TRANSPORT AND WORKS ACT 1992
TOWN AND COUNTRY PLANNING ACT 1990
THE TRANSPORT AND WORKS (INQUIRIES PROCEDURE) RULES 2004

THE BOSTON BARRIER ORDER

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STATEMENT OF CASE OF THE APPLICANT
THE ENVIRONMENT AGENCY

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DECEMBER 2016
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INTRODUCTION

1.1 On 23 August 2016 the Environment Agency (the Agency) applied to the Secretary of State for the Environment Food and Rural Affairs to make the Boston Barrier Order (the Order) under the Transport and Works Act 1992 (B/1).

1.2 The application (the TWAO Application) was made in accordance with the procedure prescribed in the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 (the Application Rules) (B/11).

1.3 The Order, if made, will confer upon the Agency the powers necessary to construct and operate a new tidal barrier with a moveable gate across the river Witham (also known in this location as the Haven) in Boston Lincolnshire. The Order would also authorise the construction of a new building to enable operation of the barrier, new flood defence walls on both banks of the Haven, a replacement gate across the entrance to the existing Wet Dock at the Port of Boston and to execute ancillary works, including dredging of the river. The Order would confer powers on the Agency to acquire, compulsorily or by agreement, land and rights in land and to use land for the purposes of the works. It would also confer other powers in connection with the construction, operation and maintenance of the works.

1.4 This document is the Agency’s Statement of Case for the Boston Barrier Scheme (the Scheme). It contains particulars of the case which the Agency proposes to put forward at the public local inquiry into the TWAO Application. This Statement is to be served under Rule 7 of the Transport and Works (Inquiries Procedure) Rules 2004 (the Inquiry Rules) (B/12).

1.5 This Statement of Case includes the following appendices:

   **Appendix 1:** A glossary of abbreviations used in this Statement of Case

   **Appendix 2:** A list of documents to which the Agency intends to refer or put in evidence at the public inquiry, including those documents comprising the TWAO Application as submitted on 23 August 2016

   **Appendix 3:** A list of the locations and times where a copy of, or a copy of the relevant part of, the documents identified in the list of documents at Appendix 2 may be inspected free of charge.

1.6 In this Statement of Case references to documents included in the list in **Appendix 2** have been identified in bold, for instance (B/1).
2 THE APPLICATION

2.1 The TWAO Application and its legislative context

2.1.1 The TWAO Application was made on 23 August 2016 to the Secretary of State for the Environment, Food and Rural Affairs under sections 3(1)(b) and 5 of the Transport and Works Act 1992 (B/1). Section 3(1)(b) authorises the carrying out of works which interfere with rights of navigation in waters within or adjacent to England and Wales, up to the seaward limits of the territorial sea.

2.1.2 The TWAO Application was made in accordance with the requirements of the Application Rules (B/11) and in consequence the application was the subject to publicity and notices as prescribed by those Rules. The proposals for which authority is sought were also the subject of consultation which was carried out by the Agency as described in the Consultation Report (A/5) which formed part of the TWAO Application.

2.1.3 Twenty-four (24) letters of objection, seven (7) letters of representation and three (3) letters of support to the proposed Order have been submitted to the Secretary of State. The issues arising from these representations are discussed in Chapter 13 of this Statement.

2.1.4 On 1 November 2016, the Agency was informed by the Department for Transport (DfT) of the Secretary of State’s intention to hold a public local inquiry into the TWAO Application (the Inquiry) and that 1 November 2016 would be the starting date for the purposes of the Inquiry Rules (B/12).

2.1.5 A statement of matters pursuant to Rules 7(6) of the Inquiry Rules will be served by the Secretary of State in due course.

2.2 The Scope of the Order

2.2.1 The Order is being promoted to authorise the Agency to construct and operate works and to compulsorily acquire land and interests in land for the purposes of delivery a new tidal flood defence barrier in Boston, Lincolnshire.

2.2.2 The principal works comprise:

- a barrier, with a rising sector gate, across the Haven;
- a control building and associated compound;
- a replacement gate across the existing entrance to the Port of Boston’s Wet Dock and works to widen that entrance;
- new flood defence walls on both the left and right banks of the Haven;
- the upgrading of an existing access road with the Port of Boston;
- the diversion of three 11kV electricity cables; and
- the replacement of and extension to an existing grain conveyor.
2.2.3 The draft Order comprises 70 articles, in 7 parts, together with 9 Schedules. Part 1 of the Order contains preliminary provisions including citation, commencement and interpretation provisions. Part 2, together with Schedules 1 and 2, make provision for, and relating to, the construction of works. Part 3 includes provisions relating to tidal works. Part 4 together with Schedules 3 to 5 make provision for, and relating to, the construction of works. Part 5 contains provisions relating to the operation of the works. Part 6 together with Schedules 7 and 8 contain protective provisions for the protection of statutory undertakers. Part 7 contains a number of miscellaneous and general provisions.

2.2.4 The provisions of the Order have been drafted having regard to relevant provisions contained within the model clauses in the Transport and Works (Model Clauses for Railways and Tramways) Order 2006 (the TWAO Model Clauses) (B/14). In some instances, the Order departs from the TWAO Model Clauses and instead contains provisions modelled on provisions contained within other recent Transport and Works Act Orders (TWAOs) including for instance, the provisions of the Ipswich Barrier Order 2012 (B/19), which also authorised the Agency to construct and operate a new tidal flood defence barrier.

2.2.5 The TWAO Application also included an Explanatory Memorandum (A/3) which provides a detailed explanation of the purpose and effect of each article of, and Schedule to, the draft Order.

2.3 The Suite of TWAO Application Documents

2.3.1 The Application Rules specify documents which are required to accompany an application for a TWAO. The Agency’s application comprises the documents required by those Rules (and some in addition to them) as follows:

- Letter of application (A/1);
- Draft Order (A/2);
- Explanatory Memorandum (A/3);
- Concise Statement of Aims (A/4);
- Consultation Report summarising the consultations undertaken (A/5);
- Declaration of Status of the applicant (A/6);
- List of all the consents, permissions or licences required under other enactments for the purposes of the powers sought in the application (A/7);
- Estimate of Cost of carrying out the works provided for in the Order (A/8);
- Funding Statement setting out the Agency’s proposals for funding the cost of implementing the Order (A/9);
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- Request for direction under section 90(2A) of the Town and Country Planning Act 1990 for deemed planning permission accompanied by proposed planning conditions (A/10);
- EIA Scoping Opinion (A/11);
- Planning Statement (A/12);
- Design and Access Statement (A/13);
- Order Plans (including Works Plans and Sections, Land Plans and a Public Rights of Way Plan) (A/14);
- Book of Reference (A/15);
- Planning Direction Drawings (A/16);
- Environmental Statement (Volumes 1 and 2 and a Non-Technical Summary) (A/17); and
- Order Plans and Planning Direction Drawings (A/18).

2.4 The requirement for deemed planning permission and its scope

2.4.1 Rule 10(6) of the Application Rules provides for an application to be made for a direction granting planning permission for works and the use of land pursuant to section 90(2A) of the Town and Country Planning Act 1990 (B/2).

2.4.2 Some of the proposed works contained within the Order do or may constitute development requiring planning permission under section 57(1) of the Town and Country Planning Act 1990. The Agency has sought a direction in this case with conditions subject to which it is proposed that the direction should be made. The direction sought is for deemed planning permission to be granted for the works with the details of some matters being reserved for subsequent approval by the local planning authority, Boston Borough Council (BBC).

2.4.3 A set of planning direction drawings (A/16) showing the works for which a direction of deemed planning permission is sought accompanied the TWAO Application as required by Rule 10(6)(d) of the Application Rules.

2.4.4 The request is accompanied by a statement of proposed planning conditions (the Planning Conditions). The Planning Conditions were drafted by the Agency in consultation with BBC.

2.4.5 The proposed conditions relate to:
- the time limit within which the development must commence;
- detailed design approval of certain works by BBC;
- the preparation of:
• a landscaping scheme;
• a lighting scheme;
• a programme of archaeological and building recording works;
• construction mitigation plans;
• a contaminated land scheme; and
• the hours during which construction works may take place.

2.5 **Listed Building Consent**

2.5.1 The Scheme would require works to be undertaken within the vicinity of and adjacent to a Grade II listed structure known as the Maud Foster Sluice. Accordingly, on the date of the TWAO Application, the Agency also applied to BBC for listed building consent pursuant to the Planning (Listed Buildings and Conservation Areas) Act 1990 (B/3).

2.5.2 The documents submitted to BBC comprised the following:

• Listed Building Consent Application Letter (LBC/1);
• Listed Building Consent Application Form (LBC/2);
• Listed Building Consent Application Plans (LBC/3);
• Listed Building Consent Conditions (LBC/4); and
• Design and Access and Heritage Statement (LBC/5).

2.5.3 It is understood that no letters of objection or representation were received by BBC in relation to the listed building consent application. On 13 September 2016, a BBC planning officer prepared a report on the application for a meeting of the Planning Committee (LBC/6). The report noted that:

> “the proposed works that require the listed building consent will not substantially harm the listed structure or cause harm to the Conservation Area. These works are minor in the context of the Boston Barrier scheme and the proposal appears to have been fully investigated and robustly justified. It is therefore considered that this proposal should be supported and this resolution is referred to the Minister who will make the final decision on the application.”

2.5.4 As the listed building consent application is required as a consequence of the works proposed within a TWAO, BBC has, in accordance with section 12(3A) of the Planning (Listed Buildings and Conservation Areas) Act 1990, automatically referred the application to the Secretary of State for Communities and Local Government. The report recommended that the Committee “make a resolution to support this application in preparation for the proposal to be referred to the Secretary of State for a final decision”.
2.5.5 On 13 September 2016, the Planning Committee resolved that the application for listed building consent be supported as recommended by the planning officer’s report (LBC/7).

2.6 Works within the Marine Environment

2.6.1 In accordance with advice received from the Department for Environment, Food and Rural Affairs (DEFRA), the Agency intends to apply separately to the Marine Management Organisation (MMO) for a Marine Licence under the Marine and Coastal Access Act 2009 (B/4) for works in the marine environment.
3 BACKGROUND

3.1 The Agency

3.1.1 The Agency is the applicant for the Order. The Agency is a non-departmental public body sponsored by DEFRA and established in 1996, pursuant to the Environment Act 1995 (B/10), to protect and improve the environment.

3.1.2 On its establishment the Agency assumed responsibility, amongst other things, for the roles and responsibilities previously undertaken by the National Rivers Authority. Within England, the Agency is responsible for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea and has responsibility for issuing flood warnings. Aside from its flood and coastal risk management responsibilities, it is also responsible for:

- regulating major industry and waste;
- treatment of contaminated land;
- water quality and resources;
- fisheries;
- inland river, estuary and harbour navigations; and
- conservation and ecology.

3.1.3 The Water Resources Act 1991 (B/20) seeks to regulate water resources, water quality and pollution and flood defence. In particular, section 165 of the Water Resources Act 1991 authorises the Agency to carry out ‘flood risk management work’ if:

- the Agency considers the work to be desirable, having regard to the national flood and coastal erosion risk management strategies; and
- the purpose of the work is to manage a flood risk from the sea or a main river.

3.1.4 Further information regarding national flood and coastal erosion risk management strategies is provided in Chapter 6 of this Statement.

3.2 Historic Background

Development of the Boston Combined Strategy

3.2.1 In fulfilment of its statutory duty to manage the risk of flooding, the Agency developed a draft flood risk management strategy for Boston between 2004 and 2005. This strategy identified that the most effective approach to reducing tidal flood risk in Boston would be through the construction of a tidal flood barrier in the Haven with improvements to existing flood defences downstream of the new barrier.
3.2.2 During the same time period the Agency also produced a feasibility study to identify how to improve recreational boating opportunities, and more particularly how the Fens Waterways Link (FWL) could be implemented in and around the town of Boston. The FWL plans to create a number of new circular routes for boating and recreation increasing opportunities for tourism and regeneration. The FWL would link 240km of contiguous waterway (including 80km of new waterway with increased access to 160km), connecting the rivers Witham, Glen, Welland, Nene and Great Ouse. The feasibility study identified that a navigable link could be developed between the River Witham and the South Forty Foot Drain by the construction of a barrage/barrier in the Haven to create periods when the tidal river would be held at a static level for a significant time over part of the tidal cycle.

3.2.3 As the results of both studies identified the introduction of a barrier in the Haven, the Agency considered whether the objectives of both studies could be combined into a single high level plan. This led to the development of the Boston Combined Strategy (BCS) (C/3/4).

3.2.4 Work first started on the development of the BCS in September 2005, with public consultation undertaken on the strategy and the associated environmental report in April 2006. The BCS was then formally submitted to DEFRA for approval in September 2007.

3.2.5 DEFRA delegated the power to approve the BCS to the Agency in March 2008 and the strategy was approved by the Agency in the same month. The BCS comprises five phases of work to address flood risk problems and achieve navigational aims within Boston as follows:

- **Phase 1**: a new navigation link between the Haven and South Forty Foot Drain at Black Sluice;
- **Phase 2**: Refurbishment of the Haven river walls upstream of the proposed barrier;
- **Phase 3**: the provision of a new multi-functional barrier;
- **Phase 4**: waterways facility improvements; and
- **Phase 5**: raising of the embankment downstream of the proposed barrier.

3.2.6 Phase 3 of the BCS proposed the provision of a multi-functional barrier within the Haven to:

- provide protection to the town of Boston from tidal surge flooding events with a 1 in 300 (0.33%) chance each year, allowing for climate change over the next 100 years, and
- control tidal levels in the Haven upstream of the barrier, making inland navigation safer and more attractive.
3.2.7 As is explained in Chapter 7 of this Statement, the BCS did not identify a preferred location for the proposed barrier although it did identify that it should lie within a zone defined as follows:

- Upper extent between the Swing Bridge and Black Sluice outfall; and
- Lower extent opposite St Nicholas Church at Skirbeck (downstream of Maud Foster Sluice).

3.2.8 Phase 1 works were completed in March 2009 and Phase 2 works were completed in the spring of 2014.

Boston Barrier Project Board

3.2.9 In 2009, a Project Board was established to facilitate the BCS and, since 2013, the Scheme. The Project Board meets on a monthly basis and includes members from the following organisations:

- the Agency;
- BBC;
- Lincolnshire County Council (LCC); and
- Black Sluice Internal Drainage Board.

3.2.10 The Project Board provides direction as regards the Scheme in relation to planning, technical matters, risk and change.

Water Level Management

3.2.11 As already stated, the BCS proposed that a barrier be utilised to control tidal levels in the Haven (a proposed use of the barrier known as water level management (WLM)). Accordingly, the Scheme was initially conceived in a form which would enable the barrier to be employed for both flood risk management and WLM purposes.

