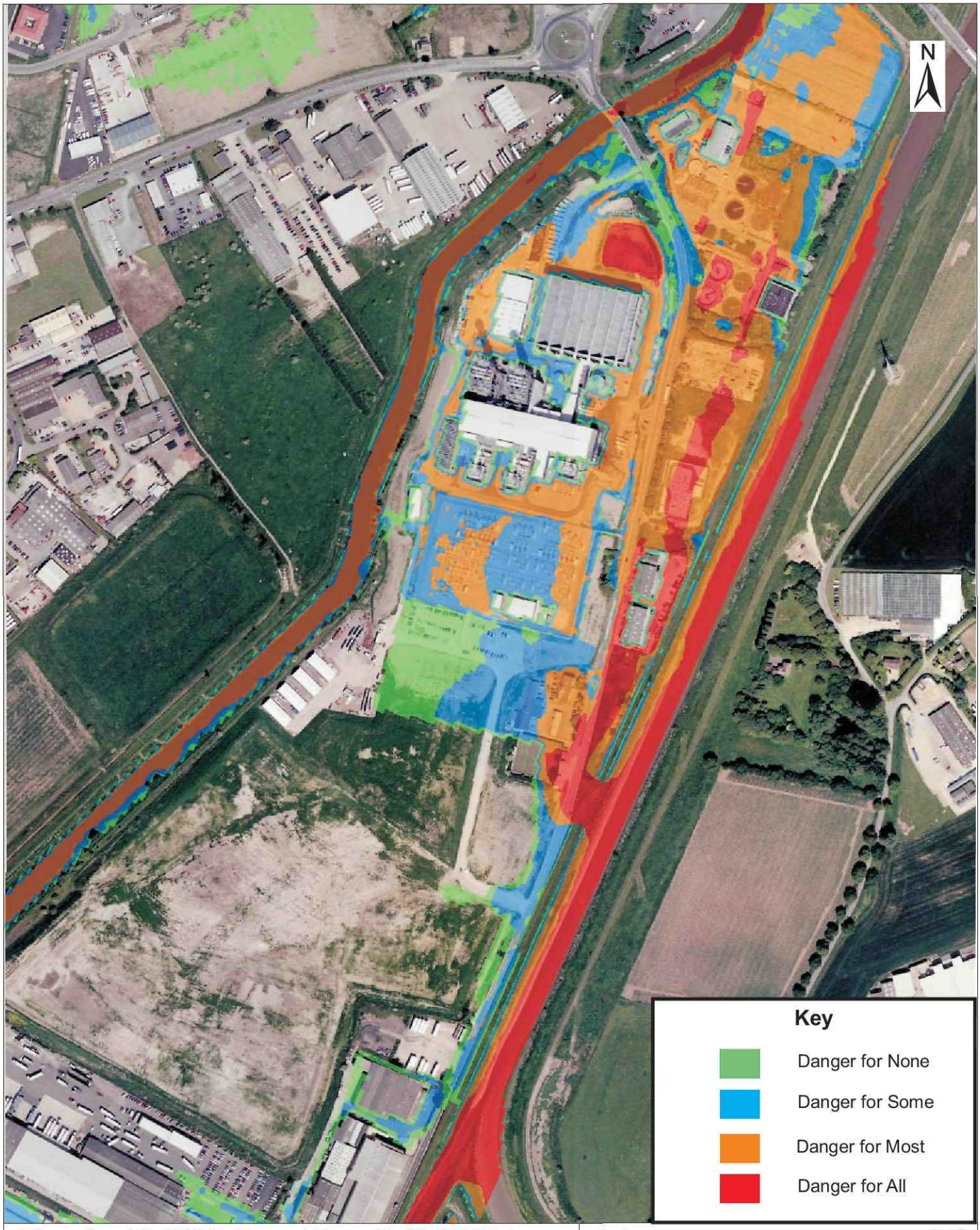
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Scale **NTS**

ENVIRON

Title	**Figure 1.1: Site Location**
Site	**Spalding Energy Expansion, Spalding, Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-12701**	Issue	**1**
Date	**July 2009**	Drawn by	**KJ/NS**



