FLOOD RISK ASSESSMENT

Parkside Box

Prepared for: AMP Energy Services Ltd.

SLR Ref: 425.064703.00001 (068)
Version 1
June 2024

BASIS OF REPORT

This document has been prepared by SLR with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with AMP Energy Services Ltd. (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

CONTENTS

1.0 INTRODUCTION 1
1.1 Site Location 1
1.2 Development Proposals 2
2.0 BASELINE SITE APPRAISAL 4
2.1 Existing Site Features 4
2.2 Topography 4
2.3 Hydrology and Drainage 5
2.4 Geological and Hydrogeological Features 5
2.4.1 Geology 5
2.4.2 Hydrogeology 5
3.0 PLANNING POLICY AND GUIDANCE 6
3.1 National Planning Policy 6
3.1.1 Development Sensitivity 6
3.1.2 Flood Zone Classification 6
3.1.3 Flood Risk Compatibility 8
3.1.4 Sequential Test 8
3.1.5 Exception Test 9
3.2 Local Planning Policy 10
3.3 Climate Change 11
3.3.1 Sea Level Change 11
3.3.2 Peak Fluvial Flows 12
3.3.3 Peak Rainfall Intensity 12
4.0 POTENTIAL SOURCES OF FLOODING 14
4.1 Methodology and Best Practice 14
4.2 Flooding from the Sea or Tidal Flooding 14
4.2.1 Tidal Defences 14
4.2.2 Tidal Flood Level Data 15
4.2.3 Tidal Risk 15
4.3 Flooding from River or Fluvial Flooding 15
4.3.1 Fluvial Flood Defences 15
4.3.2 Fluvial Risk from The Spalding Channel 15
4.3.3 Fluvial Risk from Vernatt's Drain 16
4.4 Flooding from Surface Water or Overland Flow 16

4.5 Flooding from Groundwater 17
4.6 Flooding from Sewers and Water Mains 17
4.7 Flooding from Reservoirs, Canals, and other Artificial Sources 18
4.8 Flooding from Infrastructure Failure 18
4.9 Summary 20
5.0 CONCLUSION 21

DOCUMENT REFERENCES

TABLES

Table 3-1: Flood Risk Vulnerability and Flood Zone 'Compatibility' 8
Table 3-2: Sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets 12
Table 3-3: Peak River Flow Allowances 12
Table 3-4: Peak Rainfall Intensity Allowance 13
Table 4-1: Potential Risk Posed by Flooding Sources 20

FIGURES

Figure 1-1: Site Location Plan 2
Figure 2-1: Environment Agency LIDAR of the Site 4
Figure 3-1: Extract of Flood Map for Planning 7
Figure 4-1: Extract of Environment Agency Surface Water Flood Map 17
Figure 4-2: Extract of SFRA Residual Risk Mapping 19

APPENDICES

Appendix 01: Proposed Site Layout
Appendix 02: Environment Agency Data Response

1.0 Introduction

SLR Consulting Limited has been appointed on behalf of AMP Energy Services Limited to prepare this Flood Risk Assessment (FRA) in support of a planning application for a 200kW 800kWhr Energy Storage System (ESS) ('Battery Box') ("the proposed development").

This FRA has been prepared under the direction of a Technical Director of SLR who specialises in flood risk and associated planning matters. The report has been completed in accordance with guidance presented within the National Planning Policy Framework (NPPF)[1] and its associated Planning Practice Guidance (PPG)[2], taking due account of current best practice documents relating to assessment of flood risk published by the British Standards Institution BS8533[3].

1.1 Site Location

The proposed development will be located at Parkside Cresent, Spalding, Lincolnshire, PE11 1QT ("the site"). This site is centred on National Grid Reference (NGR) TF 24486 23345. A site location plan is provided in Figure 1-1 below.

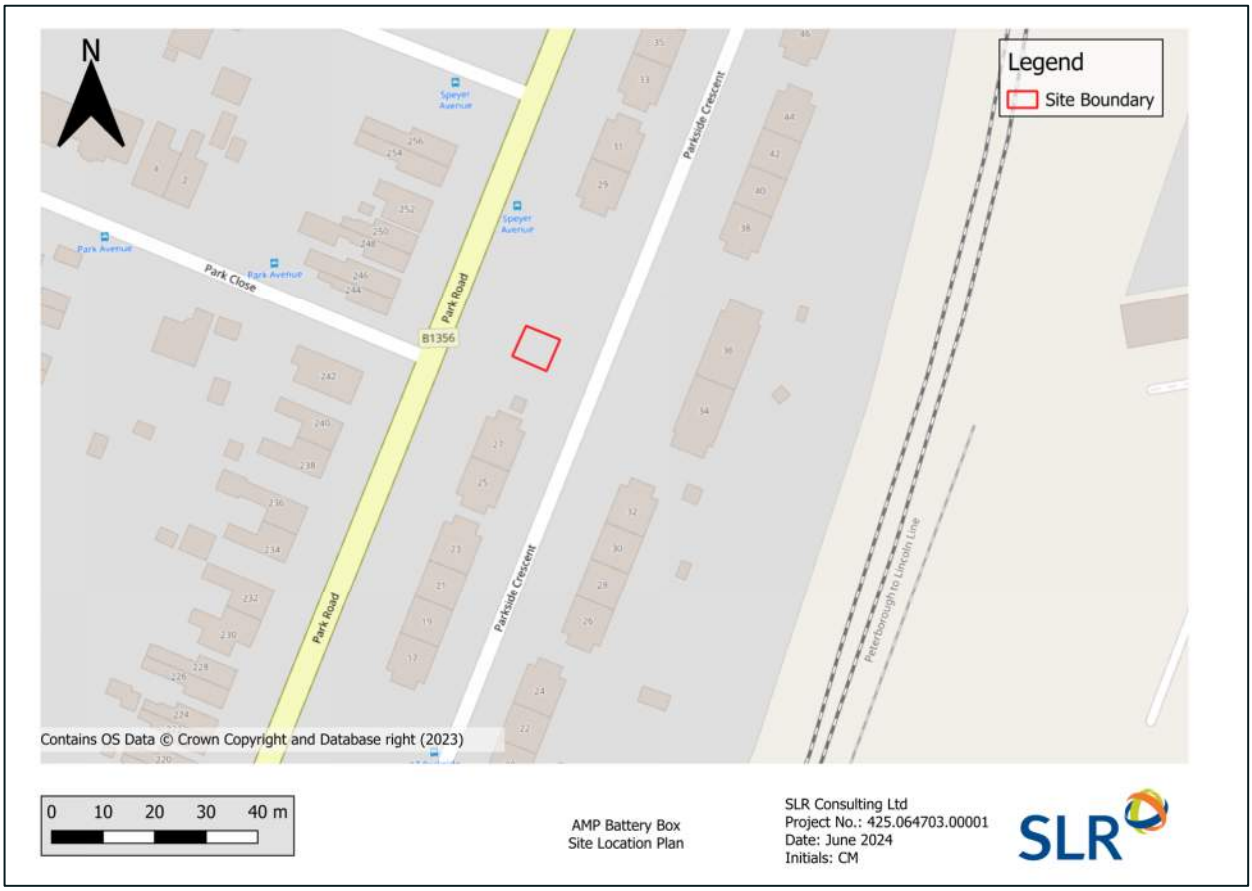
The site is under the planning jurisdiction of South Holland District Council and Lincolnshire County Council is the lead local flood authority (LLFA). The site is also located under an area in which drainage matters are managed by the Welland and Deepings Internal Drainage Board (IDB).

1 National Planning Policy Framework: Communities and Local Government (December 2023)

2 Planning Practice Guidance: Communities and Local Government (last updated May 2022)

3 BS8533:2017, Assessing and managing flood risk in development: Code of Practice (December 2017)

Figure 1-1: Site Location Plan



1.2 Development Proposals

A Battery Box is an ESS that imports electricity from the local electricity network when demand for electricity is low or when there are high levels of renewable energy available. It then exports that electricity back to the grid when required in periods of high demand. This provides a solution to the growing need for flexibility and helps address concerns regarding grid reliability prompted by an increased reliance on intermittent generation of the electricity system.

Battery Boxes connect into the low voltage (LV) network, this is the lowest and most local point in the system where there is an increasing demand for electricity with the electrification of transport and heating systems. Stored electricity from the Battery Box will be exported and consumed in the locality of the box (when it is required).