3.2.12 However, in February 2015, the Executive Committee of LCC determined to defer funding waterway elements of Phase 3 of the BCS. Although by this stage the Agency had developed a clear proposal in terms of an appropriate means of delivering WLM, LCC Executive wished to further examine all possible opportunities to ensure the delivery of wider infrastructure improvements which would bring economic benefits to Boston. In view of the urgent need to deliver improved flood risk management, particularly in light of a major flood event which occurred in Boston in December 2013, the Project Board decided to progress the Scheme to provide flood risk management. As a result the scope and the objectives of the Scheme (as previously set down within the BCS) were updated to reflect this decision. The Scheme does not include WLM but has been designed to facilitate WLM in the future.

3.2.13 Whilst delivery of the waterways objective was removed from the scope of the Scheme it remains a strategic objective of the Agency and its project partners
(including LCC and BBC) to deliver the waterway elements of the BCS in the medium to long term. The Agency has sought to develop the Scheme so as not to preclude the future delivery of the shared strategic objective to utilise the proposed barrier for WLM purposes in the future.

3.3 **Scheme Objectives**

3.3.1 As the aim of the Scheme is to provide improved protection from flood risk management in Boston, the Scheme’s revised objectives are as follows:

- **Flood Risk Management**: to reduce the risk to people and the developed and natural environment from flooding
- **Economics**: to further amenity, social and economic opportunities
- **Environment**: to minimise the adverse impacts on the natural and built environment of the area and to maximise opportunities for environmental enhancement
4 SCHEME NEED

4.1 Flood Risk in Boston

4.1.1 Boston is a market town in Lincolnshire within the River Witham catchment on the tidal reach of The Haven. Boston town is on the edge of The Wash in the low lying fens, much of which is below mean high water spring tide levels. The tidal river presents a flood risk to Boston, particularly during tidal surges.

4.1.2 Parts of the town date back to the Norman Conquest and the town has slowly grown through the centuries. Boston borough has a population of around 65,000 while the town itself has a population approaching 40,000.

4.1.3 The town of Boston is entirely located within the floodplain and many parts of the town have issues of social deprivation and low wages. The wards of Witham, Central and Skirbeck are ranked within the top 20% of the most deprived wards in England based on the Index of Multiple Deprivation. These parts of Boston suffer from considerable deprivation and poverty, with a low skilled workforce and one of the lowest average weekly wages in England.

4.1.4 The town is in need of new investment and regeneration to help meet these economic challenges. The current risk of flooding in Boston is constraining regeneration, business investment and confidence. Reducing the flood risk through delivery of the Boston Barrier scheme is seen by BBC as vital to secure the sustainable future of the town as a sub-regional centre and as an agricultural heartland that contributes significantly to the nation’s food security.

4.1.5 To do nothing would have major negative impacts upon the entire population due to the potential flood damage and risk to life along with the stress and health related impacts of living at risk of flooding.

4.1.6 Figure 1 (see Appendix 4 to this Statement) shows the tidal part of the River Witham between Boston and the Wash. This part of the river is known locally as the Haven. Flood banks line the Haven and in the town the flood banks are replaced by flood walls and other hard defences.

4.1.7 Boston already relies significantly on tidal flood defences and the town is at risk from overtopping of existing defences and the breaching of those defences. The flood banks along the Haven have a crest level around 6.3 m ODN. Further downstream towards the Wash the crest level of the flood banks rises to 6.6m ODN.

4.1.8 Currently within the town of Boston the following is witnessed as the water level rises:

- +5.1m: Seepage occurs through flood walls and property walls
- +5.3m: Flood warning issued
- +5.6m: Severe flood warning issued. Need for evacuation discussed with professional partners.
- +5.6m: Localised over-topping and high risk of breach
4.2 Boston and the National Flood Risk Assessment

4.2.1 The Agency undertakes National Flood Risk Assessments to inform its long term investment strategy. The Agency first published Flooding in England: A National Assessment of Flood Risk (the National Flood Risk Assessment) (C/1/6) in 2006 and it was last updated in 2015.

4.2.2 The National Flood Risk Assessment highlighted the local authority areas where there was the greatest flood risk. Boston borough was identified as having a higher number of properties at significant risk of flooding than any other local authority area in England and Wales.

4.2.3 The Boston area has 36% more properties within the floodplain that lie in areas with a significant chance of flooding than the next highest local area. 57% of properties in Boston – over 16,000 – are located in these areas. The average in England and Wales is 2%. 77% of properties in the local area are in locations with a moderate or significant chance of flooding – the average is 4%.

4.2.4 46% per cent of the land area in Boston has a significant likelihood of flooding. The Boston area also has the highest percentage of land – 70% – at moderate or significant chance of flooding. The average in England and Wales is 8%. Boston is one of four local areas with over 16,000 properties – around 35,000 people – located in areas with a moderate or significant chance of flooding.

4.2.5 The National Flood Risk Assessment also identified that the major flood risk in the town is from tidal surges propagating up The Haven from The Wash. The consequence of flooding from other sources, including fluvial and surface water, was identified as low.

4.2.6 BBC completed a Strategic Flood Risk Assessment (SFRA) in October 2010 (C/3/3). The SFRA provided an overview of all sources of flooding in Boston and identified flood risk zones. The majority of Boston is in Flood Zone 3 with a varying level of flood risk. Flood Zone 3 is dominated by tidal flood risk from the Haven and is identified as at medium or high flood risk.

4.2.7 The SFRA also identified that if a breach in the defences occurred the surrounding land would be in the “Danger to All” or “Danger to Most” category due to deep water and high velocity flows.

4.2.8 In January 2012 the Association of British Insurers (ABI) undertook an analysis of flood risk in the UK to highlight the areas with the most homes at significant flood risk (this was defined as a greater than one in 75 chance of flood in any given year). Analysis placed Boston as equal top of the list of areas with most homes at significant flood risk – 7,550 homes. The ABI stated that these homes faced problems in getting insurance after June 2013, when an agreement between the Government and the ABI was due to come to an end.

4.2.9 Due to the poor condition of the existing defences, current flood warning practice is to issue a severe flood warning and consider evacuation of Boston for a 1 in 40 (2.5%) tidal event.
4.3 Flood events in Boston

4.3.1 Boston has a long history of flooding, most notably in 1810, 1953, 1978 and 2013. In January 1978 there was flooding in Boston due to overtopping and breaching of defences. Flooding was extensive with around 250 properties flooded and in some instances streets were flooded to a metre deep.

Surge Tide in Boston 5 December 2013

4.3.2 The tidal surge on 5 December 2013 was caused by extreme weather conditions, when high spring tides combined with strong winds and low pressure caused the sea to rise and large waves damaged and overtopped flood defences. Overall water levels were 1.6 metres higher than what would normally be expected. The tidal surge was the most serious in 60 years and severe flood warnings were issued over 18,000 times.

4.3.3 On the east coast of England the timing of a high tide in combination with a storm surge is particularly important (see Figure 2 in Appendix 4 to this Statement).

4.3.4 The extent of the flooding in Boston on 5 December 2013 is shown in Figure 3 and Photograph 1 (see Appendix 4) illustrates the damage that can be caused.

4.3.5 Over 800 properties were flooded across 55 streets in Boston. However a much greater number of people were affected by the flood as roads, railways and other infrastructure were flooded. Hundreds of people were evacuated from their homes and some were still living in temporary accommodation a year later.

4.3.6 In the aftermath of flooding, the physical and psychological health and wellbeing of affected individuals and communities can become severely diminished, with symptoms of stress, mental illness and risk of chronic disease being exacerbated for many years after flooding occurs. Financial expenditure incurred from coping with the negative aftermaths of flooding is also substantial, with current estimates suggesting this figure is around £1 billion per annum in the UK.

4.3.7 Other properties affected by flooding included Boston College, Boston Grammar School, Leisure Centre, Bus Station and Black Sluice Pumping Station. Roughly £1m of damage was caused to St Botolph’s church, with extensive repairs needed to the heating system, electrics and pews, as well as its cafe and shop. In some cases local residents’ mental and physical health was put at risk. All emergency services were involved during the event and recovery. Millions of pounds worth of damage was caused as a result of the December 2013 event.

4.3.8 Receptors vulnerable to future flooding in Boston include electricity sub stations, pumping stations, filling stations, sewage pumping stations, water distribution station, primary schools, secondary schools, ambulance stations, hospitals, nurseries, nursing homes, and telecom masts. A flood event can give rise to need for a mass evacuation or, depending on the time available, a focused evacuation of the most vulnerable members of the community.

4.3.9 Boston is a high priority area for the Agency’s national long term strategy and had the proposed barrier been in place in December 2013 it would have protected the
town from flooding. There is therefore an imperative need to deliver the barrier as soon as possible.

4.4 Scheme Benefits

4.4.1 The Scheme, which was expressly identified as a key East Midlands investment within the Chancellor’s 2014 Autumn Statement\(^1\), will improve the standard of protection in Boston from tidal flooding. The Scheme would offer protection against an ‘extreme’ tidal flood event – considered to be an event with a 1 in 300 (0.33%) chance of happening in one year over a 100 year time period including allowance for climate change.

4.4.2 Without intervention the existing tidal flood defences have a high probability of breach in the next ten years. A breach would be followed by a rapid inundation of the low lying land behind. There is considerable risk to life from breaches of these defences. By 2110 the consequences of failure in a do nothing scenario would result in:

- permanent loss of 17,241 residential and commercial properties within Boston due to regular tidal flooding;
- increased risk of loss of life from remaining properties at significant flood risk;
- permanent loss and damage to cultural heritage assets including the Conservation Areas and Listed Buildings in Boston town centre;
- inundation and damage of the A16 main trunk road;
- permanent change to or impacts on freshwater ecological features due to regular sea water intrusion; and
- permanent (or temporary) closure during surge events of the railway line from Boston to Skegness.

4.4.3 The benefits of the Scheme therefore include:

- a reduction in flood risk from ‘significant’ to ‘low’ to 13,734 residential properties;
- a reduction in flood risk to nearly 700 commercial properties; and
- deliver present value benefits\(^2\) of £1,116m (October 2015 cost base).

\(^1\) See Chart 1.11 of the 2014 Autumn Statement.

\(^2\) The present value benefits of the Scheme have been developed in line with the approach set out in The Green Book, Appraisal and Evaluation in Central Government HMT (2003 – as updated in 2011) (C/1/7), DEFRA’s Policy Statement on Appraisal of Flood and Coastal Erosion Risk Management (2009) (C/1/3) and in accordance with current Agency flood and coastal erosion risk management appraisal guidance.
5 SCHEME DESCRIPTION

5.1 Overview

5.1.1 The Scheme involves the construction of a new tidal barrier to the south of central Boston, Lincolnshire. The tidal barrier would be constructed within the Haven, largely between Black Sluice and Maud Foster Sluice (please see the location plan provided at Figure 4 in Appendix 4 to this Statement). The works would take place within this section of the Haven as well as along the left bank to the Maud Foster Sluice and towards the Western Power Distribution (WPD) substation on the right bank.

5.1.2 The total area within which works would be undertaken (including land and water) is approximately 34ha.

5.2 Scheme Components

5.2.1 A brief description of the main components of the Scheme is provided below.

Barrier structure

5.2.2 The proposed barrier is the main aspect of the Scheme and comprises Work No.1 within the scheduled works described in Schedule 1 to the Order. It comprises a U-shaped structure which provides a 25m navigable channel. It is 35m in length, with a gate approximately 10.5m high, measured from the river bed. The top of the gate structure in its raised position would be approximately 5m above mean high water.

5.2.3 The gate would be raised during ‘extreme’ tidal conditions when tidal levels are expected to exceed a level of 5.30m above ordnance data (AOD) in the Wash – the High Astronomical Tide is 4.73m AOD. The forecast trigger level for the barrier to close will be 5.10m AOD. Typically, the tidal gate would lie level with the river bed of the Haven at -3.0m AOD.

5.2.4 The barrier structure would reduce the existing channel width to approximately 25m. The existing channel width varies from approximately 55m wide at mean high water to approximately 34m at low water. Whilst the width at the barrier would be reduced to 25m the whole 25m would be at a depth that is navigable. The position of the barrier would be slightly offset to the right from the centre of the channel to ensure an adequate width is provided for a temporary navigation by-pass channel during the construction period.

5.2.5 Warning signs, automatic signals and lighting for navigation would be installed and used to inform navigation traffic of the presence of the barrier, manage the movement of boats through the narrowed channel and provide advance warning of the gate’s operation.

5.2.6 Foundations would be installed on the left bank to support a mobile crane which would be used to lift the barrier gate into position during construction. These crane
foundations would remain in situ for any future gate removal or maintenance operations.

**Barrier control building**

5.2.7 To meet the Agency’s operational requirements, a two-storey control building with associated parking would be constructed on the left bank, within the Port of Boston estate and close to the tidal Barrier. The site is currently occupied by a buoy repair shed, which would be permanently removed.

5.2.8 The building would be approximately 21m by 7m (147m²) and 6m high and the cladding to the building would be in a colour amenable to the surrounding environment. The control building and associated works comprise Work No.2 within the scheduled works described in Schedule 1 to the Order.

**Wet dock entrance gate and related works**

5.2.9 The Port of Boston’s existing Wet Dock, which is located downstream of the proposed barrier on the left bank of the Haven, provides berths for vessels docking at the Port. A single pair of new sector gates would be installed within the Wet Dock Entrance (WDE) at the location of the existing lock to provide continuity of the line of defence downstream to Maud Foster Sluice. In addition, the width of the WDE channel would be widened from 15.3m to 18m, thereby allowing for broader vessels to access the Wet Dock berths.

5.2.10 The proposed works to widen the existing WDE are required to mitigate the impacts of constructing the Scheme on Port of Boston Limited (PoB), the statutory harbour authority and operator of the Port.

5.2.11 A small control building, with associated parking, would be constructed adjacent to the WDE to control the new gate. The building would be a single storey and would accommodate a plant room and electrical room. These works comprise Work Nos. 3A and 3B within the scheduled works described in Schedule 1 to the Order.

**Right bank flood defences**

5.2.12 A new sheet piled flood wall would be installed along the right bank of the Haven, adjacent to the scour protection. From a point approximately 100m upstream of the barrier structure, the sheet piling would be impact driven directly into the embankment to provide a flood protection level of 7.55m AOD and would continue along to tie in to existing coastal flood banks adjacent to the WPD substation, approximately 470m from the barrier.

5.2.13 The flood protection level would be achieved with the sheet pile extending approximately 1.2m above the crest of the embankment downstream of the barrier. This would result in a 1.2m high wall when viewed from the land side and a visible sheet pile between 2 and 3m in height when viewed from the riverside. These works comprise Work Nos. 5A and 5B within the scheduled works described in Schedule 1 to the Order.
Left bank flood defences

5.2.14 The left bank flood defence has two distinct elements: a flood risk management structure (flood wall) and sheet piling (retaining wall) installed in front of the existing Port quay wall to improve stability of the quayside.