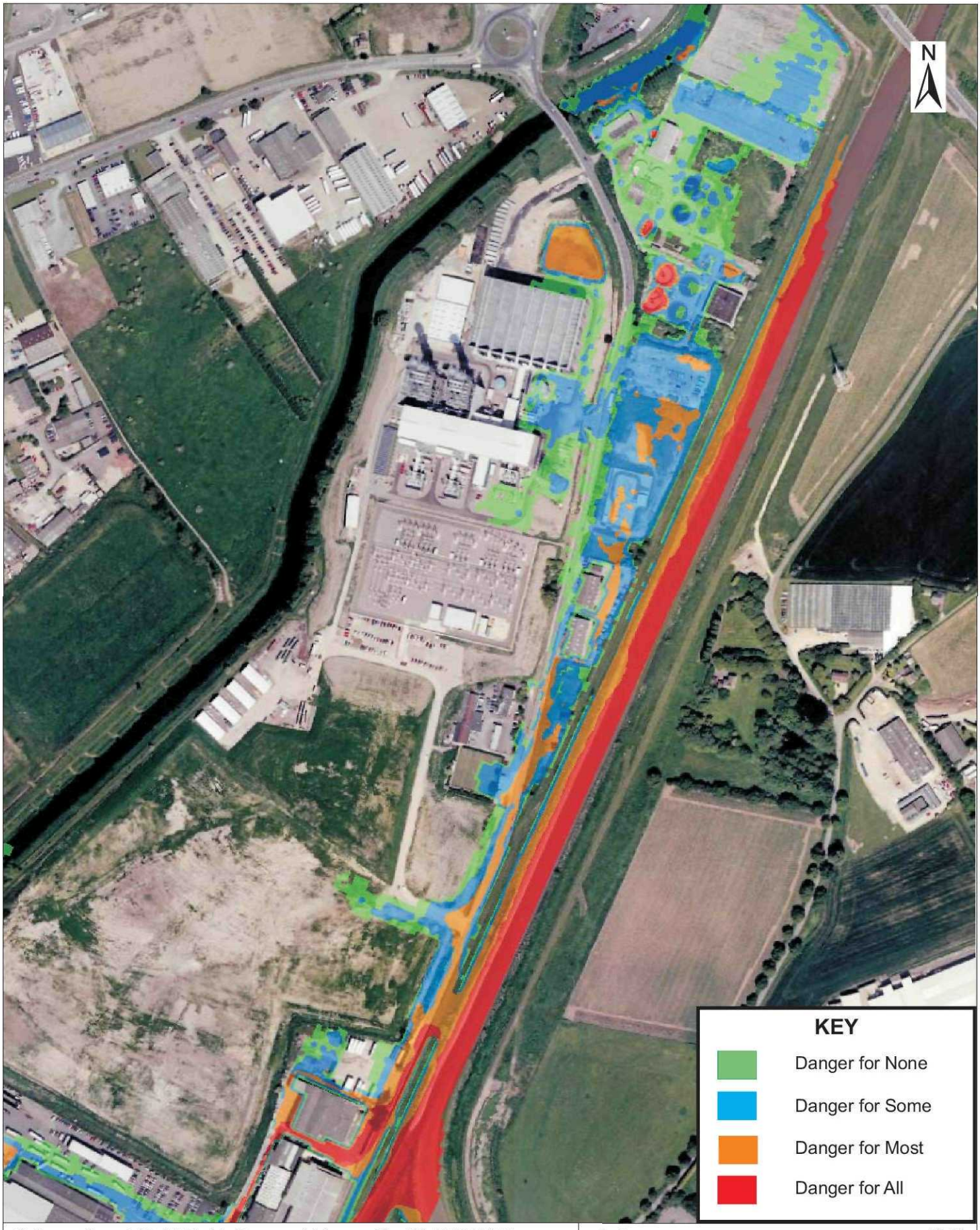
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Scale **NTS**

Title	**Figure 3.1: Breach 1**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**KJ/NS**

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Scale **NTS**

Title	**Figure 3.2:Breach 2**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**August 2009**	Drawn by	**KJ/NS**