The proposed development covers an area of just 24m^2 and is therefore a minor[4] development which is entirely ancillary to the adjacent commercial land operations. The physical infrastructure will consist of:

- Installation of a concrete plinth foundation;
- Installation of the battery containerised units and associated equipment; and
- The construction of a new fence surrounding the Battery Box.

A plan showing the proposed site layout is included in Appendix 01.

The development will be in place for no more than 30 years; following which all infrastructure will be removed, or fresh permissions would need to be sought.

The concrete plinth will be constructed in an area that has a current ground level of 3.80m above Ordnance datum (aOD) and will be finished with a top surface 0.1m above this level at 3.90m aOD. The battery containerised units and associated equipment will be placed and secured directly onto this surface and will have a further internal freeboard of 0.08m. As such flooding would need to reach an elevation of 3.98m aOD before the operation of the battery box was compromised.

[4] The Town and Country Planning (Development Management Procedure) (England) Order 2015, defines 'Major Development' as development involving any one or more of the following—

1 the winning and working of minerals or the use of land for mineral-working deposits;
2 waste development;
3 the provision of dwellinghouses where—
  (i) the number of dwellinghouses to be provided is 10 or more; or
  (ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
4 the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
5 development carried out on a site having an area of 1 hectare or more;

Inter alia, everything below these thresholds, including the current application, is 'Minor'.

2.0 Baseline Site Appraisal

2.1 Existing Site Features

The site is on a grass verge with mature trees situated between Park Road and Parkside Cresent. The surrounding area is residential. The site is located 75m west of the Peterborough to Lincoln railway line and is accessed from the A151 via Park Road.

At a distance of ~0.77km to the southeast of site is the River Welland; ~0.98km north is a large artificial channel called Vernatt's Drain.

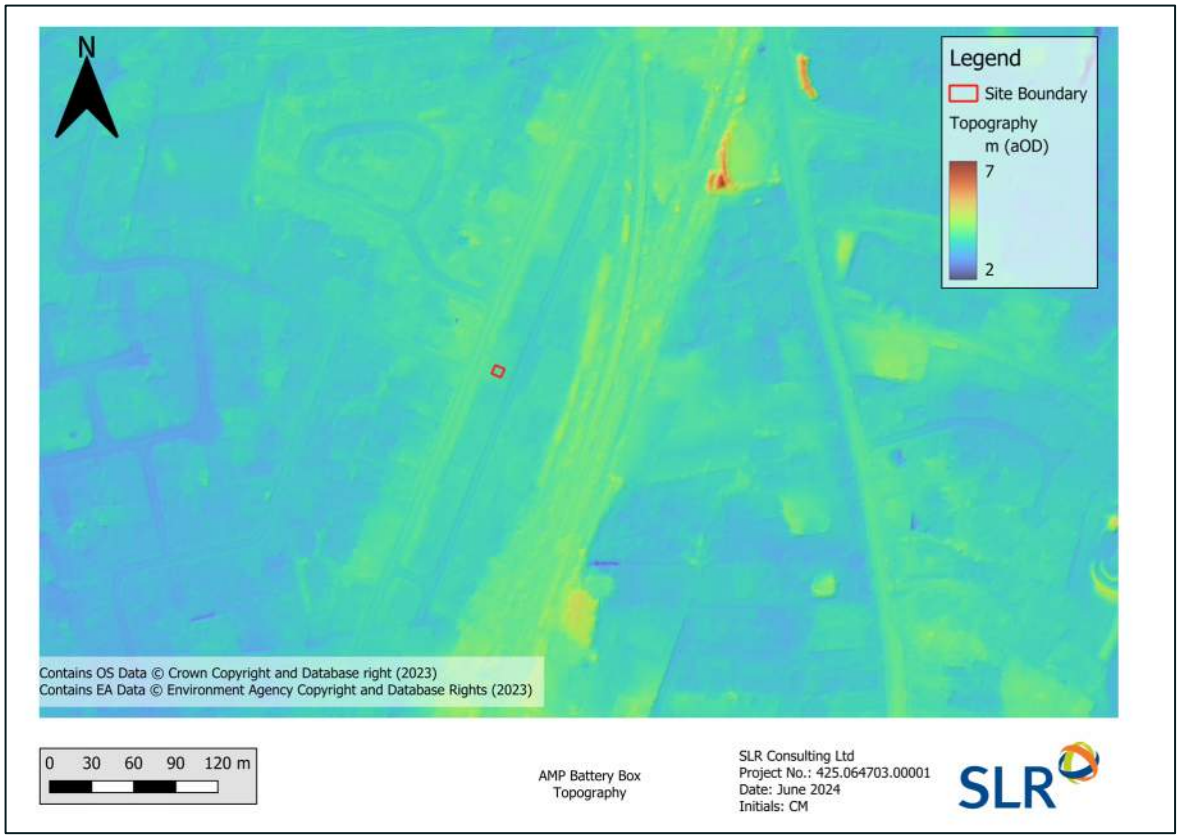
2.2 Topography

Topographic data from on and around the site, gathered using Light Detection and Ranging (LiDAR) aerial photogrammetric techniques, has been downloaded from the Environment Agency (EA) open data website[5]. This data has been used to provide information in relation to the topography of the land on and around the site, refer to Figure 2-1.

The LiDAR topographic data indicates site elevation is approximately 3.8m aOD. The site slopes from west to east at a gentle gradient but is higher than Parkside Crescent (Road) to the east which has an elevation of 3.5m aOD.

Land between Vernatt's Drain and the River Welland is mostly flat. However, the Site is situated between two slightly higher areas. These are raised to 4.0m aOD to the west and 4.4m aOD to the east along the railway line (Peterborough to Lincoln Line).

Figure 2-1: Environment Agency LIDAR of the Site



5 Defra open data website, https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

2.3 Hydrology and Drainage

The River Welland, which is .77km to the east is an EA designated Main River and is referred to as the Spalding Channel through Spalding. The river flow towards The Wash c.20.8km northwards. The River Welland is fluvial past the site until Fulney Lock (c.1.54km north of site). This structure controls the release of fluvial flows downstream and prevents tidal flows progressing upstream towards site. Water levels within the fluvial channel are, however, influenced by tidal levels downstream as free onward discharge of fluvial water is restricted during high tides.

Vernatt's Drain, which is located c.0.98km northwest from site, is a designated Ordinary Watercourse and is managed by Wellings and Deeping IDB; The drain primarily conveys pumped flows from low-lying agricultural land (former fens) towards the River Weiland's tidal reach 7.10km to the northeast.

General drainage around the immediate area of the site is assumed to be normally serviced by highway surface water drainage gullies and networks.

2.4 Geological and Hydrogeological Features

2.4.1 Geology

The National Soil Resources Institute[6] indicates that the soils at the site consist of "*Loamy and clayey soils of coastal flats with naturally high groundwater*".

British Geological Survey (BGS) mapping[7] indicates that the site is underlain by superficial tidal flat deposits comprising of clay and silt, underlain by Oxford Clay Formation bedrock geology.

A BGS borehole (TF22SW53), 190m south from the site, with a total depth of 30.5m observed an initial soil strata sequence comprising of:

- Made ground – ash and clinker (considered part of the nearby railway infrastructure) – 0.7m depth.
- Soft brown sandy CLAY – 1.0m depth.
- Soft to medium dense silty SAND – 4.4m depth.

Other BGS boreholes within the immediate vicinity to the east including TF22SW52 and TF22SW63 both found similar soil strata geology consistent with BGS descriptions.

2.4.2 Hydrogeology

The EA has designated both the bedrock geology and the drift as unproductive strata[8] which is defined as "*geological strata with low permeability that have negligible significance for water supply or river base flow*".

Groundwater across multiple nearby boreholes within 300m of the site was generally encountered between 1.0m to 1.5m below ground level. It is anticipated that the clayey superficial soils are porous and thus have the ability to contain groundwater, however, are considered to have very low permeability.

6 Cranfield Soil and Agrifood Institute, Soilscapes map, http://www.landis.org.uk/soilscapes

7 British Geological Survey, Geoindex onshore, https://mapapps2.bgs.ac.uk/geoindex/home.html

8 Magic Map Application, managed by Natural England, delivered by Landmark, https://magic.defra.gov.uk/MagicMap.aspx

3.0 Planning Policy and Guidance

3.1 National Planning Policy

This FRA report has been completed in accordance with guidance presented in NPPF[1] and with reference to the PPG for flood risk and coastal change[2].

3.1.1 Development Sensitivity

Annex 3 of NPPF sets out development sensitivities with respect to flood risk that should be used to help consider the appropriateness of different development types with respect to the prevailing flood risk.