5.2.15 The flood wall is 7.55m AOD and provides protection to 7.12m AOD with a freeboard of 0.43m. The structure ranges in height from 1.5m to 2.4m above final ground level depending on existing topography. The proposed flood wall begins at the proposed barrier and then follows (approximately) the line of the existing quay wall (deviating back to adjacent existing structures to facilitate operations of the Port quay) until it reaches the WDE. It then continues, deviating away from the existing quay wall, until tying into Maud Foster Sluice, approximately 820m from the proposed barrier.

5.2.16 The proposed new flood wall would comprise of two elements: the first is an extended sheet piled wall with concrete capping which would start at the proposed barrier and extend downstream to the end of the existing load relieving platform, and from the downstream limits of the existing load relief platform to approximately the ‘knuckle’ structure within the Port. The second is a reinforced concrete wall, which provides the required flood protection from this point tying into Maud Foster Sluice beyond the WDE. The concrete wall would be set back from the quayside to facilitate access. In addition, a new sheet piled (retaining wall) stabilisation wall would be installed in front of the existing Port quay wall with associated anchorage sheet piling. A section of sheet piled wall with anchorage sheet piling would also be provided along the northern face of the WDE.

5.2.17 Access gates would be installed within the left bank flood wall from the Barrier to the Maud Foster Sluice to allow the passage of PoB road vehicles during normal operation. These manually operated gates would be double leafed, each being 3m to 5m wide (6-10m total gate width). These works comprise Work Nos. 4A and 4B within the scheduled works described in Schedule 1 to the Order.

Dredging

5.2.18 The Agency would carry out capital dredging to facilitate the construction of the Scheme. Approximately 38,300m$^3$ of material to a depth of approximately -3m AOD would be removed across four dredging phases. It is anticipated that in the area of the cofferdam the river bed would be removed to a depth ranging from approximately -8.5m AOD below the barrier gate and approximately -7.0m AOD below the rest of the barrier structure.

5.2.19 The four dredging phases would proceed as follows:

- **Phase 1** would enable berthing facilities to be provided along the left bank (including Berth 21 within the Port), existing Agency mooring pontoon on the right hand bank, create a by-pass channel and install temporary scour protection. Dredging would also occur approximately 1.5km downstream of the proposed location of the barrier to enable construction of temporary mooring facilities for the Witham Sailing Club and recreational river users.
Phase 1 dredging would remove approximately 11,000$\text{m}^3$ of material over a 3 to 4 week period;

- **Phase 2** would involve dredging along the remainder of the left bank quay wall and turning circle prior to the closure of the Wet Dock. It would remove approximately 20,000 $\text{m}^3$ of material over a 6 to 8 week period;

- **Phase 3** dredging would be undertaken to allow installation of permanent scour protection. It would remove approximately 7,000 $\text{m}^3$ of material over a 2 to 3 week period; and

- **Phase 4** would involve dredging to sweep off any remaining built up material near the proposed barrier structure at the end of the construction period. It would remove approximately 300$\text{m}^3$ of material over a 1 to 2 week period.

5.2.20 Dredging of the river channel is required to allow for construction of the Scheme and to ensure that the PoB can utilise the Port riverside quays whilst construction works require the temporary closure of the Wet Dock.

5.2.21 Dredged material is proposed to be reused (where suitable) within the construction works as fill material, or disposed of at a licensed disposal site within Lincolnshire. Disposal of dredged material to sea would not be considered as an option.

**Scour protection works**

5.2.22 Temporary scour protection would be installed on the bed of the by-pass channel adjacent to a temporary cofferdam (within which the Barrier would be constructed) following the first dredging phase. It is anticipated that the placement would be done by barge and two way traffic would change to one way traffic through the bypass channel as a result. It is envisaged the majority of the temporary scour protection would be relocated and reused as permanent scour protection for the proposed barrier after the completion of the barrier works.

**Landscaping**

5.2.23 Landscaping is proposed along the right bank of the Haven to retain its semi-natural character. Materials to be used in the landscape design would be subject to approval by BBC in accordance with the Planning Conditions.

5.2.24 It is proposed that the landscape mitigation would allow for transition between the urban area of the Black Sluice, the proposed barrier and the semi-natural character downstream, towards the WPD site.

5.2.25 The crest of the right bank would be grass seeded and reinforced to allow vehicular movements on top of the river embankment for maintenance purposes and to cater for the needs of pedestrians and persons of restricted mobility. There would be a footpath with seating areas. The retention of the existing grass embankment and introduction of various grasses (that are saline tolerant) to the side of the new flood wall facing the water, would retain the semi-natural character of the right bank.

5.2.26 Permanent new lighting would be installed in the following locations:
The light fixtures proposed are column mounted LED floodlights for control buildings and the access gates within the flood wall, while street lighting columns are proposed for access roads and car parking areas. All columns would be hinged so they can be folded down for maintenance.

5.2.28 The final scale, siting and external appearance of the proposed barrier and WDE control buildings would be subject to approval by BBC pursuant to the proposed Planning Conditions.

5.3 Enabling Works

5.3.1 To deliver the Scheme certain enabling works would need to be undertaken. Details of the main enabling works are summarised below.

Cable Diversions

5.3.2 The Scheme would require the diversion of three existing 11kV electricity cables owned by WPD. The proposal is to divert the cables from their current routeing along the right embankment, to a new southern alignment along Wyberton Low Road for a distance of approximately 200m, before the alignment would revert northwards onto London Road in order to connect into existing services adjacent to Black Sluice.

Witham Sailing Club – temporary relocation

5.3.3 As part of the consultation process, Witham Sailing Club (WSC) raised concerns regarding the ability of its members to navigate safely within the river during the construction of the proposed barrier. The Agency is proposing temporarily to relocate the WSC during construction of the Scheme.

5.3.4 The proposal is for the WSC to be temporarily relocated approximately 1.5km downstream of the proposed barrier location. To achieve this, the Agency proposes to construct:

• a slipway to allow WSC members safe access to the river during construction of the Barrier;
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- a single clubhouse with welfare facilities (anticipated to be a portakabin type structure);
- a safety boat storage container (anticipated to be a portakabin type structure);
- a fenced compound with storage for 4 dinghies; and
- parking facilities.

5.3.5 These temporary facilities would be maintained during construction activities which would restrict the navigation channel, for instance when the cofferdam is in place. The proposal is temporary in nature and the Agency proposes to remove all temporary structures and reinstate the land affected when the WSC returns to its current operating base, which is located upstream of the Grand Sluice.

Alternative moorings

5.3.6 Mooring pontoons are proposed to be provided in two locations. These would be available for recreational users during the construction of the Scheme. One pontoon is proposed to be located adjacent to Black Sluice (upstream of the proposed barrier) and a second is proposed to be located adjacent to the area within which it is proposed to temporarily relocate WSC. These pontoons would be available for use by recreational river users during construction of the Scheme. Dredging will be undertaken at the upstream mooring to ensure that this location would be suitable for use in the manner proposed.

5.3.7 Following completion of the construction of the Scheme, the upstream mooring adjacent to Black Sluice will be maintained.

Boston and District Fishermen’s Association – temporary relocation

5.3.8 In consultation with the local fishing fleet, who are represented by the organisation known as Boston District Fishermen’s Association (BDFA), concerns were raised regarding navigating the temporary works associated with the construction of the Barrier. Subject to agreement with the PoB, which has been provided in principle, the fishing fleet would be provided with an alternative mooring location for the duration of the construction of the Barrier. It is proposed that the Lairage Quay will be available to the fishing fleet for the duration of the construction of the Barrier.

Works to access route within the Port estate

5.3.9 The Agency proposes to undertake upgrading works to existing access roads within the Port, which are proposed to be utilised during construction of the Scheme. Works may be undertaken to provide the required turning circles, safety aids and sight lines for construction traffic.

Wooden quay structure (disused hoist) and grain tower

5.3.10 A disused hoist on the right bank of the Haven would be deconstructed and removed, potentially via barge. The resulting materials would be recycled where possible.
5.3.11 In addition, it would be necessary to dismantle the existing grain tower conveyor which is located on the left bank of the Haven, within the Port. This facility is currently utilised by Frontier Agriculture Limited (Frontier). It is the Agency’s intention to relocate the grain conveyor to a new location approximately 100m downstream and to construct new towers to enable a single aerial conveyor to be installed between Frontier’s operational site and the quayside. Discussions continue with both Frontier and PoB as regards the details concerning the Agency’s proposal to replace the grain conveyor.

Extending loading platform

5.3.12 A load relieving platform is intended to reinforce the quayside to support the additional loading expected to occur while moored boats transfer goods to and from land. During detailed design, the Agency would consider whether to further extend the existing loading platform within the Port estate.

5.4 Scheme Construction

Timing of work

5.4.1 Construction of the Scheme is proposed to commence in late 2017 and to be completed by December 2019. The construction programme assumes a five day working week, with works generally taking place between 07:30 and 18:30 Mondays to Fridays. However, some activities may take place outside these hours as follows:

- capital dredging works;
- constructions works within the WDE would take place on a 24 hours per day, 7 days per week basis, in accordance with the current operational hours within the Port;
- completion of operations commenced which cannot safely be stopped;
- completion of works delayed or held up by severe weather conditions which disrupted or interrupted normal construction activities;
- highway works which the local highway authority requests be undertaken on a Saturday or a Sunday or the usual working hours; and
- works required to be undertaken in the case of an emergency (provided that BBC is notified in writing within 24 hours of such works taking place).

Proposed Construction programme

5.4.2 It is anticipated that there would be 10 weeks of enabling works to divert the 3 11kv cables and to demolish the disused hoist on the right bank, which is anticipated to occur prior to November 2017. Following this between November 2017 and January 2018, the first two phases of dredging would be undertaken.

5.4.3 The establishment of the site would take between 6 and 8 weeks between January 2018 and March 2018. The Wet Dock would be scheduled to close on completion of Phase 2 Dredging, which will be in January 2018. Upon closure of the Wet Dock,
works will take place 24 hour per day 7 days per week until the end of September 2018, at which time the Wet Dock will re-open. Following the completion of the enabling dredging works, installation of the temporary scour protection along the bypass channel will take place between September and October 2018.

5.4.4 Works to the left bank quayside, tying into the Wet Dock and proposed barrier, will begin in October 2018 and are expected to last 13 months, until November 2019. The works to the right bank will take place between April 2018 and December 2019. The placement of the cofferdam will occur between October and December 2018 and the construction of the proposed barrier would follow between January 2019 and July 2019. The Barrier would be operational when the tie-in to left bank works occurs.

5.4.5 Completion of the proposed barrier, removal of temporary works and the final phases of dredging (phases 3 and 4) would be carried out between August and December 2019. Once the works to construct the barrier were completed, the by-pass would be closed and navigation traffic redirected. An indicated construction programme is provided at Table 1 within Appendix 4 to this Statement.

Construction compounds

5.4.6 Three temporary construction compounds would be required to deliver the Scheme.

5.4.7 Two would be located on the left bank within the Port estate and one compound would be on the right bank.

5.4.8 The main left bank compound would be located on the site of the future barrier control building would be approximately 21m by 50m and would contain office and welfare facilities, equipment storage areas, working area and car parking. A satellite compound is also proposed to the north of the WDE adjacent to the northern access route. This compound would principally store and stockpile deliveries from barges. Both compounds would be accessed via St John’s Road, the northern entrance point into the Port.

5.4.9 In addition, on the right bank the Agency currently leases a parcel of land adjacent to Marsh Lane, on part of which the Scheme’s Community Hub is situated. This site would be reconfigured to accommodate a further construction compound site office. The construction compound would be approximately 21m by 25m and would be able to store larger equipment, with access to the barrier structure.

Cofferdam

5.4.10 A cofferdam would be constructed within the river channel in order to create a temporary dry working area for construction of the proposed barrier and to divert flow around the working area via a temporary by-pass channel. The by-pass channel, although narrowed to 18m, would allow for continued navigation through the Haven during the construction phase, although there would likely be some constraints to existing navigation. The cofferdam would be approximately 35m by 35m in size and would require lateral support due to the excavation depth which ranges from approximately -8.50m AOD below the barrier gate to approximately -7.0m AOD beneath the rest of the barrier structure.
5.4.11 Once construction of the proposed barrier had completed, the piles which make up the cofferdam would be cut to the appropriate level and form part of the permanent barrier structure. A second sheet piled cofferdam would be situated adjacent to the Wet Dock ‘knuckle’ area to provide stabilisation during construction activities related to the widening of the WDE. After use, the cofferdam would be connected directly into the new sheet pile wall.

Construction of the proposed barrier

5.4.12 Following the dewatering of the cofferdam and excavation of material to get down to the base formation level, an initial concrete layer would be installed in the base of the cofferdam area to provide a firm and clean working area. The tubular steel foundation piles installed earlier would then be capped off and the concrete base would be poured in one operation, ensuring a monolithic slab. The structure’s walls would be constructed onto the slab: the slab and walls will house the gate. The concrete elements of the stilling basin, such as the baffle piers, would be cast at the same time.

5.4.13 On completion of the concrete structures, mechanical and electrical fixings would be installed before installing the gate. A foundation area would be prepared for the mobile crane from which the barrier gate would be lifted into place; the foundation area would remain as a permanent facility for any future gate removal or maintenance. The barrier gate is proposed to be manufactured off site and could be delivered to site on a barge.

5.4.14 Installation of the barrier gate is anticipated to be followed by a period of dry commissioning and working checks. When this has been completed, the dewatering system would be decommissioned and the area within the cofferdam would be allowed to flood. A period of wet commissioning would then be carried out. On completion of the final checks, the piles that make up the upstream and downstream walls of the cofferdam would be cut down to the same level as the base slab and removed. River traffic would then be allowed through the permanent Barrier structure and the temporary navigation channel at the North side of the cofferdam would be closed.

By-pass channel and scour protection

5.4.15 It is proposed that the temporary by-pass channel would run between the left bank and the cofferdam. The by-pass channel would be approximately 18m wide. The by-pass channel would require temporary scour protection which is envisaged to be grout mattresses, asphalt mats, gabions or concrete (subject to detailed design and the Port’s approval). It would be back filled following the completion of the barrier structure.

Construction of flood walls and retaining walls

5.4.16 The left bank would consist of a sheet piled wall which would be placed along the entire Port quayside, except in the vicinity of the load relieving platform where the new flood wall steps back from the quay frontage, in front of the existing piled frontage in order to effectively stabilise the current quay wall which is in poor condition.
5.4.17 The first half of the left bank, downstream of the proposed location of the Barrier would have a sheet piled wall raised to the 7.55m AOD defence level. For the remainder of the left bank, a 1.5 to 2.4m high concrete flood wall (above ground level) would be set back from the quay edge, within the Port's frontage. The flood wall would follow the line of the existing quay wall for 830m downstream of the proposed barrier before it deviates from it in order to cross the knuckle and tie into the vertical sector gates which span the WDE. From the proposed barrier the right bank anchored sheet pile wall would extend approximately 430m in the downstream direction and 110m long in the upstream direction (toward Black Sluice).