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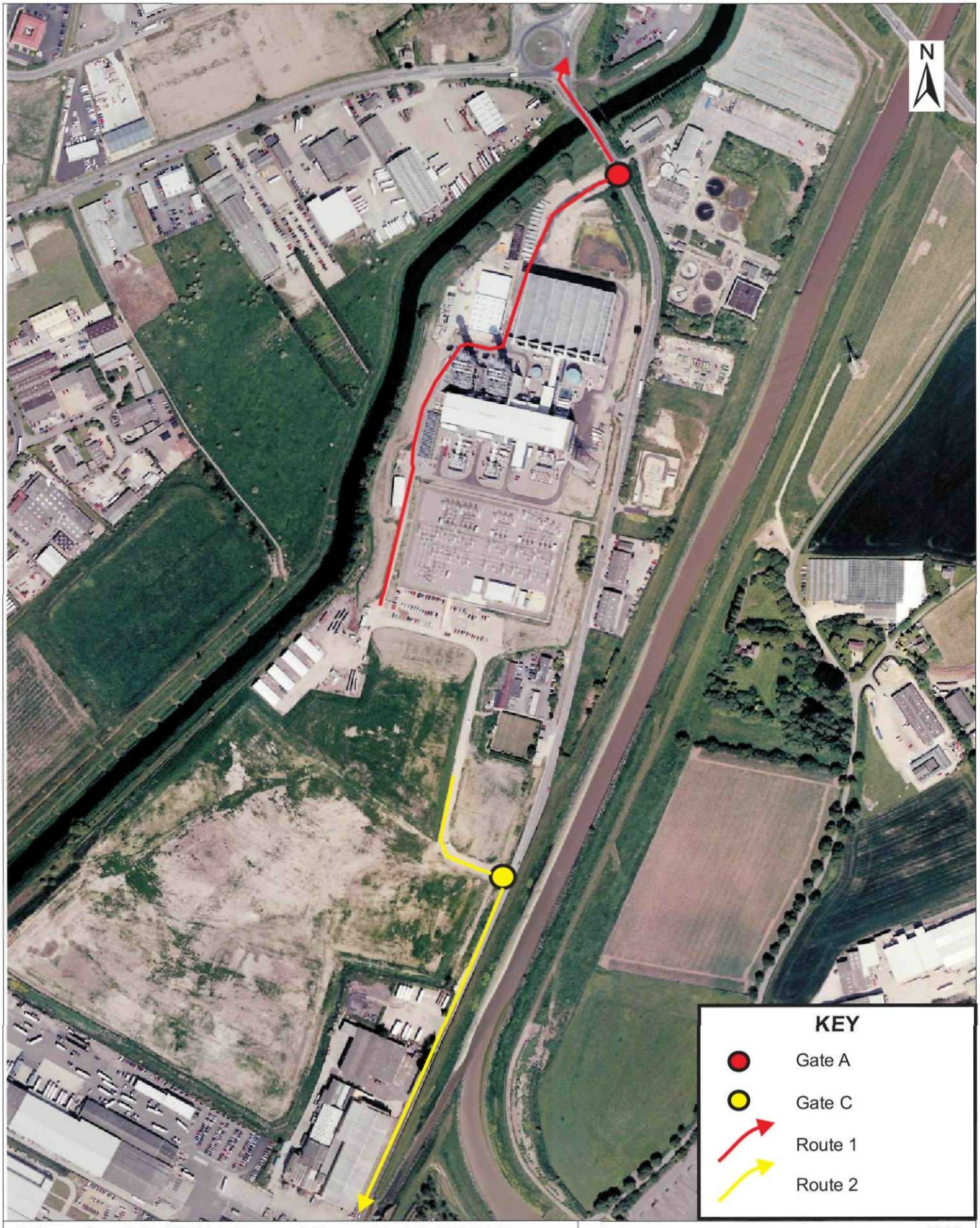
Scale **NTS**

ENVIRON

Title **Figure 4.1: Parameters Plan**

Site **Spalding Energy Expansion, Spalding, Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-12701**	Issue	**1**
Date	**July 2009**	Drawn by	**KJ/NS**