The proposed development consists of an ESS to provide highly localised grid support. This infrastructure is intended to support the immediate land usage and will not serve a wider area. Failure of the installation due to flooding would have little or no consequence beyond the immediate locale of the site.

Under the development sensitivity classifications set out in Annex 3 of NPPF, standalone energy facilities are typically considered as '*Essential Infrastructure*'. This is because normally they comprise infrastructure *'the loss or compromise of which could result in a major detrimental impact on the availability, integrity or delivery of essential services - including those services whose integrity, if compromised, could result in significant loss of life or casualties - taking into account significant economic or social impacts'*[9].

Clearly a small scale 200kW battery box, intended to serve adjacent land use only (all of which would in fact be subject to similar or higher levels of flood risk), would not fulfil this definition. It is therefore considered that a battery box development should be assessed as more similar to an electrical junction box for a site and classified as ancillary to the wider land usage.

The surrounding land usage is all residential. Under the development types defined within Annex 3 of NPPF these would be considered as "*less vulnerable"* with respect to flood risk which is allowed within Flood Zone 3a but not Flood Zone 3b.

3.1.2 Flood Zone Classification

PPG Table 1 defines Flood Zones as follows:

- *Zone 1 - Low Probability (Flood Zone 1): Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).*
- *Zone 2 - Medium Probability (Flood Zone 2): Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).*
- *Zone 3a - High Probability (Flood Zone 3a): Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).*
- *Zone 3b - the Functional Floodplain (Flood Zone 3b): his zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:*
    - *land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or*

9 Critical National Infrastructure, National Protective Security Agency, https://www.npsa.gov.uk/critical-national-infrastructure-0

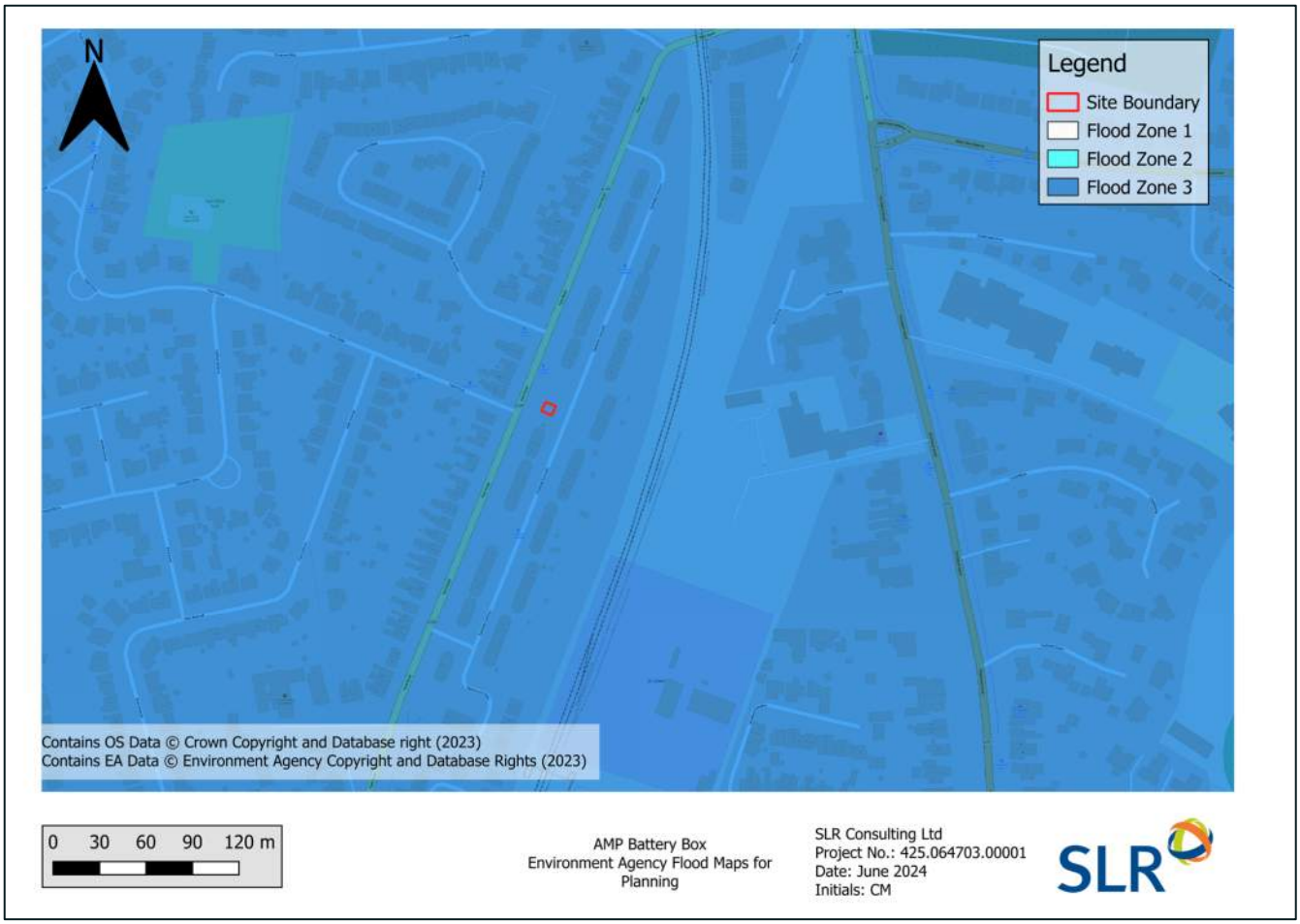
- *land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).*

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

The EA publish mapping[10] showing the Flood Zones across England. In assessing the boundary between Flood Zones 1, 2 and 3, the protection afforded by a flood defence structures, and other local circumstances, is not considered.

Based upon the Flood Map for Planning (Figure 3-1) the site lies within Flood Zone 3. The delineation between Flood Zone 3a and Flood Zone 3b is not shown by the flood Map for planning. This is normally defined within the local Strategic Flood Risk Assessment.

Figure 3-1: Extract of Flood Map for Planning



The Strategic Flood Risk Assessment[11] sets out that within the South Holland District, the functional floodplain (Flood Zone 3b) is restricted to the designated flood storage reservoirs of the Crowland and Cowbit Washes and the Surfleet Reservoir. All other areas of Flood Zone 3 are considered to be Flood Zone 3a.

10 Flood Map for Planning Service: Website https://flood-map-for-planning.service.gov.uk/

11 South East Lincolnshire Strategic Flood Risk Assessment, Southeast Lincolnshire Joint Planning Committee, March 2017, https://www.sholland.gov.uk/media/7937/South-East-Lincolnshire-SFRA-Report-March-2017-including-guidance-on-applying-the-Sequential-Test-for-planning-applications-/pdf/SE_Lincolnshire_SFRA_2017_v6.pdf

On this basis the area of the proposed development is classified as Flood Zone 3a.

3.1.3 Flood Risk Compatibility

As discussed in Section 3.1.2, the site lies wholly within Flood Zone 3a and, as detailed in Section 3.1.1, the development proposals are considered a *'less vulnerable*' development type.

PPG Table 2: Flood risk vulnerability and flood zone 'compatibility' (reproduced as Table 3-1) confirms that, with respect to flood risk, '*less vulnerable*' development types are considered appropriate in Flood Zone 3a.

Table 3-1: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 2)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	x	x	x	✓

Key: ✓ Development is appropriate x Development should not be permitted

3.1.4 Sequential Test

With reference to the NPPF, the Sequential Test gives preference to locating new development in areas that are at lowest risk of flooding.

In paragraph 168 of NPPF the Sequential Test sets out that:

> "*Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding.*"

Paragraph 171 confirms that this process should take into account;

> *"all sources of flood risk and the current and future impacts of climate change".*

Paragraph 174 of NPPF confirms that *"Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59".* The proposed battery box is a minor development[12] which is entirely ancillary to an existing commercial site, and, on that basis, the Sequential Test does not need to be applied. Indeed, the proposals should be treated as a '*small non-residential extension (with a footprint of less than 250m^2)*' to the existing industrial site as defined within Footnote 59 to Paragraph 174.

Irrespective of this we note that suitable available land on which to site a battery box is not easy to find. A suitable site must be within 50m of an existing substation or a large 3 phase low voltage cable to allow for a viable electrical connection. Sites must also have available space and a landowner who is prepared to host a battery box.