5.4.18 The sheet pile anchorage wall proposed for the right bank anchored wall is similar to that for the left bank although the offset distance is greater due to constraints caused by reduced space and its position in relation to the existing embankment.

Wet Dock Entrance widening and Wet Dock gate

5.4.19 The WDE would be widened by 2.7m across the northern face. Sheet piling, consistent with the left bank flood wall would be installed and embedded to a maximum depth of -9.0m AOD such that the existing northern face can be removed. A coffer dam (Wet Dock cofferdam) would be required to create a dry working area.

Construction of barrier control building and Wet Dock control building

5.4.20 The barrier control building would be completed and operational before the commissioning of the proposed barrier. It is planned that construction would commence by 4th Quarter 2018.

Hard and soft landscaping

5.4.21 Hard and soft Landscaping would be delivered through a landscape scheme which would be subject to the approval of BBC pursuant to the proposed Planning Conditions. Landscaping is proposed along the right bank. It is proposed that the landscape mitigation would allow for transition between the urban character in the area of the Black Sluice and the proposed barrier and the semi-natural character downstream, towards the WPD site.

Flood risk management during construction

5.4.22 During construction, workers would be made aware of the fluvial and tidal flood risk on site and an evacuation plan would be put into place to ensure the safety of workers in the event of a flood event.

Construction waste

5.4.23 The construction of the Scheme would require a substantial amount of movement of construction waste and spoil, a proportion of which may be contaminated. During construction, most of the waste would be generated within the immediate environment; from a range of waste streams and different construction activities.

5.4.24 The Agency has the following aspirational construction waste targets:

- send no more than 20% of construction waste to landfill;
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- at least 80% of aggregates used on Agency construction projects to come from secondary/recycled sources; and
- these targets to be incorporated into future design and build contract for contractors bidding to build the Scheme.

5.4.25 If the material is found to be unsuitable for re-use within the Scheme, for example, as embankment raising or backfilling sheet piling walls, it is proposed that the remainder would be dewatered and disposed of at a licenced landfill site within Lincolnshire.

Construction traffic

5.4.26 It is estimated that the travel requirements of up to 30 staff, plus delivery vans (up to 5 per day), would be the daily trips associated with construction of the Scheme. It is anticipated that approximately 90% of construction materials could be delivered via barge which would avoid significant impacts on the local road network.

5.4.27 River traffic is likely to be reduced to one-way traffic through the by-pass channel due to the reduced channel width (approximately 18m) and to avoid the risk of collisions. To ensure this is suitably carried out, a traffic management system, agreed with the Harbour Authority, would be introduced prior to the installation of the by-pass channel. Appropriate lighting and navigational aids would be installed to aid navigation during periods of poor light and/or night time navigation.

5.4.28 The Boston Public Footpath No.14 (Macmillan Way) would be temporarily closed and an alternative diversion route would be put in place.

Environmental management during construction

5.4.29 Agency guidance stipulates that environmental management best practice must be implemented by all contractors carrying out the construction of its flood risk management schemes.

5.4.30 The Scheme would incorporate best practice in construction design and implementation adhering to all appropriate Agency guidelines, specifications and standards and in accordance with the Construction Design and Management Regulations 2015 (B/16).

5.5 Scheme operation

5.5.1 The Scheme proposes that the barrier would only be operated in the following circumstances:

- tidal flooding events (5.3m AOD or greater with a trigger level of 5.10m AOD);
- operational maintenance (monthly, yearly and 5-yearly);
- to train staff on or to test the barrier operation (this is likely to arise monthly); and
• for construction, maintenance for re-laying of any works in or beside the Haven (for instance the placement of scour protection or works to the barrier itself).

5.5.2 Otherwise, the barrier’s gate would lie flat against the river bed, recessed within the barrier structure.

5.5.3 The gate would take approximately 20 minutes to open and 20 minutes to close fully (that is, lifting it off the river bed to its fully closed position). This would be completed on the rising tide when conditions were appropriate to balance the forecast tidal level against fluvial flow. It is anticipated that during an extreme tide, the barrier is likely to remain closed for eight to nine hours (estimated as the time span between two consecutive low tides and taking into consideration potential extreme tide duration).

5.5.4 The Agency has a risk assessment process determines how many levels of redundancy are required for their assets. In the case of the proposed barrier, three levels of redundancy are proposed for the gate’s power supply and hydraulics which are the key elements required to operate it. The levels of redundancy are provided by the primary source of mains electricity supply and a main hydraulic pump supported by the secondary source of a standby generator and pump, with emergency hydraulic power packs situated adjacent to each side of the gate as a tertiary source. In addition as a last resort the hydraulics could be released such that the gate would be able to lower itself to a significant degree under its own weight. In summary this would make the likelihood of a failure occurring when the barrier is in the closed position very unlikely.
6 POLICY CONTEXT

6.1 Introduction

6.1.1 Flood risk management has been a matter of national priority since major floods hit the UK in summer of 2007. Described by many as the country’s largest peacetime emergency since World War II, following those events a comprehensive review of the lessons to be learned was commissioned by central government. This culminated in the publication of The Floods Review\(^3\) in June 2008.

6.1.2 Sir Michael Pitt’s independent report made a number of recommendations about improved flood risk management. Serious flooding can happen at any time and climate change projections suggest that they will happen more frequently in the future. The Floods Review resulted in the passing of the Flood and Water Management Act 2010 (\(B/9\)). This new legislation provided for better, more comprehensive management of flood risk for people, homes and businesses and for the introduction of new strategies. Reducing the risk of flooding was recognised by Government Ministers as a top priority investment area.

6.1.3 The Scheme is accordingly supported by policy at national, regional and local policy and this chapter of the Statement of Case outlines the policy context considered to be material.

6.2 National Policy Context


6.2.1 The Agency is under a duty, pursuant to section 7 of the Flood and Water Management Act 2010 (\(B/9\)) to develop, maintain, apply and monitor a strategy for flood and coastal risk management in England. Once the strategy has been prepared and approved by the Secretary of State for the Environment, Food and Rural Affairs, it must be laid before Parliament.

6.2.2 Accordingly, in September 2011, DEFRA presented to Parliament the National Flood and Coastal Erosion Risk Management Strategy (the National Strategy) (\(C/1/8\)) which the Agency had prepared. This strategy sets out a national framework for managing the risk of flooding and coastal erosion and aims to ensure that DEFRA, the Agency, local authorities, water companies and other risk management authorities work together, making clear the responsibilities and roles of all the organisations involved in flood and coastal erosion risk management.

6.2.3 The National Strategy seeks to ensure that risks from flooding and coastal erosion are properly managed through the utilisation of a wide range of options in a co-ordinated way. Key guiding principles include:

- community focus and partnership working;

\(^3\) The Floods Review, Sir Michael Pitt (2008)
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- a catchment based approach;
- sustainability;
- a proportionate risk based approach;
- multiple benefits (recognising that as well as reducing the risks to people and property, flood risk management can bring significant economic, environmental and social benefits); and
- encouraging beneficiaries to invest in risk management.

6.2.4 The National Strategy sets out a framework for action by flood risk management authorities in order to reduce the risk of flooding and coastal erosion and its consequences.

6.2.5 The National Strategy requires that Flood and Costal Erosion Risk Management activities are carefully planned to ensure that appropriate, sustainable options are selected and that they are implemented correctly. Key to this planning and one of the main themes underpinning the National Strategy is the development of plans to identify the opportunities to manage the risks to flooding and coastal erosion where possible and to set out where risk management authorities will take action.

6.2.6 The National Strategy also states that Regional Flood and Coastal Committees should have a major role in coordinating flood and coastal erosion risk management plans and expenditure. The Scheme enjoys the support of the Lincolnshire and Northamptonshire Regional Flood and Coastal Committee and features in its approved capital programme.

Reducing the Risks of Flooding and Coastal Erosion – An Investment Plan (December 2014)

6.2.7 In December 2014, DEFRA published ‘Reducing the Risks of Flooding and Coastal Erosion – An Investment Plan’ setting out future plans for managing and improving flood and coastal defences over the 2015 – 2021 period. The plan recognises the importance of the Scheme, noting that its delivery has been accelerated.


6.2.8 The National Planning Policy Framework (NPPF) promotes an overarching “presumption in favour of sustainable development” in respect of both plan-making and decision-taking.

6.2.9 Paragraph 19 of the NPPF states that the planning system is required to perform a specific economic role:

“The Government is committed to ensuring that the planning system does everything it can to support sustainable economic growth. Planning should operate to encourage and not act as an impediment to sustainable growth. Therefore significant

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4 Reducing the Risks of Flooding and Coastal Erosion – An Investment Plan (December 2014)
weight should be placed on the need to support economic growth through the planning system.”

6.2.10 Paragraph 21 re-enforces the need to deliver this economic role as well as striving to deliver a stronger economy:

“Planning policies should recognise and seek to address potential Barriers to investment, including a poor environment or any lack of infrastructure, services or housing. In drawing up Local Plans, local planning authorities should:

- Set out a clear economic vision and strategy for their area which positively and proactively encourages sustainable economic growth;
- Set criteria, or identify strategic sites, for local and inward investment to match the strategy and to meet anticipated needs over the plan period; and
- Identify priority areas for economic regeneration, infrastructure provision and environmental enhancement.”

6.2.11 Paragraph 65 states:

“Local planning authorities should not refuse planning permission for buildings or infrastructure which promote high levels of sustainability because of concerns about incompatibility with an existing townscape, if those concerns have been mitigated by good design”.

6.2.12 The NPPF advises applicants to work closely with those directly affected by development proposals and to evolve the designs to take into account the view of the local community (paragraph 66). Consultation with the local community and other stakeholders was undertaken throughout the development of the Scheme, to ensure views could be taken into account in developing the Scheme design. Ongoing consultation will continue throughout the detailed design phase and construction of the Scheme.

6.2.13 Paragraph 93 of the NPPF notes that ‘planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimalizing vulnerability and providing resilience to the impacts of climate change’ and that this is central to the economic, social and environmental dimensions of sustainable development.

6.2.14 In line with the objectives and provisions of the Climate Change Act 2008 (B/7), paragraph 94 of the NPPF states that local authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations.

6.2.15 Paragraph 100 of the NPPF states that inappropriate development in flood risk areas should be avoided by directing development away from areas at highest risk and includes requirements for local plans to include strategic flood risk assessments.

6.2.16 Paragraphs 99 and 103 of the NPPF highlight the need to consider climate change and increased risk of flooding when granting permission and ensuring that new
development be planned to avoid increased vulnerability to the range of impacts arising from climate change.

6.2.17 Paragraph 131 of the NPPF emphasises desirability of sustaining and enhancing the significance of heritage assets and the positive contribution that conservation of heritage assets can make to sustainable communities.

6.2.18 Paragraph 156 of the NPPF requires local planning authorities to identify strategic priorities for their areas, including for the provision of infrastructure for flood risk and coastal change management, whilst paragraph 162 states that local planning authorities should work with other authorities to assess the quality and capacity for infrastructure for flood risk and coastal change management.

**UK Marine Policy Statement**

6.2.19 The UK Marine Policy Statement (MPS) (C/1/9) was jointly adopted by DEFRA, Scottish Ministers, Welsh Ministers and the Department for the Environment in Northern Ireland in September 2011. It was prepared and adopted for the purposes of section 44 of the Marine and Coastal Access Act 2009 (B/4) and is the framework for the marine planning system established by that Act.

6.2.20 The high level marine objectives set out within the MPS state that the use of the marine environment should benefit society as a whole, contributing to resilient and cohesive communities that can adopt to coastal erosion and flood risk, as well as contributing to physical and mental wellbeing. The MPS also recognises that the marine environment plays an important role in mitigating climate change.

**East Inshore and Offshore Marine Plans 2014**

6.2.21 In April 2014, and also pursuant to the Marine and Coastal Access Act 2009 (B/4) DEFRA published the East Inshore and Offshore Marine Plans (C/1/2) to inform and guide regulation, management, use and protection of the marine plan areas. These Marine Plans apply to the area within which it is proposed to deliver the Scheme.

6.2.22 Marine plans work within the framework of the MPS and other national policies: they do not establish new requirements, but apply or clarify the intent of national policy in the East Inshore and Offshore areas, taking in to account the specific characteristics of the plan areas.

**Cultural heritage**

6.2.23 Policies SOC2 and SOC3 have been developed to support Objective 5 of the Marine Plans "to conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area".

6.2.24 In accordance with SOC2, proposals that may affect heritage assets should demonstrate, in order of preference:

- that they will not compromise or harm elements which contribute to the significance of the heritage asset;
how, if there is compromise or harm to a heritage asset, this will be minimised;

how, where compromise or harm to a heritage asset cannot be minimised it will be mitigated against; or

the public benefits for proceeding with the proposal if it is not possible.

6.2.25 This policy ensures that all heritage assets (whether formally designated or not) are considered in the decision-making process and that decisions aim to minimise or mitigate possible detrimental effects.

6.2.26 In accordance with SOC3, proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference:

- that they will not adversely impact the terrestrial and marine character of an area;
- how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them;
- how, where these adverse impacts on the terrestrial and marine character of an area cannot be minimised they will be mitigated against, and
- the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

6.2.27 Policies ECO1 and ECO2 were developed to support Objective 6 of the Marine Plans, “to have a healthy, resilient and adaptable marine ecosystem in the East Marine Plan area”.

6.2.28 In accordance with ECO1, cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation.

6.2.29 In accordance with ECO2, the risk of release of hazardous substances as a secondary effect due to any increased collision risk should be taken account of in proposals that require an authorisation.

**Biodiversity**

6.2.30 Policy BIO 1 requires that appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence including on habitats and species that are protected or of conservation concern in the East Marine Plans and adjacent areas (marine, terrestrial).

**Climate change**

6.2.31 The Marine Plans recognise that coastal change and flooding represent key effects of climate change against which increased resilience is needed. Policies CC1 and
CC2 have been developed to support Objective 9 of the Marine Plans, “to facilitate action on climate change adaptations and mitigation in the East Marine Plan areas”. These policies set out to ensure approved developments are supporting a transition to a low carbon future, incorporating both specific and general measures.

6.2.32 In accordance with CC1, proposals should take account of:

- how they may be impacted upon by, and respond to, climate change over their lifetime; and
- how they may impact upon any climate change adaptation measures elsewhere during their lifetime.

6.2.33 Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts.

6.2.34 This policy gives effect to high level principles for decision-making related to the need to account for the potential impacts of climate change adaptation. It is consistent with the NPPF, adding marine context to the need to ensure new development is planned to avoid increased vulnerability to the range of impacts.

6.2.35 In accordance with CC2, proposals for development should minimise emissions of greenhouse gases as far as is appropriate. Mitigation measures will also be encouraged where emissions remain following minimising steps. Consideration should also be given to emissions from other activities or users affected by the proposal.