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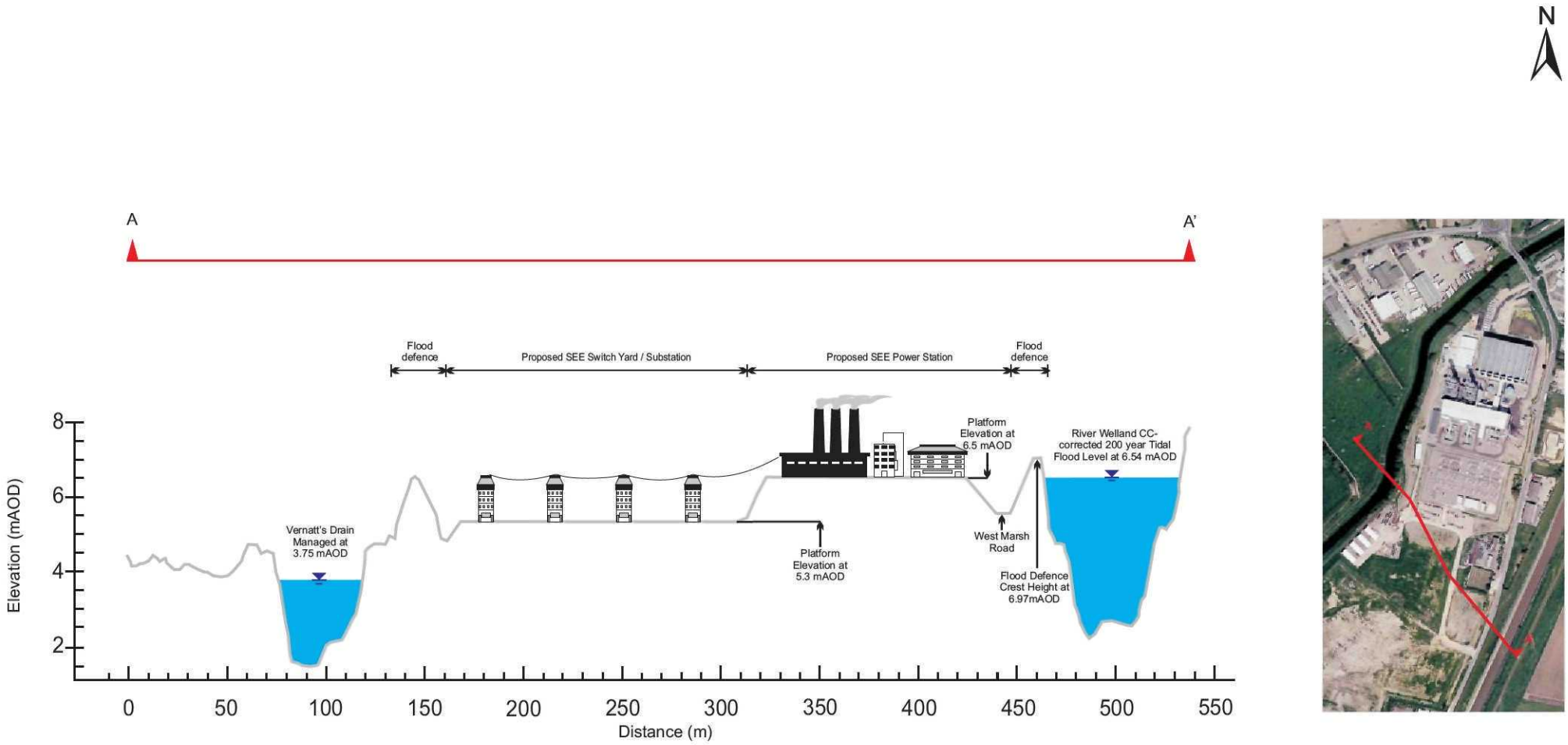
Title	**Figure 4.2:Evacuation Routes**
Site	**Spalding Energy Expansion** **West Marsh Road** **Spalding** **Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-14701**	Issue	**1**
Date	**July 2009**	Drawn by	**KJ/NS**

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APPENDIX B

Cross Section of SEE Site and Flood Levels



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Scale **As Shown**

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Title	**Figure 1: Cross Section of SEE Site and Flood Levels**
Site	**Spalding Energy Expansion, Spalding, Lincolnshire**

Client	**Spalding Energy Expansion Limited**		
Project No.	**UK12-12701**	Issue	**1**
Date	**August 2009**	Drawn by	**KJ/NS**