12 As defined by the Town and Country Planning (Development Management Procedure) (England) Order 2015

This site has been carefully selected for the following reasons:

- Proximity to local grid.
- Development land available.
- Suitable flat industrial land.
- Near local electricity demand.

Furthermore, while the development proposed is located within an area that is designated a Flood Zone 3a, the extent of Flood Zone 3a great. Given that the proposed battery box is intended to support the immediate land usage, it could not reasonably be located in any areas designated as Flood Zone 1 or 2 as these are all remote from the area of commercial land that this infrastructure would support.

In Section 4.0 this assessment confirms that, given the local flood defences that are present, the risk of flooding at the site is low. In the event of a failure of the flood defence, due to the raised footprint of the proposed site, the residual risk at this site is also lower than much of the surrounding area.

It is therefore concluded that there are no reasonably available alternative locations for the proposed battery box that are subject to a lower level of flood risk, and which could serve the surrounding industrial and commercial areas.

On this basis it is considered that, even if it were to be applied to this application (which as a minor non-residential extension it shouldn't) the Sequential Test would be passed.

3.1.5 Exception Test

The Exception Test, as set out in paragraph 170 of NPPF, states that;

> *"To ass the exception test it should be demonstrated that:*
>
> *(a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
>
> *(b) 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.*
>
> *Both elements of the exception test should be satisfied for development for be allocated or permitted".*

As outlined in the Table 3-1, PPG identifies that '*less vulnerable'* development located within Flood Zone 3a does not need to pass the Exception Test.

Irrespective of this we note that as renewable power generation does not always match demand, the UK requires a more flexible energy system that allows 'excess' renewable electricity to be stored and used later when low carbon sources are unable to generate enough electricity (i.e., when it isn't windy and sunny). ESS's are a major part of the process of achieving this and thereby help prevent the need to turn on fossil fuel generators and allow the UK to maximise the use of renewable power and to facilitate the UK's transition to net-zero.

Whilst the amount of carbon saved each year will vary with changing weather and demand patterns, AMP Clean Energy expect each Battery Box will save 80 tonnes of Carbon each year and 2,400 tonnes of carbon throughout the project Lifecyle. On this basis it is clear that the proposals are highly sustainable and will be an important contributor to helping local land users move towards zero carbon.

Furthermore, as discussed in Section 4.0 this assessment confirms that, given the local flood defences that are present, the risk of flooding at the site is low. The scheme will also be unmanned and will not exacerbate flood risk locally.

On this basis it is considered that, even if it were to be applied to this application (which as a *'less vulnerable'* development type it shouldn't) the Exception Test would be passed.

3.2 Local Planning Policy

The South East Lincolnshire Joint Strategic Planning Committee is comprised of South Holland District Council, Boston Borough Council and Lincolnshire County Council. Together they have produced new Local Plan[13] which was adopted on 8th March 2019. This document provides a framework for development locally for the period from 2011 through to 2036.

As a major issue locally, consideration of flood risk is embedded throughout the plan; however, of key relevance is Policy 4 which is reproduced below.

Policy 4: Approach to Flood Risk

Development proposed within an area at risk of flooding (Flood Zones 2 and 3 of the Environment Agency's flood map or at risk during a breach or overtopping scenario as shown on the flood hazard and depths maps in the Strategic Flood Risk Assessment) will be permitted, where:

1. *It can be demonstrated that there are no other sites available at a lower risk of flooding (i.e. that the sequential test is passed). The sequential test will be based on a Borough or District wide search area of alternative sites within the defined settlement boundaries, unless local circumstances relating to the catchment area for the development justify a reduced search area, i.e. there is a specific need for the development in that location. The sequential test is not required for sites allocated in the Local Plan, minor development[1] or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site).*
2. *It can be demonstrated that essential infrastructure in FZ3a & FZ3b, highly vulnerable development in FZ2 and more vulnerable development in FZ3 provide wider sustainability benefits to the community that outweigh flood risk.*
3. *The application is supported with a site-specific flood risk assessment, covering risk from all sources of flooding including the impacts of climate change and which:*
    a. *demonstrate that the vulnerability of the proposed use is compatible with the flood zone;*
    b. *identify the relevant predicted flood risk (breach/overtopping) level, and mitigation measures that demonstrate how the development will be made safe and that occupants will be protected from flooding from any source;*
    c. *propose appropriate flood resistance and resilience measures (following the guidance outlined in the Strategic Flood Risk Assessment), maximising the use of passive resistance measures (measures that do not require human intervention to be deployed), to ensure the development maintains an appropriate level of safety for its lifetime;*
    d. *include appropriate flood warning and evacuation procedures where necessary (referring to the County's evacuation routes plan), which have been undertaken in consultation with the authority's emergency planning staff;*
    e. *incorporates the use of Sustainable Drainage Systems (SuDS) (unless it is demonstrated that this is not technically feasible) and confirms how these will be maintained/managed for the lifetime of development (surface water connections to the public sewerage network will only be permitted in exceptional circumstances where it is demonstrated that there are no feasible alternatives);*
    f. *demonstrates that the proposal will not increase risk elsewhere and that opportunities through layout, form of development and green infrastructure have been considered as a way of providing flood betterment and reducing flood risk overall;*

13 South East Lincolnshire Local Plan 2011-2036 Adopted March 2019, http://www.southeastlincslocalplan.org/wp-content/uploads/2019/02/Local-Plan-text-March-2019.pdf

g. demonstrates that adequate foul water treatment and disposal already exists or can be provided in time to serve the development;

h. ensures suitable access is safeguarded for the maintenance of water resources, drainage and flood risk management infrastructure.

Development in all flood zones, and development over 1 hectare in size in Flood Zone 1, will need to demonstrate that surface water from the development can be managed and will not increase the risk of flooding to third parties.

Change of use of existing buildings will be supported providing they do not pose an increase in risk to people. Change of use that would result in self-contained ground floor residential accommodation in areas of hazard rating 'danger for some', 'danger for most' and 'danger for all' will not be supported. In these areas unrestricted access to a habitable room above the flood level and an emergency evacuation plan will be required. Caravans, mobile homes and park homes intended for permanent residential use will not be permitted in areas at risk of flooding. Caravan, chalet, log cabin, camping and touring sites at risk of fluvial flooding where there is a 'danger for most' and 'danger for all' will not be permitted. Occupancy of caravan, chalet, log cabin, camping and touring sites at risk of tidal flooding will not be permitted to open between 1st November in any one year and the 14th March in the succeeding year.

No development will be permitted within a 50m buffer from the toe of the raised Witham Haven Banks (flood defences), as shown on the indicative Plan contained in Appendix 10, to allow access for construction and maintenance.

Flood risk management infrastructure shall be provided at the strategic level, where development opportunities allow, to reduce the hazard and probability of flooding.

Where applicable to this development these local policy requirements are all either reflected in the discussion of national policy set out in Section 3.1 or are considered in the assessment of flood risk detailed in Section 4.0.

3.3 Climate Change

In February 2016 the EA issued guidance on the impacts of climate change on flood risk in the UK to support the NPPF. This was most recently updated in May 2022[14]. This advice sets out that peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.

PPG recommends that considerations for future climate change are included in FRA's for proposed developments. Consideration of wave heights and offshore wind speed are only of relevance in areas immediately adjacent to open areas of water. As such the consideration of climate change in this assessment only considers possible changes to peak river flows, sea levels and peak rainfall intensity.

3.3.1 Sea Level Change

Sea Level Allowances, published by the EA for the Anglian Region, are presented in Table 3-2. This shows the estimated annual uplifts to mean sea level which increase over time.

14 Environment Agency, Flood Risk Assessments: Climate Change Allowances, February 2016 (Updated May 2022), https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Table 3-2: Sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Anglian	Higher Central	5.8 (203)	8.7 (261)	11.6 (348)	13.0 (390)	1.20
	Upper end	7.0 (245)	11.3 (339)	15.8 (474)	18.1 (543)	1.60

Taking a base date of 2006[15], the anticipated sea level rise throughout the 30-year anticipated lifetime of development, up until 2054, is 0.33m using the higher central allowance and up to 0.42m using the upper end allowance.

In reality, these uplifts relate to areas of open sea and the site is located on a tidally influenced river system. In such situations best practice is to apply the projected sea level rise at the downstream boundary of a tidal flood model and then use the model to assess how these impacts water levels extending up the tidal reaches. Where available the outputs of such modelling should be used in preference to simply uplift current day estimates of extreme flood levels.