6.2.36 This policy gives effect to high level principles for decision-making related to the need to consider the potential impacts of climate change mitigation. It supports, and adds marine context to paragraph 95 of the NPPF, supporting local planning authorities to plan for new development in locations and ways which reduce greenhouse gas emissions.

Port development

6.2.37 Policy PS3 requires that proposals should demonstrate, in order of preference:

- that they will not interfere with current activity and future opportunity for expansion of ports and harbours;
- how, if the proposal may interfere with current activity and future opportunities for expansion, they will minimise this;
- how, if the interference cannot be minimised, it will be mitigated; and
- the case for proceeding if it is not possible to minimise or mitigate the interference.
Dredging and disposal

6.2.38 Policy DD1 requires that proposals within or adjacent to licensed dredging and disposal areas should demonstrate, in order of preference:

- that they will not adversely impact dredging and disposal activities;
- how, if there are adverse impacts on dredging and disposal, they will minimise these;
- how, if the adverse impacts cannot be minimised they will be mitigated; and
- the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

6.2.39 This policy aims to protect dredging and disposal activities, in or adjacent to licensed dredging and disposal areas, against other new proposals that could compromise the continued access to ports and harbours for the shipping industry. When assessing proposals against this policy, planning authorities are to take account of a range of relevant considerations including compliance with legislation and regulations detailed in the maintenance dredging protocol and from the applicable environmental impact assessment.

Government

6.2.40 Policies GOV1, GOV2, and GOV3 have been developed to ensure planning authorities ensure land uses are being utilised in a sustainable manner. This has been assured through consistent stakeholder engagement with the necessary statutory bodies, and adherence to local planning policy.

6.2.41 In accordance with GOV1, appropriate provision should be made for infrastructure on land which supports activities in the marine area and vice versa. This policy ensures that public authorities assess the potential positive and negative impacts, on both the marine and terrestrial environments, of development proposals in a collective and cumulative manner.

6.2.42 In accordance with GOV2, opportunities for co-existence should be maximised wherever possible. This policy ensures all relevant public authorities ensure that the feasibility of co-existence is taken into account when assessing new development and other activities.

6.2.43 In accordance with GOV3, proposals should demonstrate in order of preference:

- that they will avoid displacement of other existing or authorised (but yet to be implemented) activities;
- how, if there are adverse impacts resulting in displacement by the proposal, they will minimise them; and
- how, if the adverse impacts resulting in displacement by the proposal, cannot be minimised, they will be mitigated against or
6.2.44 This policy has been developed to clarify the provisions of the Marine Policy Statement, complement GOV2 and to provide more detail and prescription in regard to displacement.

Tourism

6.2.45 Policies TR1, TR2 and TR3 were developed to protect the tourism and recreation industry surrounding marine and coastal areas. It has been recognised that in order to sustain the contribution to the economy these industries make, plans and policies must ensure that developments from other sectors do not cause a detrimental effect on the tourism and recreation sector.

6.2.46 In accordance with TR1, proposals for development should demonstrate that during construction and operation, in order of preference:

- they will not adversely impact tourism and recreation activities;
- how, if there are adverse impacts on tourism and recreation activities, they will minimise them;
- how, if the adverse impacts cannot be minimised, they will be mitigated; and
- the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

6.2.47 This policy seeks to ensure that impacts on tourism are considered in the decision-making process and that decisions aim to minimise or mitigate possible detrimental effects.

6.2.48 In accordance with TR2, proposals that require static objects in the East Marine Plan areas, should demonstrate, in order of preference:

- that they will not adversely impact on recreational boating routes;
- how, if there are adverse impacts on recreational boating routes, they will minimise them;
- how, if the adverse impacts cannot be minimised, they will be mitigated; and
- the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

6.2.49 This policy seeks to address the potential conflict between proposals involving static objects and recreational boating, highlights the benefits of early engagement and aims to ensure that any development takes account of the recognised boating areas and most used cruising routes for recreational craft.

6.2.50 In accordance with TR3, proposals that deliver tourism and/or recreation related benefits in communities adjacent to the East Marine Plan areas should be supported. This policy aims to support sustainable tourism and recreational opportunities within
the East Marine Plan areas, to help improve the local economies of many coastal communities. It allows the planning authority to support proposals which can achieve this goal.

6.3 **Lincolnshire Policy Context**

*Draft South East Lincolnshire Local Plan 2011-2036 (2016)*

6.3.1 A new Joint Local Plan for South East Lincolnshire is being developed by South Holland District Council, BBC and LCC. The Draft South East Lincolnshire Local Plan 2011-2036 (C/2/2) was published for consultation in January 2016. As the plan is a draft document, it carries limited weight in the determination of planning applications.

6.3.2 A number of responses to the 2016 Local Plan Consultation related to flood risk. The Agency raised two specific concerns, the first relating to the strategic approach to flood risk in respect of site allocations. The second concern related to a lack of detail on the level of assessment and mitigation requirements in support of planning applications. The impact of the construction of the Scheme was queried by a respondent in terms of whether the Councils have factored in the construction of the proposed barrier in the formulation of planning policy, and selection of development sites.

6.4 **Local Policy Context**

*River Witham Catchment Flood Management Plan*

6.4.1 In December 2009 the Agency produced, in consultation with relevant local authorities, the River Witham Catchment Flood Management Plan (CFMP), one of 77 such plans produced for England and Wales.

6.4.2 The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the longer term. The CFMP addresses flooding issues in Boston (Sub-area 8), noting that the area is still at substantial risk from tidal flooding and that the most effective way to manage flood risk may be to improve existing defences or create new flood defences. It also identifies delivery of the tidal barrier as an action to be implemented.

*Boston Borough Local Plan (1999)*

6.4.3 The Boston Local Plan was adopted following public consultation in April 1999. The saved policies of the Local Plan are a material consideration in the determination of planning applications.

6.4.4 Policy G1 (Amenity) states that planning permission will only be permitted for development which will not substantially adversely affect other nearby land users, residents or general character of the area in terms of the development nature, layout, density, appearance or traffic generation.

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5 River Witham Catchment Flood Management Plan (CFMP) (2009)
Policy G2 (Wildlife and landscape resource) identifies that planning permission will not be granted for proposals which will have a significant adverse impact upon existing landscape, wildlife and vegetation resources.

Policy G4 (Safeguarding the water and environment) planning permission will not be granted for developments which will have an adverse effect on the water environment, or the quality of surface or ground water.

Policy G6 (Vehicular and pedestrian access) states that planning permission will not be granted for development where the proposed means of pedestrian and vehicular access are unsatisfactory.

Policy G7 (Accessible Environments) states that planning permission will not be granted for non-residential developments which include an external layout which would be unsuitable for persons of restricted mobility.

Policy G8 (Air and Soil Resources) states planning permission will not be granted for developments which will have an adverse effect upon the quality of air or soil such as to lead to:

- harm to local living or working conditions or the operation of nearby land uses;
- harm to the natural flora and fauna of interest in the locality; or
- added constraints on future developments in the area (Policy G8).

Policy ED1 (Development in Industrial/Commercial Areas) of the saved policies states that permission will be granted for new industrial/commercial development provided there is not:

- an increase in traffic levels, dust, noise, smell or pollution that would cause significant harm;
- unacceptable harm to the character of the locality due to their nature, scale, density, layout, appearance or level of traffic generation;
- unacceptable deterioration in the quality of utility services elsewhere; and
- adversely affect the wash SSSI or sites of local nature conservation interest.

Policy ED2 (Development of Ports) relates to the development of the port where planning permission will be granted for development which is associated with the port’s activities, provided that it will not:

- generate levels of traffic, dust, noise, smell or other pollution which would significantly harm the environment, local living or working conditions, or the operation of nearby land uses;
- cause unacceptable harm to the character of the locality due to their nature, scale, density, layout, appearance or level of traffic generation;
cause an unacceptable deterioration in the quality of utility services elsewhere; and

adversely affect the Wash SSSI or sites of local nature conservation interest.

6.4.12 Policies T1 and T2 relate to new access roads and footpaths, and ensure that any new roads are, necessary, safe for all users including cyclists and integrated into the current form of Boston.

6.4.13 In accordance with saved policy C7 (Development of Sites Adjacent to River Witham), planning permission will be granted for the development of land adjacent to the river Witham, or the Haven (the tidal stretch of the River) only where the submitted proposals are well designed and visually related to the river scene and (where appropriate) accommodate and promote any recreational potential of the site concerned.

6.4.14 Policy C8 (Stump Views) states that planning permission will not be granted for any development which would obstruct a public view of St. Botolph’s Church in Boston, or which would challenge the visual dominance of the church.

6.4.15 Policy C17 (Sites of Local Conservation Importance) states that development proposals which would adversely affect the sites of local nature conservation interest will only be permitted where they are in the local interest with public benefits which decisively outweigh their adverse effect and they could not feasibly be sited in a less sensitive location.
7 SCHEME DEVELOPMENT

7.1 Overview

7.1.1 As detailed in Chapter 3 of this Statement, the Agency developed a draft flood risk management strategy for Boston between 2004 and 2005 which identified that the best approach to reducing tidal flood risk in Boston would be through the construction of a tidal barrier in the Haven and improvements to existing flood defences downstream of the new barrier. Accordingly, feasibility work began to develop the proposals for a new flood risk management barrier. Initial consultation was undertaken in spring 2004 to identify key environmental issues associated with the proposed Boston Haven flood management strategy and to seek comments and agreement on draft strategic environmental assessment objectives.

7.1.2 At around the same time the Agency had also produced a feasibility study to see how the Fens Waterways Link could be implemented in and around the town of Boston which identified that a navigable link could be developed between the River Witham and the South Forty Foot Drain by the construction of a barrage/barrier in the Haven. Towards the end of 2004, a decision was taken to look at how the objectives of the proposed Boston Haven flood management strategy aligned with the Boston Waterways Link feasibility study and the BCS was subsequently developed.

7.1.3 The BCS considered a number of flood risk management options and recommended five phases of work to deliver flood risk management and achieve navigation objectives. The BCS was approved by DEFRA in 2008 and Phases 1 and 2 are now complete.

7.1.4 Phase 3 of the BCS comprised of the delivery of a multi-functional barrier. The BCS stated that the barrier should be within a zone defined upstream by the Swing Bridge and downstream by the entrance to the Port's WDE. In reaching this conclusion several locations for the barrier were considered, including at Hob Hole and the mouth of the Haven. (Figure 5 at Appendix 4 to this Statement illustrates various locations within the Haven).

7.1.5 In preparing the BCS the Agency took into consideration the consultation it had undertaken in previous studies for the Fens Waterways Link and the Boston Haven Flood Management Strategy. In addition further consultation relating to flood risk management was undertaken in Boston (May 2004 and October 2004) and as regards navigation proposals (November 2004). Public consultation undertaken in April 2006 reinforced that ecological constraints surrounding the Wash (designated as a SSSI, Ramsar, SPA and SAC) were sufficient not to progress further consideration of the location of the barrier near the mouth of the Haven. Both construction and long term impacts on the designated sites were obstacles.

7.1.6 Following a competitive tender exercise in 2009 a Halcrow Jacobs Alliance (HJA) was commissioned to progress Phase 3 of the BCS. The services provided by HJA included the appraisal of options and the identification of a preferred option (known as Gateway 1). This work is described in section 7.2 below.
7.1.7 Following a competitive tender exercise in 2014 Mott MacDonald Limited (MML) were commissioned to progress the proposals from Gateway 1 to Gateway 2 (including supporting an application for a TWAO). The Gateway Review process offers a structured approach to the management and governance of a project based around a series of independent peer reviews carried out at key stages known as Gateways to verify that projects should be allowed to progress to the next stage.

7.2 Appraisal of Options

7.2.1 Following the decision to progress the delivery of a multi-functional barrier, an exercise was undertaken to determine the best location for a new barrier and the downstream flood defences.

7.2.2 As part of the first stage of a more detailed appraisal, a high level assessment was undertaken of barrier location options within the Haven from a point upstream of the fishermen’s London Road Quay to Hobhole Sluice. However, just upstream of Slippery Gowt is the estimated limit where the channel geomorphology is considered to be stable and for this reason, option locations downstream of Slippery Gowt were discarded. Therefore nine location options were considered within the zone between the London Road Quay and downstream of Maud Foster Sluice, as suggested in the BCS.

7.2.3 After an initial assessment of these nine options for the proposed barrier, including a public open forum and stakeholder workshops, four of these options were discounted for technical, operational or financial reasons, or a combination of all three, as is explained within Table 2.7 of Chapter 2 of the Environmental Statement Main Report (A/17/1).

7.3 Shortlisted Options

7.3.1 The five short listed options (Options A to E) were subject to further public consultation and detailed assessment. These options are illustrated within Figure 6 in Appendix 4 to this Statement.

7.3.2 A multi-criteria approach was also used to compare monetised and non-monetised costs and benefits. The outcome of this assessment recommended that two of the short listed options, Option A (barrier upstream of London Road Quay) and Option D (barrier downstream of the Wet Dock Entrance), be discounted and that Option B (barrier downstream of Black Sluice), Option C (barrier upstream of the WDE) and Option E (barrier downstream of the Maud Foster Sluice) be taken forward to Stage 2 of the appraisal for further more detailed consideration.

7.3.3 Option A was removed from the shortlist following consultation with the Inland Waterways Association, PoB, Victoria Group and the BDFA. It was identified as not meeting the navigation objectives identified within the BCS; provision of a safe navigation link between the Lower Witham and South Forty Foot Drain. The resulting short tidal length between the proposed barrier and Black Sluice Lock was identified as being unsafe for inexperienced inland boaters, particularly the right turn angle into the Black Sluice Lock under tidal flows. LCC and the Agency’s Waterways team highlighted concerns as regards this option on these grounds, with LCC further
identifying that the option would not attract their waterways contribution. In addition, Option A would have required more flood wall raising through the town.

7.3.4 Option D was also removed from the shortlist as it was identified as having significant impacts on the day to day business operations of the Port during and after construction. In particular, it was considered to unacceptably interfere with the Port’s vessel turning circle area at the WDE. It was concluded, following consultation with the PoB, that these impacts could not be adequately mitigated.

7.3.5 Whilst Option E gave rise to similar concerns as Option D in terms of the effects it would have on the day to day business operations of the Port, feedback received from the local community demonstrated a strong preference for Option E. This preference was due to a perceived (yet misplaced) view that it would offer improved flood protection over other options. Notwithstanding that this perception was incorrect, Option E was taken forward alongside Options B and C for further appraisal. That further appraisal confirmed that Option E would give rise to significant impacts on the day to day business operations of the Port whilst offering no additional flood protection and the Agency concluded that it should not be progressed on this basis. The Agency undertook further engagement with local residents in order to address the misplaced perception that the location of the Barrier upstream of Option E would affect their residual flood risk.