3.3.2 Peak Fluvial Flows

Peak River Flow Allowances, published by the EA for the Welland Management Catchment, are presented in Table 3-3. This shows the anticipated changes to peak fluvial flow rates.

Table 3-3: Peak River Flow Allowances

Management Catchment	Allowance Category	2020s	2050s	2080s
Welland	Central	5%	4%	17%
	Higher	10%	10%	28%
	Upper	22%	26%	53%

Guidance states that for "*less vulnerable*" development located in Flood Zone 3a the "central" allowance should be considered. For the 30-year anticipated lifetime of development, up until 2053, this equates to maximum uplift in peak fluvial flow of 4%.

3.3.3 Peak Rainfall Intensity

Peak Rainfall Intensity Allowances, published by the EA for the Welland Management Catchment, are presented in Table 3-4. This shows the anticipated changes to extreme rainfall intensity or depth.

15 Base data for flood level estimates provided by the Environment agency at Marsh Lane (Appendix 02), East Coast and Wash: Immingham to the West Lighthouse 2018 Coastal Flood Boundary Extreme Sea Levels

Table 3-4: Peak Rainfall Intensity Allowance

Management Catchment	Annual Exceedance Rainfall Event	Allowance	2050s	2070s
Welland	3.3%	Upper End	35%	35%
		Central	20%	25%
	1%	Upper End	40%	40%
		Central	20%	25%

Guidance states that flood risk assessments should assess the 'Central' allowance to understand the range of impact for both the 1% and 3.3% annual exceedance events. For the 30-year anticipated lifetime of development, up until 2053, this equates to maximum uplift in rainfall intensity of 20%.

4.0 Potential Sources of Flooding

4.1 Methodology and Best Practice

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)[16], and BS85333[3].

This includes a screening study to identify whether there are any potential sources of flooding at the site and, where warranted further consideration refencing available flood model data.

The following potential sources of flooding are highlight within guidance:

- Flooding from the sea or tidal flooding;
- Flooding from rivers or fluvial flooding;
- Flooding from surface water and overland flow;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources; and
- Flood from infrastructure failure.

The flood risk from each of these potential sources is discussed below.

4.2 Flooding from the Sea or Tidal Flooding

The River Welland (Spalding Channel) is located c.0.77km east of the site. The river is fluvial along the reach nearest to site, with the tidal reach located c.1.54km northwest at the Fulney Lock. EA flood mapping (Figure 3-1) places the site in Flood Zone 3 with the Strategic Flood Risk Assessment confirming that this is not the functional floodplain.

Should flood defences not present, the annual probability of tidal flooding would be greater than 1 in 200 years.

4.2.1 Tidal Defences

Tidal flood defences are present along the tidal reach of the River Welland (i.e. c.1.54km northeast of site). Tidal Defences primarily consist of embankments in fair condition with an effective crest level[17] of 7.11 aOD. Fulney Lock prevents tidal ingress upstream from The Wash.

The EA advise (Appendix 02) that when considered holistically the defences reduce the risk of flooding locally (i.e. not necessarily at the site) to a 1 in 100 chance of occurring in any year (1% AEP). Such flooding would however be remote from the site and would not affect the proposed development. Overtopping of the embankments would likely cause erosion, resulting in flood breaches. The risk posed from a breach of the defences is assessed together in Section 4.8.

The Environment Agency indicates that there are currently no capital projects scheduled to alter the defences. Assets are routinely inspected to ensure defects are identified before resulting in any significant risk to people and property.

16 CIRIA Report C624, Development and flood risk: guidance for the construction industry
17 Environment Agency Asset Management, Asset Information and Maintenance Programme (data.gov.uk)

4.2.2 Tidal Flood Level Data

Tidal flood levels at the River Welland at Marsh Road Sluice (NGR: 525988 324065) have been provided by the EA. These are taken from the 2018 Coastal Flood Boundary Extreme Sea Levels dataset and indicates a current day (2006) 1 in 200 annual probability (0.5% AEP) flood level of 5.98m aOD.

Uplifting this flood elevation by 0.42m (See Section 3.3.1) to account for climate change through to 2053 increases the 1 in 200 annual probability flood level to **6.40m aOD**.

4.2.3 Tidal Risk

The future in channel flood height (6.40m aOD) is significantly lower than the crest of the tidal flood embankments downstream of Fulney Lock (7.11m aOD). As such direct over topping of the tidal defences from the River Welland adjacent to the site is unlikely for the present day or for the future scenario. The risk of defence breach is assessed in Section 4.8.

Tidal flood risk is therefore considered to be **low**.

4.3 Flooding from River or Fluvial Flooding

The Spalding Channel[18] is a fluvial upstream of Fulney Lock. It is located 0.77km southeast from the site and represents the main risk to the area. Beyond Fulney lock, the River Welland is tidally influenced.

As discussed in Section 2.3, Vernatt's Drain is located c.0.98km to the north and is under pumped-flow conditions. It is managed by the Wellings and Deepings IDB and discharges to the River Welland c.6.8km northwest of site.

4.3.1 Fluvial Flood Defences

There are no formal fluvial defences alongside the Spalding Channel adjacent to site, however raised ground is present[17] which is in a fair condition and has an effective crest level of 5.67m aOD.

Considering the significant impact to residents should failure occur; the EA has targeted to maintain fair (or better) condition of defences. It is reported that the defences provide a standard of protection (annual probability) of 1 in 100 years.

4.3.2 Fluvial Risk from The Spalding Channel

During periods of high tide on the River Welland, water from the fluvial section of the river will not be able to discharge from Fulney Lock, resulting in an upstream increase in water level in the fluvial channel (Backwater effect), which may cause localised flooding. However, management of water levels in the event of exceedance is expected to direct flows into less vulnerable areas away from site.

The EA modelled in channel water level (Appendix 02) within Spalding Channel to the south of site for the 1 in 100 annual probability (1.0% AEP) is 4.52m aOD, and for the 1 in 1000 annual probability (0.1% AEP) is 4.55m aOD. This is projected to increase with the addition of climate change (+ 20% on flows) giving a 1 in 100 (1% AEP) and 1 in 1000 annual probability (0.1% AEP) in-channel level of 4.68m aOD.

The EA advises (Appendix 2) that there are currently no fluvial modelled flood extents for the area encompassing site. However, as the extreme modelled flood levels are lower than the crest of the flood defences it can be concluded that the probability of flooding resulting from over topping of fluvial flood defences is **low**.

18 Environment Agency Briefing Note, Fulney Lock (River Welland), 399_13_SD01 Blue one column template (moderngov.co.uk)

4.3.3 Fluvial Risk from Vernatt's Drain

Vernatt's Drain is a pumped system[19] draining water from the Welland Catchment via Pode Hole Pumping Station[20]. It drains the Fens into the River Welland upstream from Spalding 7.10km to the northeast of the site.

As a predominantly pumped system the potential for flooding along Vernatt's Drain is low. Due to the regional topography, in the event of flooding along Vernatt's Drain, floodwater would spread out across the Fens. Since there are extensive areas significantly lower than the site, the floodwater would not reach the site.

Therefore, flood risk from Vernatt's Drain is **very low** and not considered further.

4.4 Flooding from Surface Water or Overland Flow

The site is located on a slightly raised verge adjacent Park Road and while the land immediately to the west is higher than the site, the potential upgradient catchment is small and unlikely to generate significant surface runoff. Furthermore, the development will be slightly raised to avoid any residual overland flow.

The immediate topography slopes eastwards from site towards Parkside Cresent. Excess runoff would likely collect and be managed by highway drainage infrastructure.

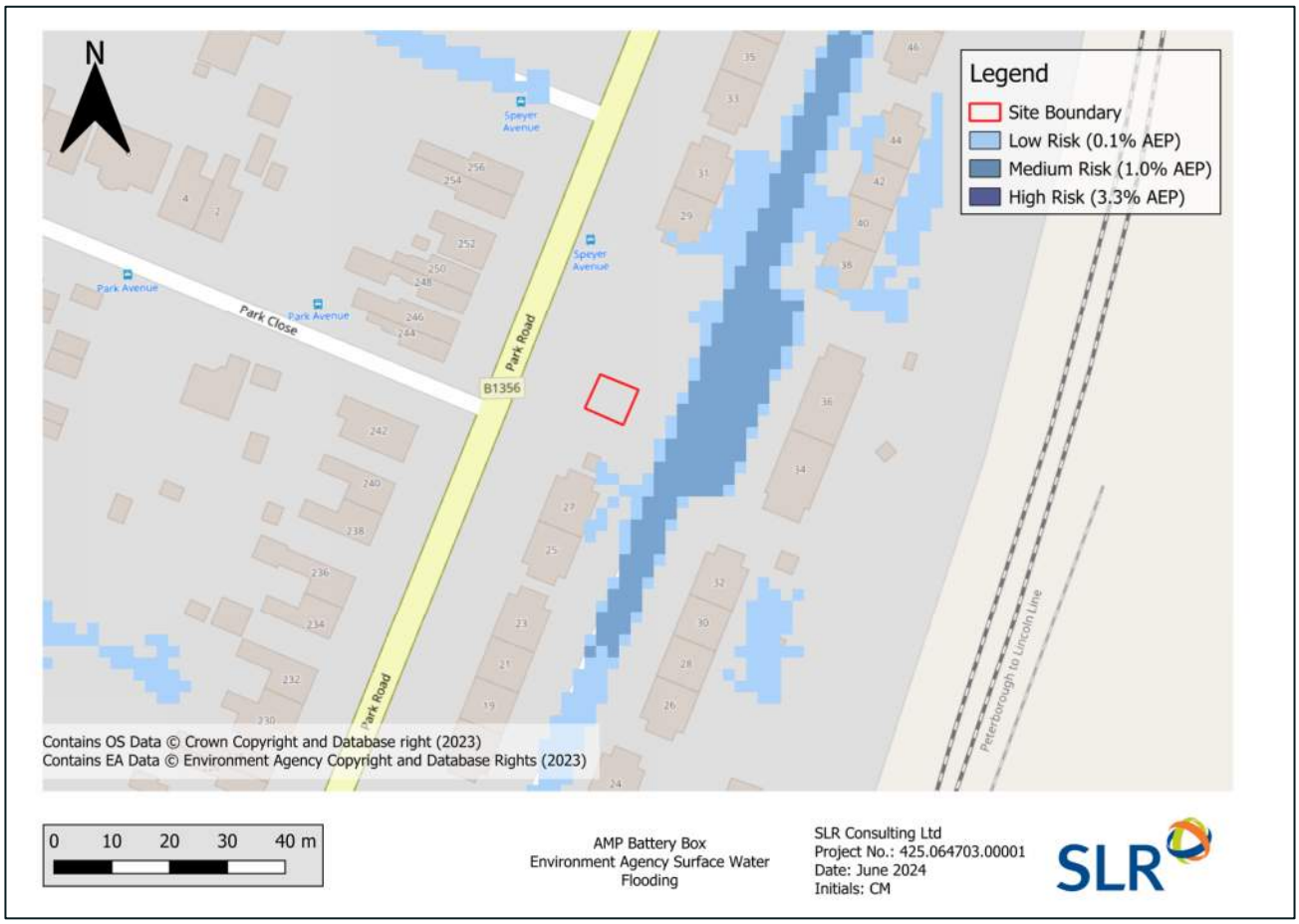
Long Term Flood Risk Information (LTFRI)[21] provided by the EA includes mapping of surface water flood risk. Surface water modelling has been undertaken to establish areas at risk of surface water flooding based upon the latest hydrological techniques and surface terrain data.

An extract of the map for the site and surrounding area is presented in Figure 4-1 where the EA define the surface water flood risk categories as:

- Very Low: less than 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- Low: less than 1 in 100 (1% AEP) but greater than or equal to 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- Medium: between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) chance of flooding in any given year; and
- High: greater than 1 in 30 (3.3% AEP) chance of flooding in any given year.

19 South Holland Heritage, https://www.heritagesouthholland.co.uk/article/nineteenth-century-pinchbeck/
20 South Holland Heritage, Pode Hole, https://www.heritagesouthholland.co.uk/location/pode-hole/
21 Long Term Flood Risk Information Service, https://www.gov.uk/check-long-term-flood-risk

Figure 4-1: Extract of Environment Agency Surface Water Flood Map



The mapping in Figure 4-1 confirms the conceptual understanding and indicates that the entirety of the site is located within an area of very low risk (less than 1 in 1000 annual probability). The modelling indicates a potential for flooding to the east, primarily on Park Road Cresent. However, the mapped flood extent does not however approach the site. On this basis the flood risk from Surface Water and Overland Flows is assessed to be **very low**.

4.5 Flooding from Groundwater

Groundwater flooding can be defined as flooding caused by the emergence of water originating from subsurface strata. Groundwater flooding can occur where sites are located on permeable ground. After a prolonged period of rainfall and groundwater recharge, a considerable rise in the water table can results in inundation for extended periods of time.

As discussed in Section 2.4, the site is underlain by bedrock geology of the Oxford Clay Formation which is overlain by superficial drift deposits that are described as Tidal Flat Deposits of clay and silt. Significant ground water flow through these strata is highly unlikely.

On this basis the flood risk posed to the battery box from Groundwater is assessed to be **very low**.

4.6 Flooding from Sewers and Water Mains

Flooding from sewers or water mains inherently poses a risk at any site. The site's location within a residential area indicates that there is a high likelihood of adopted sewerage and mains networks locally. The site as viewed from google street view indicates no sewage or surface water manholes on the grass verge.

In the event of a failure or surcharge along highways, any overland exceedance flow will likely be captured by road, particularly Parkside Cresent and conveyed away from site.

On this basis the flood risk posed to the battery box from Sewers and Water Mains is assessed to be **very low**.

4.7 Flooding from Reservoirs, Canals, and other Artificial Sources

EA mapping[21] indicates that the site does not lie within a flood risk zone due to a breach scenario of any reservoirs. No other artificial sources of flooding have been identified in the vicinity of the site.

On this basis the flood risk posed to the battery box from Reservoirs, Canals, and other Artificial Sources is assessed to be **very low**.

4.8 Flooding from Infrastructure Failure

During an extreme tidal flood event (potentially with some fluvial component) over topping of the flood defences remote from the site is possible. Such over topping would significantly increase the potential for scour and erosion of flood embankments, and this could result in major breaches through which significant quantities of flood water would enter the floodplain.

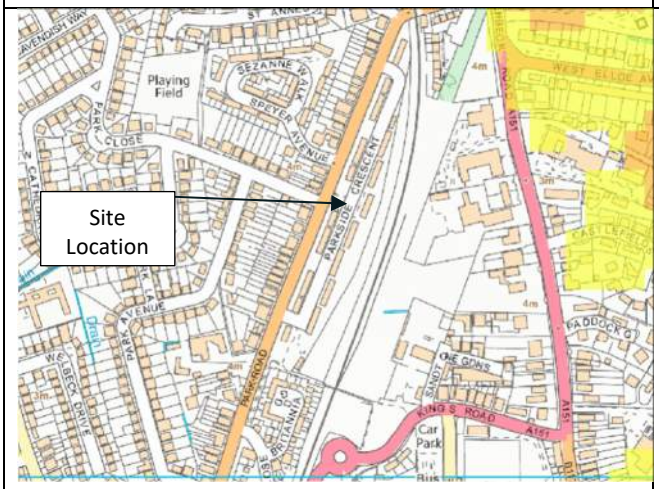
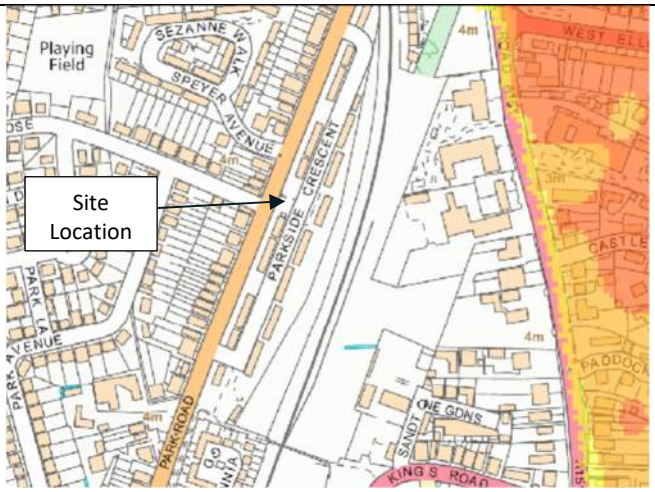
The Strategic Flood Risk Assessment flags this as a major concern locally and extensive modelling has been undertaken with the aim of quantifying this risk. This breach and over topping modelling includes a series of breach locations along the embankments of the River Welland to the east of the site including both the tidal and fluvial (Spalding Channel) reaches.

Excerpts from this modelling are presented in Figure 4-2 below and confirm that the area of the proposed development is not currently within the breach flood outline (current day).