7.3.6 The monetised flood risk benefits were considered to be the same for each of the three remaining options (B, C & E) that were considered. The next stage of appraisal focused on which option offered the most cost effective means of delivering those benefits.

7.3.7 The cost of Option B (immediately downstream of Black Sluice pumping station) was marginally cheaper than the cost of location Option C (adjacent to entrance to PoB’s WDE) while Option E was considered significantly more expensive (downstream of PoB’s Wet Dock).

7.3.8 A multi-criteria approach with scoring and weighting was used to compare both monetised and non-monetised costs and benefits for the three options considered in detail for barrier location. The preferred option, selected on the basis of cost effectiveness and scoring and weighting of technical, environmental and economic factors, was Option B.

7.3.9 Option C was considered to give rise to negative impacts on the Frontier Agriculture facility and Port of Boston and the cost of mitigation was considered likely to be greater than in the case of Option B.

7.3.10 Option B, a barrier located approximately 200m downstream of the confluence of the Boston Haven and the South Forty Foot Drain and adjacent to the Port (please see Figure 7 in Appendix 4 to this Statement), was therefore identified as the most cost effective solution. Option B was also identified as the option which minimised impacts on key stakeholders and facilitated the accommodation of mitigation measures.

7.3.11 As funding for the WLM element of the proposals was not assured to the same extent as the flood risk management elements were, consideration was also given as to
how these options would perform in the case of a flood risk management only barrier. This was integrated into the options appraisal process. On a purely flood risk management basis, Option C performed strongly. However, building the barrier at this location would restrict the Agency’s ability to deliver navigation objectives at a later date.

7.3.12 On this basis, the same conclusions were reached for a flood risk management barrier as compared to a multi-functional barrier and this was reported at the time, namely that the preferred location for the barrier was approximately 200m downstream of the confluence of the Boston Haven and the South Forty Foot Drain; adjacent to the Port of Boston (Option B).

7.3.13 As the public consultation on the options suggested that consideration should be given to locations other than Options A to E, the Agency also reviewed other locations closer to the Wash. In particular, 4 locations were considered again but the conclusion previously reached did not change.

7.4 Review of Proposals in view of the removal of WLM

7.4.1 Following the decision to revert to the Agency’s original proposal to deliver the proposed barrier for flood risk management purposes only, the Agency reviewed the scope of works required to be delivered. The objective of this review was to remove works from scope of the Scheme which could be reasonably delivered later, as part of future plans for WLM, thus ensuring that the Scheme being delivered for flood risk management best employed public funds, having regard to the benefits it would deliver. It was also identified that ‘waterways-only’ components of the proposals that could be reasonably deferred would not qualify for Flood Defence Grant-in-Aid funding and thus were also unfunded.

7.4.2 This review identified that it was reasonable to retain the WDE widening, which forms part of the identified waterways mitigation works, as part of the current Scheme. A key reason for this is that the proposed widening of the WDE helps to mitigate the impact of construction of the Scheme on operations within the Port, by enabling the PoB to accommodate vessels within the Wet Dock during works to construct the barrier and to the Port’s quayside and to mitigate permanent effects from the Agency’s use of parts of the Port’s quayside.

7.4.3 The Agency’s review also identified that it was no longer necessary to permanently relocate the BDFA, which had been intended to mitigate the effects of operating the barrier for WLM purposes on their existing operations. The reason for reaching this decision was that it would be possible to make provision for the permanent relocation of the fishermen as part of a future WLM proposal without incurring additional cost at this time, as compared to permanently relocating them now as part of the current ‘flood risk management only’ Scheme. To permanently relocate the fishermen would incur additional costs that are not considered to be necessary for the current Scheme. As a result the costs associated with the permanent relocation of the BDFA would not qualify for Flood Defence Grant-in-Aid funding and thus would be unfunded if included as part of this Scheme.
7.4.4 The Scheme presented in the TWAO Application is the best option to reduce the risk to people and the developed and natural environment from flooding. The design of the Scheme further ensures that the future provision of WLM and a safe and attractive navigation link between the River Witham and South Forty Foot Drain remains possible and as such the proposals do not preclude the longer term delivery of those elements of Phase 3 of the BCS.
8 CONSULTATION

8.1 Overview

8.1.1 The Agency has consulted widely prior to and throughout the development of the Scheme to ensure that all those who have views have been able to have their say.

8.1.2 Prior to 2008, consultation was undertaken by the Agency to prepare the BCS (C/3/4). Following publication of the BCS, when the need for the tidal barrier and improved flood defence had been identified, extensive consultation then followed on the development of the Scheme.

8.1.3 Throughout development of the Scheme the Agency has engaged with the general public, land owners, local interest groups and over 50 organisations including statutory bodies, non-governmental organisations and parish councils. A comprehensive stakeholder mapping exercise was undertaken by the Agency’s team in the early stages to identify and classify stakeholders based on their relationship to the Scheme and ongoing consultation has been carried out through development of the Scheme.

8.1.4 This has been carried out through formal EIA consultation, public exhibitions, meetings, public drop-in sessions and social media. The views of all interested parties have been taken into account during the development of the Scheme. Throughout the development of the proposals the Agency has had ongoing detailed discussions with landowners and will continue to work closely with landowners. Public consultation was designed to inform members of the public and other interested parties about ongoing development of the Scheme and to invite any comments they may have.

8.1.5 The Agency’s communications and engagement plan for the Scheme was based on the following principles:

- engaging directly with key partners and the wider local community;
- being honest and open and making every effort to avoid raising false expectations;
- being transparent about how the Agency hoped to engage with the broader community going forward and how expectations would be managed and questions answered;
- making time to involve people properly;
- providing feedback, including clear explanations about the process and how the parties might work together going forward; and
- listening and acting upon feedback and using this to work together with our partners to shape our engagement with the broader community.
8.2 Consultation Timeline

8.2.1 The Consultation Report (A/5) submitted as part of the TWAO Application in accordance with Rule 10(2)(d) of the Application Rules sets out in detail the consultation undertaken by the Agency during the development of the Scheme, including details of the organisations with whom the Agency has consulted. The key stages of consultation were as follows:

March 2008: the approval of the BCS which included five stages, one of which was the provision of a barrier;

November 2009 to October 2011: six workshops were held with key stakeholders to identify a long list of option locations for the barrier, followed by a short list of option locations and then to identify the final preferred location for the barrier;

January 2010 to November 2011: three Public Open Forums were held to provide the public with the opportunity to review long and short option locations and to be presented with the final preferred location;

October to November 2012: public drop-in sessions were held regarding the preferred option;

December 2013: the original EIA scoping report was sent to DEFRA with a request for an EIA scoping opinion;

November 2014: an Updated Scoping Report was submitted to DEFRA, along with a request for a further EIA scoping opinion;

October to December 2014: six weeks of public consultation was undertaken in parallel with the consultation undertaken by DEFRA in relation to the updated EIA scoping opinion request;

November to December 2015: six public exhibitions were held to update and inform the public as regards the decision to proceed with a flood risk management barrier proposal; and

January to February 2016: a draft environmental statement was sent to identified consultees who were invited to comment on the draft statement.

8.2.2 In addition to the above activities, since August 2015 the Agency has operated the Boston Community Hub, located on Marsh Lane, Boston, each Wednesday between 12.30pm and 7.30pm. The Hub arrangement has been established to enable members of the public and interested parties to speak to a member of the Agency’s team should they have any questions regarding the Scheme.

8.3 Consultation Feedback

8.3.1 The appendices to the Consultation Report (A/5) identify the main issues raised by consultees regarding the Scheme and the account taken by the Agency in developing the proposals. In some cases, consultation feedback resulted in changes
to the proposals comprised within the Scheme. Some examples of Scheme components which are proposed in light of consultation feedback include:

(a) Temporary relocation of Witham Sailing Club

(i) The Witham Sailing Club raised concerns about the ability of recreational river users to safely navigate the Haven during the construction of the barrier and as a result the Agency is now proposing to temporarily relocate the Sailing club to a new location downstream of Maud Foster Sluice during the barrier construction works.

(b) Maud Foster Sluice

(i) At a meeting in March 2015 heritage and landscape stakeholders provided feedback on the Agency’s proposal to connect the proposed new left bank flood wall with the existing Grade II listed Maud Foster Sluice and as a result the design was revisited to ensure that the Sluice retained its physical profile and to reduce visual impacts.

(c) The Port of Boston

A number of changes to the Scheme have arisen in light of consultation feedback received from PoB, including the following examples:

(i) early feedback from the PoB was taken into account in determining the preferred location for the new barrier, with locations downstream of the Port estate (and immediately adjacent to the Port quayside) considered to give rise to significant adverse effects on the Port’s operational activities;

(ii) PoB raised concerns about the proposed use of the Wet Dock during the construction of the Scheme; the proposals will include works to widen the entrance to the Wet Dock;

(iii) the route of the proposed left bank flood wall was realigned in light of feedback received from PoB; and

(iv) the duration of the proposed closure of the Wet Dock during construction of the new gate within the existing entrance has been determined in consultation with PoB.

(d) Boston District Fishermen’s Association

(i) In light of feedback received from members of the BDFA regarding the implications of the construction of the barrier on their existing operations, the Agency now proposes to temporarily relocate the fishing fleet to a location downstream of the barrier location;

(e) Safe mooring areas
(i) Safe mooring areas for use by multiple types of vessels were included in the project design for use during construction and operation following concerns raised during consultation.

(f) Landscape design

(i) In light of consultation feedback received, the Agency has introduced the following landscaping elements to the Scheme:

(ii) new street furniture along the banks of the Haven; and

(ii) natural aquatic margins to be introduced along the new sheet piling proposed on the right bank of the Haven, to soften views from St Nicholas Church.

(g) Location of barrier control building

In light of consultation feedback received that it was important not to preclude the future delivery of a lock adjacent to the proposed barrier, the Agency relocated the proposed barrier control building from a location immediately adjacent to the proposed barrier to an alternative location within the Port estate.
9 ENVIRONMENTAL ASSESSMENT

9.1 Introduction

9.1.1 The Agency will seek, as far as reasonably practicable, to minimise the adverse impacts of the Scheme on the local environment and, where appropriate, will seek to enhance it. The Agency commissioned the production of a full Environmental Impact Assessment (EIA) of the Scheme and the findings of this assessment were report in the Environmental Statement (ES) (A/17) that was submitted with the TWAO Application.

9.1.2 The EIA identified and assessed the likely significant effects of the Scheme on the environment. It considered both positive and adverse impacts and identified measures to reduce and manage any potentially significant adverse impacts while enhancing positive impacts. These are reported in the ES which comprises the following documents:

- Volume 1 – Main Report (A/17/1);
- Volume 2 – Technical Reports (A/17/2); and
- a Non-Technical Summary (A/17/3).

9.1.3 The EIA undertaken for the Scheme has followed relevant EIA regulations and best practice guidance.

9.1.4 The EIA process is a systematic and iterative procedure, using the best practicable techniques and best practice sources of information, to determine the potential environmental effects of a proposed development (both beneficial and adverse) and their significance. The ES has been prepared on a reasonable worst case basis and as such represents a conservative assessment of the potential environmental effects of the Scheme.

9.1.5 The EIA process provides an opportunity for public input to the proposals and public scrutiny of the proposed development. It enables the importance of predicted effects to be assessed and taken into account by appropriate bodies before a decision on whether to grant an Order is taken. The Scheme has evolved through consultation with stakeholders, including local planning authorities and the local community. This engagement has led to notable changes to the Scheme to lessen the environmental impacts, including the retention of the sweeping right embankment to soften the view of the Scheme from the left bank.

9.1.6 The ES and technical reports have been prepared to meet the requirements of the Application Rules (B/11), relevant European Directives (B/17 and B/18) (please also see chapter 4 of the ES (A/17/1)), UK legislation and the Agency’s EIA management procedures. The ES presents the key baseline information, impact assessment, describes the environmental effects arising from the construction and operation of the Scheme and, where appropriate, the measures that are intended to mitigate any potential impacts.
9.1.7 The Application Rules highlight that, where the Secretary of State for Environment and Rural Affairs has given an EIA Scoping Opinion on a proposed TWAO application, the EIA for that application needs to include the information specified in the Scoping Opinion only. The ES provided for the Scheme has addressed the potentially significant issues identified through the EIA scoping process, including those identified within the consultation undertaken in relation to the original EIA scoping that was undertaken in 2011 and any changes to the Scheme since the Updated Scoping Opinion was received in December 2014 (A/11). This information is presented within the ES.

9.2 Summary of environmental effects

9.2.1 Both the construction and operation phase effects of the Scheme have been assessed in the ES as set out in the subcategories below. The construction phase impacts are limited in duration: the Scheme will take approximately 2 years in total to construct, however activities in specific areas (such as along the Boston Public Footpath No.14 behind the properties on Wyberton Low Road) will be shorter and will vary in intensity, with some anticipated to possibly create minor disruption.

Cultural heritage

9.2.2 During construction, dredging and excavation activities within the Haven will result in the permanent removal or destruction of archaeological features if they are found to be present within the buried tidal mudflats. This is considered to be a potentially significant adverse effect. Prior to construction archaeological investigations would be agreed in discussion with the Lincolnshire County Archaeology Services and Lincolnshire Heritage. This would detail all archaeological surveys to be undertaken pre- and during construction. If archaeological remains are found, steps would be taken to make the discoveries available to the local community. This is a standard approach applied to development projects to safeguard archaeological features.

9.2.3 Construction activities will result in a temporary significant adverse effect on the setting of both St Nicholas Church (Grade II*) and the Skirbeck Conservation Area within the landscape. The construction activities would also potentially reduce the quiet character of St Nicholas Church and its churchyard. To maintain the setting of St Nicholas Church and the Skirbeck Conservation Area, the new flood defence on the right bank would be placed directly into the embankment. This results in the flood defence only being visible where it emerges from the embankment rather than being placed in front of the embankment which would have resulted in the flood defence forming the river bank.

9.2.4 To reduce the effect of the left bank flood wall on the setting of the Maud Foster Sluice (Grade II listed), in-design mitigation has been incorporated, and the flood wall tapers down where it joins the sluice. With this in-design mitigation, the impact is not considered significant.

9.2.5 Once in operation, the Scheme will have a permanent beneficial significant effect as the historic features and structures within Boston would benefit from improved flood protection. It would also encourage opportunities for investment in historic buildings due to reduced flood risk, and reduce spending related to flood damage repairs.
Landscape and Visual Amenity

9.2.6 The construction activities will be visible from a number of locations surrounding the Scheme area, with clear views of the works from the upper back windows of properties on Wyberton Low Road, Marsh Avenue and Marsh Lane, and from the Boston Public Footpath No.14 (Macmillan Way) and the river (boat users). The construction works will negatively affect the existing view of the river from these locations, resulting in a temporary significant adverse effect. In addition, the presence of construction works and associated plant and machinery would potentially alter the landscape character within the Scheme area, resulting in a temporary adverse significant effect.

9.2.7 Once the proposed barrier has been constructed, there are no significant impacts anticipated on landscape character. However, the proposed barrier support structures, above water level, and the flood walls will be visible from the first floor of residential properties on Wyberton Low Road, Marsh Avenue Marsh Lane and from the southern sections of London Road and from the Boston Public Footpath No.14 (Macmillan Way) and the river (boat users). This will result in a change to their current views, which is considered to be a permanent significant adverse effect.

9.2.8 To mitigate the operational effects, the proposed barrier will have a galvanised steel finish (grey) and therefore, it should blend with the tall buildings, cranes and other structures required for the operation of the Port of Boston. In addition, lighting will be localised (to prevent additional light pollution at night) and saline resistant wild flowers would be planted. Following the implementation of the mitigation measures, the residual effect is considered to be significant adverse for users of Boston Public Footpath No.14 (Macmillan Way), river users and residential properties on Wyberton Low Road.

9.2.9 Mitigation measures will be secured and enforced through the proposed Planning Conditions which would require the Agency to submit an Ecological Management Plan to BBC for approval and to deliver the Scheme in accordance with the approved Plan.

Land Use

9.2.10 During the construction phase, there will be a temporary diversion of the existing Boston Public Footpath No.14 (Macmillan Way) for the entire construction period. This is not a significant effect as an alternative route will be provided. The footpath will be re-instated following construction and will be improved as a result of betterment to the surface of the footpath, making it more attractive for walkers and accessible for persons of restricted mobility.

9.2.11 Cycle access will be maintained on Wyberton Low Road during the diversion of the three 11kv electrical cables to reduce disruption to users of the National Cycle Network Route 1. Restrictions may be applied for the safety of the cyclists but it is not anticipated to result in a significant effect.

9.2.12 As a result of the Scheme there would be a permanent change in land use within part of the Port of Boston estate due to the control buildings required for the proposed barrier and WDE gate. In addition, when the proposed barrier and flood gates within
the flood wall are closed during extreme tidal events it will result in a temporary restriction in the use by the Port of Boston and their commercial operators, in front/riverward of the flood defence. However, these are not considered adverse significant effects and in any case would be outweighed by the benefits to the Port of Boston that they enjoy due to the presence of improved flood defences.

**Noise and Vibration**

9.2.13 Construction works will primarily take place between the hours of 07:30 and 18:30, Monday to Friday. Any noisy work undertaken outside of normal working hours (i.e. 07:30 and 18:30, Monday to Friday) will be controlled through a noise and vibration management plan, details of which would be agreed with BBC prior to the start of construction.

9.2.14 Phase 1 dredging works are predicted to last for up to 4 weeks, Phase 2 dredging works are predicted to last for up to 8 weeks and Phases 3 and 4 are predicted to last less than 1 month.

9.2.15 Phase 1 dredging works are anticipated to result in a temporary significant adverse effect during the day, evening and night time at Wyberton Low Road.

9.2.16 Phase 2 dredging works are anticipated to result in a temporary significant adverse effect during the evening and night time for the following receptors closest to the works:

- Wyberton Low Road;
- Marsh Lane;
- Victoria House;
- The Featherworks;
- Windsor Bank;
- Alfred Street;
- Skirbeck Road; and
- London Road.

9.2.17 The Agency’s proposal for the installation of sheet piling is that works will take place during the day time only and not during the evening or night time. Therefore, there will be no significant effects related to piling during the evening and night time period. Noise levels from the left bank piling works required for the construction of the proposed barrier and flood wall is not anticipated to exceed the noise threshold levels.

9.2.18 The potential construction noise impacts are to be managed and reduced to non-significant by implementing measures including erection of noise barriers, appropriate equipment selection, traffic management, appropriate scheduling of works and effective and timely stakeholder consultation. These measures would be
designed to reduce noise to a level that is closer to levels normally heard by people in the Scheme area and therefore would be less noticeable. These measures would be implemented through the Noise and Vibration Management Plan that the Agency would be required to submit to BBC for its approval, pursuant to the proposed Planning Conditions.

9.2.19 The operation of the proposed barrier is not predicted to result in an increase in noise levels.

9.2.20 During construction the increased vibration levels are expected to be perceptible as a result of piling and the diversion of the electricity cables. Prior warning and explanation will be provided to the properties likely to be affected and as the works will be short term and temporary they are not expected to cause ongoing longer term disturbance to local residents and therefore it is anticipated not to be significant.

9.2.21 Technologies such as silent sheet piling which produces less vibration than conventional piling methods and very low noise levels will be investigated and implemented to limit impacts. In addition, the use of softer alternatives (to hammering) of piling techniques will be used where ground conditions allow.

9.2.22 There is no indication of significant effects in terms of potential cosmetic (such as paint works and plastering) or structural damage in residential buildings. However, as a precautionary measure the Agency is committed to undertaking both pre-construction and post-construction structural condition surveys of properties along Wyberton Low Road and remedying any defects that the construction of the Scheme gave rise to.

Ecology and Nature Conservation

9.2.23 During construction, fish populations will be temporarily affected by the narrowing of the Haven, and an increase in local noise and vibration from construction activities, which will result in a temporary significant adverse effect.

9.2.24 During construction, mitigation measures to reduce the impact on fish will be implemented through the ecological management plan which will be agreed with BBC. These will include: training of construction staff by an ecologist, minimising noise and vibration, minimising sediment release, dredging to be undertaken during cooler months, and dredging to avoid smelt spawning season (generally mid-February to end of March). Works will be carried out in line with Agency best practice on topics such as pollution control, and refuge areas will be provided. In addition, fish movements will be monitored to check for changes in numbers and migration patterns, and additional measures taken if necessary.

9.2.25 Technologies such as silent sheet piling which produces less vibration than conventional piling methods and very low noise levels will be investigated and implemented where practical, to limit impacts on fish populations. In addition, the use of softer alternatives (to hammering) of piling techniques will be used where ground conditions allow. Where this is not possible, soft start piling procedures will be utilised.
9.2.26 No other animals or plant life (land or marine) are expected to experience significant adverse effects from the construction works. However good practice measures will be detailed in the ecological management plan to ensure that potential effects remain non-significant and include measures, such as biosecurity measures, to avoid, or failing which, prevent the spread of invasive species, training, pollution prevention, reducing dust, noise and lighting, hand searches of suitable habitat prior to vegetation clearance and vegetation clearance to avoid bird nesting season.

9.2.27 The operation of the proposed barrier is not expected negatively to affect animals or plant life. However, general measures such as the timing of maintenance during operation to avoid migration seasons and fish monitoring will be implemented.

Surface Water

9.2.28 Construction activities will be carried out in line with standard industry practice and normal tidal activity would continue in the Haven for the duration of the construction period. As a result, the assessment concluded that there would be no significant adverse surface water effects, either temporarily or permanently resulting from the construction phase of the Scheme.

9.2.29 A preliminary Water Framework Directive (WFD) assessment has been undertaken for the Scheme. The principal risk identified in the assessment was degrading the structure of the river. However, the Scheme components are an integral part of managing flood risk, and the water body is already classified as heavily modified. In addition, the Scheme components are not predicted significantly to alter the hydromorphological (physical characteristic) of the water body. Similarly, it has been determined that the risk of decreasing water quality is minimal. Therefore, the Scheme components will not result in a significant effect in terms of WFD.

9.2.30 The assessment has shown that there will be no significant effects on water quality within the Haven as a result of the operation of the proposed Barrier.

Estuarine Processes and Geomorphology

9.2.31 During construction, there will be a slight increase in the speed of water flowing through the Haven at the location of the tidal Barrier due to the narrowing of the channel. However, the modelling carried out has shown that the overall changes in velocity remain low and would not substantially increase the rate of erosion or sediment removal within the Haven. Therefore, this is not a significant effect. However, erosion control would be provided during construction and surveys would be carried out during the construction period to determine the rate of erosion and deposition to ensure the control measures are effective.

9.2.32 There are no significant effects anticipated once the Barrier is operational.

Contaminated Land

9.2.33 During construction there is a potential risk to workers who may come into direct contact with contaminated land and associated ground gas. This is considered to be a temporary significant adverse effect. Best practice measures would be employed to reduce the risk of exposure. These would include: regular training, preparation of
method statements to establish ways of working, appropriate use of Protective Personal Equipment (PPE) (such as dust masks), dust suppression, and collection of drainage water and management of surface water. These measures would reduce the effect to non-significant.

9.2.34 Once the proposed barrier is operational, there is a small risk to operators in the control building due to the potential accumulation of ground gas in the building, resulting in a permanent adverse effect. However, the control building would be designed to include ground gas protection measures which would eliminate the risk and therefore be non-significant effect.

Navigational Impact Assessment

9.2.35 The ES reported the findings of a Navigational Impact Assessment that was undertaken to consider the effects of the Scheme on river users. Without mitigation, there would be potential significant effects to navigation and boat users arising from restrictions on navigation. These effects could include reduced area for vessels to manoeuvre, increased river traffic, reduced river width, reduced available quay length, and river restrictions and closures.

9.2.36 Construction of the Scheme is likely to result in significant residual adverse impacts to commercial and recreational river users which would be managed. With the implementation of mitigation measures it is anticipated that all the significant construction effects would be reduced to non-significant apart from increased collision risk (risk of collision with moored ships on river berths by vessels utilising the bypass as a result of increased in-channel activities) and reduction in available quay length (progressive closure of riverside berths and relocation of all PoB traffic to riverside berth during the closure of the WDE would impact PoB’s operation and require all commercial vessels to be turned outside the WDE).

9.2.37 For the operational phase of the Scheme, the significant impacts would be reduced to non-significant when appropriate mitigation measures are implemented. The reduction of PoB’s quay length available for berthing is considered the only significant residual impact for operation; however, this is offset by the widening of the WDE.

9.2.38 The Navigational Impact Assessment set out a number of identified significant effects and details of mitigation measures that the Agency proposes be employed to address those effects.

9.2.39 In consideration of matters raised by third parties in their representations and objections to the TWAO Application regarding navigation, the Agency is preparing, and intends to produce in advance of the public inquiry, a draft Navigational Management Plan to document and commit to mitigation measures proposed to be implemented. It is the Agency’s intention to propose a new planning condition that would require it to comply with the provisions of the Navigational Management Plan.

Road Traffic and Transport

9.2.40 Construction works are expected to increase road traffic levels during construction associated with both the left and right banks of the Haven. Traffic from the left bank
compound is expected to follow St John’s Road onto the A16 and A52, and traffic from the right bank construction compound would follow Marsh Lane onto the A16.

9.2.41 The increase in traffic could lead to an increase in delays on the local roads which are considered a significant adverse effect. Any road-based construction impacts will be temporary and will be managed effectively by a construction traffic management plan (CTMP) which would reduce the effects to non-significant. A draft CTMP was prepared and submitted as part of the TWAO Application (A17/2d). This draft plan will be further developed and submitted to BBC for its approval pursuant to the Planning Conditions prior to the start of construction.

9.2.42 The Boston Public Footpath No.14 (Macmillan Way), would be diverted throughout the entirety of construction phase of the Scheme, and would result in a temporary adverse significant effect. The CTMP would provide information on the diversion which would be distributed to local residents and businesses. In addition, appropriate signage would be provided and specified in the CTMP. This would reduce the effect to non-significant.

9.2.43 There are no effects anticipated to result during the operation of the proposed barrier.

Air Quality

9.2.44 The assessment has shown that effects on local air quality resulting from increased traffic during construction, including within the Boston Air Quality Management Area (AQMA), will not be significant. In addition, construction activities on site would not result in significant effects, but onsite activities could potentially increase dust levels. This would be managed and controlled through good site practice, including damping down of spoil material and limiting stockpiles on site. The mitigation measures will be documented in the construction method statement which would be submitted to BBC for approval prior to the start of construction.

9.2.45 The operation of the proposed barrier will not reduce air quality in the vicinity of the Scheme.

Community

9.2.46 During construction, the appointed contractor will seek to use materials that can be sourced locally and reduce the carbon impact of transportation, and also report, and demonstrate their commitment to, their use of small and medium enterprises. This will be captured and delivered through the construction method statement.

9.2.47 The diversion of Boston Public Footpath No.14 (Macmillan Way) and the disruption to cyclists as a result of the Scheme are not anticipated to result in significant community effects.

9.2.48 There is the potential for odour as a result of drying of the dredged materials across the four dredging phases. However, this is not anticipated to result in a significant effect.
9.2.49 Once operational, the Scheme would result in long term benefits for the community and local businesses by reducing the risk of flooding and the resulting damage to houses, streets and community stress.

Cumulative and in-combination effects

9.2.50 Cumulative and in-combination effects were considered within the ES. Cumulative effects arise due to interactions between the Scheme and past, present and future (reasonably foreseeable) developments in the locality of the Scheme which have not been included in the baseline. In-combination effects result due to interactions between different elements (i.e. noise and landscape affecting the same receptor) within the Scheme.

9.2.51 Eleven developments (five residential developments and six Agency schemes) were identified within the vicinity of the Scheme which have the potential to result in cumulative effects. Three of the Agency schemes were scoped out of the assessment. One was scoped out due to the type of work being undertaken and two were scoped out as they were still in the inception stage.

9.2.52 An assessment of the remaining eight developments determined that there would be no inter-project cumulative effects with any of the residential developments during either construction or operation. In addition, it was determined that with the implementation of mitigation and construction best practice measures by the Agency schemes it would be unlikely that the schemes would result in significant cumulative effects during construction or operation.

9.2.53 It was determined that there was the potential for in-combination effects during construction as a result of a decrease in visual amenity, increase in noise and a loss of community assets. However, the assessment determined that it was unlikely that these would result in significant adverse effects.

9.2.54 During operation it was determined that there was the potential for in-combination cumulative effects as a result of increased protection from flood risk for community and heritage assets and reduction in visual amenity as a result of the Scheme. However, the assessment showed that significant in-combination cumulative effects during operation were unlikely.
10 ACQUISITION AND USE OF LAND

10.1 Overview

10.1.1 The Order, if made, will grant the Agency the authority to acquire compulsorily land and interests in land in order to construct, operate and maintain the Scheme. The extent of the land affected is shown within the red line boundary on the Location Plan included within the Order Plans (A/14) which accompanied the TWAO Application. This red line boundary is referred to within the Order as the Order Limits.

10.1.2 All areas of land and interests sought are necessary for the Scheme and no land will be acquired permanently or subject to temporary possession unless properly required for the construction, operation or maintenance of the Scheme or to mitigate its effects. The Order Limits have been drawn as necessary to achieve this in an appropriate manner.

10.2 Land Requirements

10.2.1 Land lying within the Order Limits has been divided into numbered plots, having regard to the persons who currently enjoy interests in the land. Each land parcel is identified in the Book of Reference (A/15) which accompanied the TWAO Application. The Book of Reference also provides information regarding the extent and description of each land parcel, as well as details of owners, occupiers and lessees in each case. It has been prepared following diligent enquiry and on the basis of Land Registry data, owner questionnaires, site inspections and notices.