Changes in flood severity associated with climate change will increase risks; however, even with these changes by 2115 (i.e. significantly beyond the project development lifetime) the mapping indicates that the site is not within the breach outline, thus the projected residual flood risk is very low.

On this basis the flood risk posed to the battery box from Infrastructure Failure is assessed to be **very low**.

Figure 4-2: Extract of SFRA Residual Risk Mapping

Residual Peak Depth, Spalding – Present Day, 1% Fluvial / 0.5% Tidal event probability	Residual Peak Depth, Spalding – Year 2115, 1% Fluvial / 0.5% Tidal event probability
	
Map Legend **Peak Depth** 0m - 0.25m 0.25m - 0.5m 0.5m - 1m 1m - 2m 2m + Functional Floodplain South Holland District Boundary	**NOTES** 1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defence 2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update. 3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas 4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences. 5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood. 6. Land outside South Holland District is not considered. 7. This map shows the extents only of the flooding probability bands relevant to the map Title

4.9 Summary

A summary of potential sources of flooding and the flood risk arising from them is presented in Table 4-1.

Table 4-1: Potential Risk Posed by Flooding Sources

Potential Source	Flood Risk at Site
Sea or Tidal Flooding	low
Rivers or Fluvial Flooding	low
Surface Water and Overland Flow	Very low
Groundwater	Very low
Sewers and Water Mains	Very low
Reservoirs, Canals and other Artificial Sources	Very low
Infrastructure Failure	Very low

5.0 Conclusion

SLR Consulting Limited has been appointed on behalf of AMP Energy Services Ltd to prepare this Flood Risk Assessment (FRA) in support of a planning application for a 200kW (800kWhr) Energy Storage System (ESS) ('Battery Box') ("the proposed development").

The proposed development will be located at Parkside Cresent, Spalding, Lincolnshire, PE11 1QT ("the site"). The flood risk posed to this development has been assessed in line with BS8533 and national policy and guidance and taking into account Policy 4 of South-East Lincolnshire Local Plan.

The assessment has concluded that:

1. The site is located in Flood Zone 3a. This indicates that if no flood defences existed the probability of tidal flooding at the site would be greater than 1 in 200 and / or of fluvial flooding would be greater than 1 in 100.
2. As a minor and '*less vulnerable*' development the Sequential Test and the Exception Test do not apply to this scheme. Irrespective of this, even if they were applied, given the context of the site and the nature of the development proposed, these would be passed.
3. The River Welland (referred to locally as Spalding Channel) is fluvial past the site and then becomes tidal downstream of Fulney Lock (c1.54km downstream). Raised embankments along the tidal section of the channel and raised ground along the fluvial sections provide a high standard of protection. As such flooding at the site as a result of over topping of the defence is unlikely.
4. Water flowing over embankments remote from the site could cause erosion and scouring of the flood defences, resulting in flood breaches. This would exacerbate flooding and result in impacts across a larger area. Modelling of this residual risk indicates that the area of the proposed development is not at risk and that changes in flood severity associated with climate change will not alter this.
5. A review of other potential flood sources, including surface water, sewer, groundwater, and reservoir has confirmed that the flood risk from these is all low to very low.

The technical assessment of risk presented within this flood assessment demonstrates that the flood risks present at the site are mostly low and that development on the site will be 'safe' in flood risk terms throughout its lifetime without increasing flood risk elsewhere.

APPENDIX 01: PROPOSED SITE LAYOUT





Key: = POS | --- Freehold Border | --- Battery Box Compound
Site Name: Parkside Box
Site Address: Parkside Crescent, Spalding, PE11 1QT

Grid Reference: TF 24486 23345
What3Words: spoons.helpfully.bulge

BATTERY BOX
LEADING THE CHARGE

APPENDIX 02: ENVIRONMENT AGENCY DATA RESPONSE

Zainab Jarmajo
zjarmajo@slrconsulting.com

Our ref: CCN-2024-346620
Date: 15/02/2024

Dear Zainab,

Provision of Flood Risk Information for Parkside Crescent and Albion Street, Spalding.

Thank you for your request for our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Please read the letter in full as the information covered has been updated in **June 2023.**

1. Flood Map for Planning

The attached map includes the current Flood Map for Planning for your area. The map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map for Planning also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map for Planning only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Recorded Flood Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

Please note, our Recorded Flood Outlines do not reflect the latest (October 2023-present) flood incidents. Due to the scale of the events, it will take time to gather the information and verify the extent of the flooding before we are able to provide this information.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

This site is considered to be at risk of flooding from main rivers.

The site may also be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

4.1 Fluvial Defence Information

There are no formal flood defences reducing the risk of flooding to this site.

4.2 Fluvial Modelled Levels and Flows

Available modelled fluvial flood levels and flows for the model nodes shown on the attached map are set out in the data table attached. This data is taken from the model named on the data table, which is the most up-to-date model currently available.

Please note these levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

Our models may not have the most up to date climate change allowances. In time we will update our models for the latest allowances. You should refer to 'Flood risk assessments: climate change allowances' to check if the allowances modelled are appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

4.3 Fluvial Modelled Flood Extents

Our modelled flood extents, which take into account flood defences, do not impact this site.

There may still be a residual risk of fluvial flooding to your site due to the failure of flood management infrastructure such as a breach of a raised flood defence. You may need to undertake further assessment of this residual risk using the data provided.

4.4 Fluvial Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

At present this site is not covered by any Environment Agency hazard mapping.

Detailed Hazard Mapping is available within the 2017 Update of South Holland Strategic Flood Risk Assessment. This can be downloaded via the following link:
http://www.southeastlincslocalplan.org/water/

5. Tidal Flood Risk Information

This site is not considered to be at risk from tidal flooding.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at LNplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. The Flood Map for Surface Water can be viewed at https://www.gov.uk/check-long-term-flood-risk

Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Christopher using the email address below and quoting our CCN reference number above.

Yours sincerely,

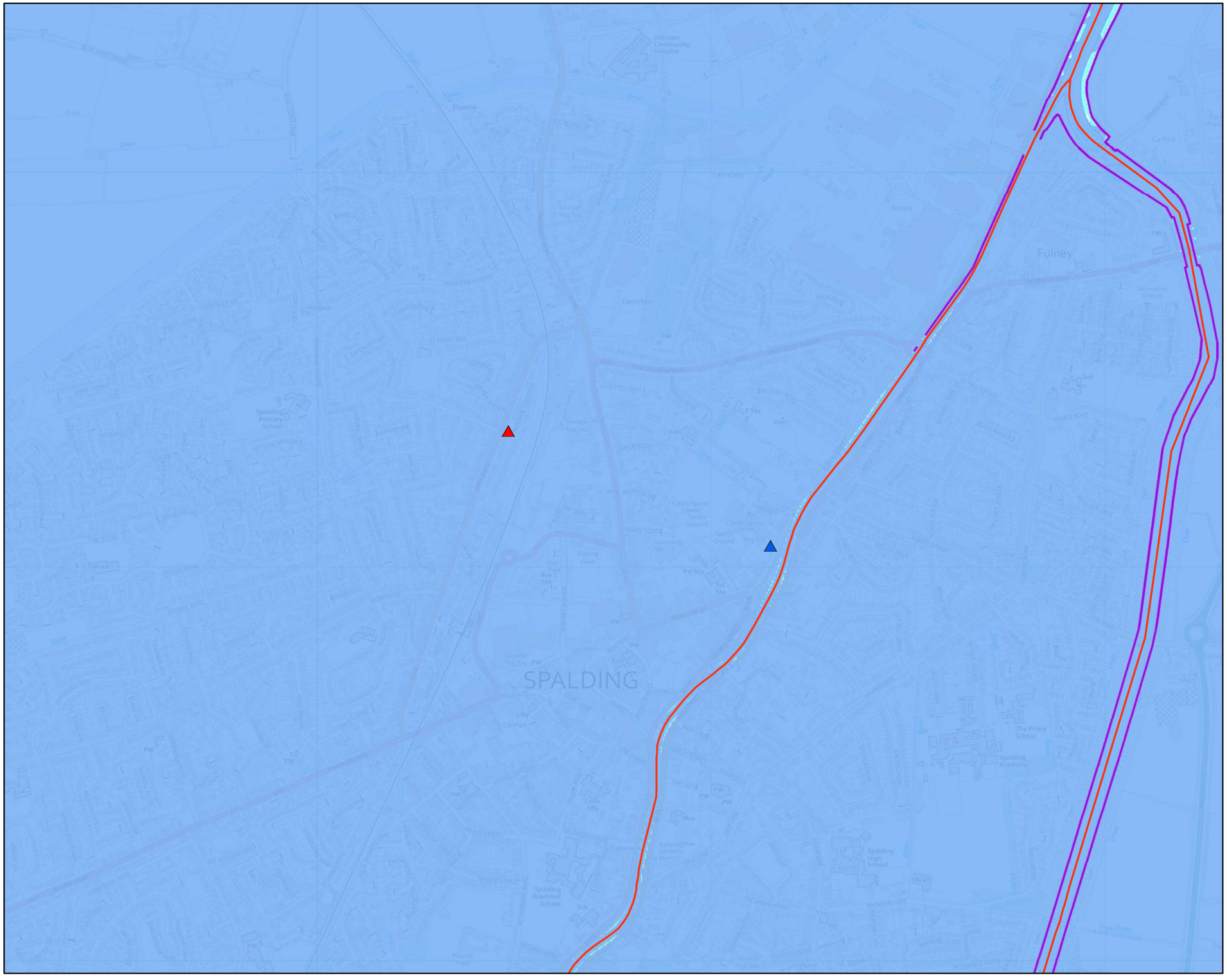


+44 7385226602

for Ben Thornely
Area Flood and Coastal Risk Manager
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map for Planning
Modelled Node Points Map
Modelled Fluvial Levels and Flows Data Sheet

Flood Map centred on TF 24759 23199 - created February 2024 [Ref: CCN-2024-346620]



Environment Agency

Scale 1:10,000

N

Legend

- CCN-2024-346620
- CCN-2024-346630
- Main Rivers
- Raised Defences
- Flood Storage Areas
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

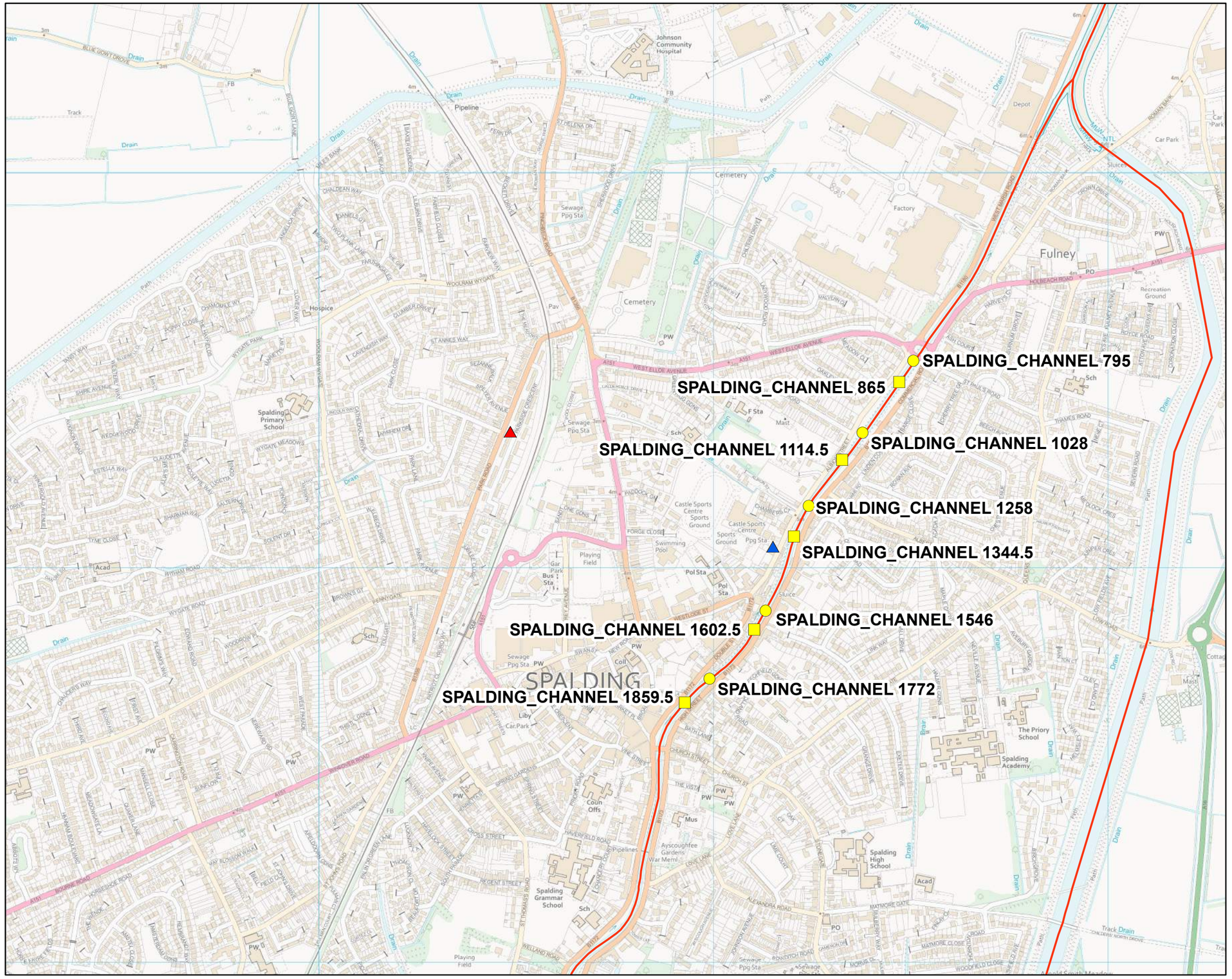
These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

© Environment Agency copyright and/or database rights 2024. © Ordnance Survey Crown copyright and database rights 2024 AC0000807064.

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

Modelled Nodes Map centred on TF 24759 23199 - created February 2024 [Ref: CCN-2024-346620]



Environment Agency

Scale 1:10,000

N

Legend

- Modelled Nodes - Flows
- Modelled Nodes - Levels
- CCN-2024-346620
- CCN-2024-346630
- Main Rivers

Created by the Partnerships and Strategic Overview Team, Kettering

© Environment Agency copyright and/or database rights 2024. © Ordnance Survey Crown copyright and database rights 2024 AC0000807064.

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

Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

			Annual Exceedance Probability - Maximum Water Levels (mODN)											
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**3.33% (1in 30)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SPALDING_CHANNEL 795	525507	323524	3.70	4.00	4.17	4.45	4.50	4.51	4.52	4.52	4.68	4.53	4.55	4.68
SPALDING_CHANNEL 1028	525379	323342	3.70	3.99	4.17	4.45	4.50	4.51	4.52	4.52	4.68	4.53	4.55	4.68
SPALDING_CHANNEL 1258	525242	323157	3.70	3.99	4.17	4.45	4.50	4.51	4.52	4.52	4.67	4.53	4.55	4.68
SPALDING_CHANNEL 1546	525133	322892	3.70	3.98	4.17	4.44	4.49	4.51	4.52	4.52	4.67	4.53	4.55	4.67
SPALDING_CHANNEL 1772	524991	322719	3.69	3.98	4.17	4.44	4.49	4.51	4.51	4.51	4.67	4.53	4.55	4.67

Fluvial Flood Flows (m^3/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m^3/s).

			Annual Exceedance Probability - Maximum Flows (m^3/s)											
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**3.33% (1in 30)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SPALDING_CHANNEL 865	525471	323470	1.75	2.69	2.48	2.87	2.86	2.70	3.13	3.25	4.56	3.10	2.86	5.02
SPALDING_CHANNEL 1114.5	525327	323272	2.33	3.50	3.38	3.88	3.88	3.66	4.19	4.39	6.03	4.21	3.86	6.40
SPALDING_CHANNEL 1344.5	525204	323079	2.82	4.10	4.17	4.81	4.85	4.57	5.17	5.45	7.39	5.27	4.84	7.57
SPALDING_CHANNEL 1602.5	525104	322844	3.30	4.61	5.03	5.75	5.85	5.51	6.12	6.48	8.63	6.34	5.83	8.54
SPALDING_CHANNEL 1859.5	524928	322659	3.69	4.97	5.86	6.68	6.87	6.45	7.03	7.47	9.83	7.43	6.90	9.44

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
belfast@slrconsulting.com

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
T: +44 (0)141 353 5037

GUILDFORD
T: +44 (0)1483 889800

LONDON
T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER (Denton)
T: +44 (0)161 549 8410

MANCHESTER (Media City)
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14