10.2.2 The land parcels are also identified within the four Land Plans comprised within the Order Plans (A/15). Colouring has been applied to each land parcel to reflect the most onerous acquisition power the Agency is seeking over each land parcel. The categories in question are as follows:

(a) permanent freehold acquisition is proposed in relation to land coloured pink;

(b) the acquisition of permanent rights is proposed in relation to land coloured yellow;

(c) temporary possession only is proposed in relation to land coloured brown; and

(d) temporary powers to carry out protective works to buildings is proposed in relation to land coloured green.

10.2.3 The powers relating to the acquisition of land and rights in land are set down within Part 4 of the Order.

10.2.4 Article 31 (power to acquire land) of the draft Order (A/2) would authorise the Agency to acquire land compulsorily. These parcels of land have been coloured pink on the Land Plans and so identified for permanent acquisition. Land parcels have generally been identified for permanent acquisition because they represent areas where the Agency is proposing to construct permanent new structures (for instance the areas required for the new barrier and control building and the new flood walls).
10.2.5 Article 24 (*power to acquire new rights*) of the Order would authorise the Agency to acquire new rights only instead of acquiring a freehold interest in the land. The Agency may exercise this power in relation to the land parcels coloured pink instead of acquiring the freehold interest of that land. This power has been included to ensure that the Agency can adopt a proportionate approach to the exercise of compulsory acquisition powers, only acquiring what it requires to deliver the Scheme.

10.2.6 Article 36 (*new rights only to be acquired in certain lands*) of the Order specifies that in relation to some parcels of land the Agency may only acquire a new right (and not a freehold interest). These land parcels, of which there are 16 in total, are shown coloured yellow on the Land Plans. In addition, these parcels of land are listed in Schedule 4 to the Order which also explains the purpose for which new rights are being sought in each case.

10.2.7 Article 38 (*temporary possession of land for construction purposes*) of the Order would authorise the Agency, in connection with the construction of the Scheme, to take temporary possession of two different categories of land parcel.

10.2.8 Firstly, it provides that certain land parcels may only be subject to temporary possession (as opposed to permanent acquisition). These land parcels are shown coloured brown (and, in the case of land which is only required to enable protective works to buildings to be undertaken, green) on the Land Plans. In addition, these parcels of land are listed in Schedule 5 to the Order which also explains the purpose for which new rights are being sought in each case.

10.2.9 Secondly, article 38 authorises the Agency to take temporary possession of any of the other land parcels lying within the Order Limits (including the land coloured pink and yellow) provided steps have not yet been taken to permanently acquire the land or interests in it.

10.2.10 In accordance with Rule 15 of the Application Rules (*B/11*), notices were served on all persons identified within the Book of Reference when the TWAO Application was made.

### 10.3 Acquisition by Agreement

10.3.1 The Agency's aim is to minimise the need to exercise the compulsory acquisition powers being sought in the Order and in an effort to achieve that aim it has engaged with affected landowners in order to negotiate by agreement the right to acquire the land or interests in the land.

10.3.2 Positive negotiations have taken place with PoB, the Crown Estate and G W Padley Holdings Limited, three of the most significantly affected landowners. Terms for the voluntary transfer of the interests required have been substantially agreed in each case and the Agency continues to work towards completion of option agreements which will avoid the need for the Agency to exercise Order powers.

10.3.3 In addition to the affected landowners, the Agency has identified that some river users (including members of the local fishing fleet, the operator of the Boston Belle and Witham Sailing Club) could be affected by the construction of the Scheme due to the effects it will have on the public right of navigation. The Agency has engaged
with those river users as regards possible mitigation measures or compensation for disturbance caused during construction of the Scheme. These discussions continue.

10.4 The Compensation Code

10.4.1 Those affected by the exercise by the Agency of the compulsory acquisition powers, either temporarily or permanently, will be entitled to compensation in accordance with the Compensation Code and, in certain circumstances, landowners who are affected by the works may also be entitled to compensation, again in accordance with the Compensation Code.

10.4.2 The Order applies Part 1 of the Compulsory Purchase Act 1965 (B/8) which, through its application, has the effect of requiring the Agency to pay compensation to qualifying parties under what is known as the Compensation Code.

10.4.3 The Code sets down the rules relating to the calculation and payment of compensation and is an amalgamation of numerous Acts of Parliament and legal precedents that have evolved over 150 years. In the event of any dispute with the Agency as to the level of compensation payable, landowners may refer the matter to the Upper Tribunal (Lands Chamber) and the Agency appreciates that these are not matters for the inquiry that has been fixed to consider the TWAO Application.

10.5 Summary

10.5.1 In identifying the land required to deliver the Scheme, the Agency has had full regard to the Guidance on Compulsory Purchase and the Crichel Down Rules issued by DCLG in 2015 (C/1/5) and considers that there is a compelling case in the public interest to justify the compulsory acquisition powers being sought through the Order.
11 UTILITIES

11.1 Engagement

11.1.1 The Agency has, over the course of the development of the Scheme, consulted with numerous statutory undertakers with a view to identifying the existence of apparatus within the Order Limits, to explain its proposals and to identify the need for protective measures or diversions.

11.1.2 The Book of Reference identifies all of the statutory undertakers who have or possibly have a right to keep equipment on, in or over land lying within the Order Limits.

11.2 Apparatus Likely to be Affected

11.2.1 Following engagement with statutory undertakers, the Agency has identified that it will be necessary to divert three existing 11kV electricity cables which are currently installed on the right bank of the Haven. This is because it is proposed to install new flood defence walls in this location. The Agency is proposing to divert the electricity cables away from the embankment, for a short distance along Wyberton Low Road. These works have been identified as Work No. 7 within the Order.

11.3 Protective Provisions

11.3.1 The draft Order includes, at Schedule 6, provisions which regulate works which may affect apparatus belonging to statutory undertakers generally. In addition, Schedule 7 contains detailed provisions which will apply for the protection of undertakers involved in the provision of electricity, gas, water and sewerage services.
12 COSTS AND FUNDING

12.1 Estimate of Cost

12.1.1 The anticipated costs of the Scheme are identified in the Estimate of Costs (A/8) submitted with the TWAO Application to the Secretary of State in accordance with Rule 10(3)(b)(ii) of the Application Rules. The capital cost of the Scheme is identified in that document to be £97,395,000 (at 2015 prices).

12.1.2 In the context of securing outline business case approval for the Scheme from Her Majesty’s Treasury (HMT) in October 2016, the updated capital cost of the Scheme was identified to be £96,372,000 (also at 2015 prices). In this context, HMT and DEFRA have scrutinised the costings prepared for the Scheme and so there can be confidence in their accuracy.

12.1.3 The cost estimate includes the capital expenditure required to obtain consents for and construct the Scheme, including the cost of acquiring land and interests in land (including any land which might be considered blighted within the meaning of section 149 of the Town and Country Planning Act 1990 (B/2)).

12.2 Whether the proposals are reasonably capable of attracting the necessary funding

12.2.1 As explained within the Funding Statement submitted with the TWAO Application (A/9) in accordance with Rule 10(3)(a) of the Application Rules, the Agency will fund the cost of implementing the works proposed to be authorised by the Order through its own resources. Funding to facilitate the construction of the Scheme has already been secured within the Agency’s investment programme for flood and coastal erosion risk management for the period 2015 to 2021. If delivered within the current programme period (by 2021), the Scheme will qualify for 100% flood and coastal erosion risk management grant in aid. Funding is therefore secure.

12.2.2 The medium and long term operation and maintenance costs of the Scheme will be funded through the Agency’s maintenance programme and in accordance with its existing protocol for the maintenance of flood and coastal erosion risk management assets in England. Capital refurbishment in the medium and longer term would be funded through future capital investment programmes. Given the importance of this Scheme, funding for the operational and maintenance costs in the future is assured.

12.3 Scheme Business Case

12.3.1 The Agency has followed the ‘Five Case Model’ recommended by HMT for use in central Government by Departments and other Government bodies to develop the Scheme’s business case and to secure financial approval to progress the Scheme.

12.3.2 In May 2014, ‘Gateway 1’ was secured following the receipt of scheme specific guidance from HMT. The achievement of Gateway 1 was accepted by the Agency with its decision supported by a Cabinet Office MPA assurance review, an informal DEFRA technical review and a recommendation for approval from the Agency’s Large Project Review Group assurance panel.
12.3.3 Gateway 2 was secured in October 2016. Following receipt of scheme specific guidance from HMT, the achieve of Gateway 2 was accepted by HM Treasury, with their decision supported by an informal DEFRA technical review, a recommendation for approval from the Agency’s Large Project Review Group assurance panel and formal acceptance by DEFRA’s Executive Committee.

12.3.4 HMT, in approving the outline business case, concluded that there is a clear strategic need for the Scheme, that the works offer a strong benefit cost ration and that a sensible approach to delivery has been identified.
13 OBJECTIONS AND REPRESENTATIONS

13.1 Introduction

13.1.1 Following the submission of the Agency’s application for the Order on 23 August 2016, a 42 day period ran from 24 August until 5 October 2016 during which representations were invited in response to the TWAO Application.

13.1.2 A total of 34 responses were made and these were categorised by DEFRA and the Transport and Works Act Orders Unit within the DfT as follows:

- 24 letters were classified as objections;
- 7 letters were classified as representations; and
- 3 letters were considered to be in support of the Scheme.

13.1.3 Whilst the above categorisations have been identified by the TWAO Unit, the Agency has considered all comments raised within the objections and representations. The Agency intends to make all reasonable efforts to address all comments raised, including entering into direct third party agreements wherever possible and appropriate.

13.1.4 This chapter of the Statement addresses the comments made within the objections and representations submitted in response to the TWAO Application. It outlines the Agency’s overall position in response. The comments received fall into a number of general categories and these are summarised below. Where necessary, the Agency intends to expand upon the matters addressed below in its evidence to the public inquiry.

13.2 Efficacy of the proposed barrier

13.2.1 Some third parties have suggested that the proposed barrier will not work, or that it will be ineffective in providing improved flood risk management.

13.2.2 In developing its proposals the Agency has considered the ability of the proposed barrier to function in the Haven’s natural environment. As such it has been designed to, and modelling has demonstrated that the structure will, provide improved flood protection to Boston and surrounding areas.

13.2.3 The Agency has undertaken a Flood Risk Assessment (FRA) (A/17/2d) for the Scheme in accordance with the UK government guidance for FRAs to assess flood risk from all sources, with the primary risk being from tidal and fluvial sources. Appropriate industry standard tools have been used to undertake the FRA, which is based on hydraulic modelling packages which have been benchmarked and approved suitable for use to simulate flood risk.

13.2.4 As shown on Figure 2.1 in the Boston Modelling Report: Non-Technical Summary which is within Appendix B of the Estuarine and Geomorphology Technical Report (A/17/2b), on completion of the proposed barrier a tidal surge would be excluded from the Haven upstream of the Barrier thus significantly reducing flood risk from...
water overtopping the flood defences during a 1 in 100, 1 in 200 or 1 in 300-year tidal flood event.

13.2.5 The proposed flood walls between the proposed barrier and Maud Foster Sluice (on the left bank) and the WPD operational site (on the right bank) would contain a 1 in 100, 1 in 200 and 1 in 300-year tidal flood event within the banks of the Haven, reducing flood risk to the Port and residential areas along Wyberton Road.

13.2.6 The Agency is committed to raising the embankments along the Haven downstream of the proposed barrier in response to predicted rise in future sea levels. The Agency is further undertaking works alongside the barrier proposals which will maintain existing tidal defences at a minimum crest level of 6.35m AOD downstream of the proposed barrier and the proposed flood wall, by filling in a number of low spots on both banks downstream of the barrier.

13.3 **Location of Barrier at the mouth of the Haven - effectiveness**

13.3.1 Comments made by third parties suggest that the proposed barrier should be located towards the mouth of the Haven, or as close as possible to it. Concerns have been raised that the current location only protects the centre of Boston from flooding whereas a barrier located at the end of the Haven would provide protection for a larger area.

13.3.2 As set out in chapter 2 of the Environmental Statement: Main Report (A/17/2a) in determining the location of the proposed barrier the Agency has undertaken a detailed and thorough selection assessment. The reasons for discounting a location at or near to the mouth of the Haven and why the Agency considers the proposed location to be the best location for the proposed barrier are set out in detail in Chapter 6 of this Statement. In any event, a barrier at the mouth of the Haven would provide no greater level of protection from flood risk and would protect no greater an area than the proposals comprised within the Scheme.

13.4 **Increased fluvial flood risk**

13.4.1 Some third parties have expressed concern that the proposed barrier will cause increased fluvial flood risk during operation. Both 1D and 2D hydraulic modelling was undertaken to assess flood risk from the River Witham, South Forty Foot Drain and Haven. The modelling was used to simulate three scenarios and the results are presented in the FRA (A/17/2c).

13.4.2 The three scenarios modelled were as follows:

- Existing / Baseline Scenario;
- Construction Scenario; and
- Operational Scenario.

13.4.3 In summary, due to the restriction of the river width, during a 1 in 100 year fluvial flood event (the proposed barrier is open in this type of flood condition) the model predicts a small increase of 60mm in the River Witham between Grand Sluice and
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the proposed barrier and 50mm in South Forty Foot Drain in the period for which Black Sluice and Grand Sluice are tide-locked (high tides which prevent flows from draining – the barrier will not alter tide-locking).

13.4.4 However, the resulting water level rise is minimal and only lasts for 30-40 minutes. This result is as expected given the main controlling influence on fluvial flows is the Grand Sluice and South Forty Foot Drain. Therefore, the proposed barrier is not predicted to substantially increase fluvial flood risk on the River Witham and South Forty Foot Drain in the 1 in 100-year flood event under existing conditions nor when considering climate change in the next 100 years.

13.4.5 Up to 22km upstream of Grand Sluice in the River Witham water levels are predicted to increase by 0.04m in the 1 in 20-year fluvial flood event and up to 0.05m in the 1 in 100-year fluvial flood event with climate change (again the proposed barrier is open for this type of flood condition). A 2.8km2 increase in the flooded area is predicted however this is restricted to the drainage ditches located between fields (see Figure 2.5 of the Flood Risk Assessment). Therefore, the model predicts no substantial change in fluvial flood risk due to the operational scenario.

13.5 Increased tidal flooding at Wyberton, Fishtoft and Frampton

13.5.1 Specific concerns were raised by some that a barrier at the proposed location will cause increased flood risk to the Parishes of Wyberton, Fishtoft and Frampton. As explained above, a FRA has been undertaken for the Scheme (A/17/2c). In summary, the FRA demonstrates that:

(a) with regards to properties and agricultural areas in the parishes of Wyberton, Fishtoft and Frampton, there will be no material change in the water levels within the Haven downstream of the proposed barrier once operational in the 1 in 100, 1 in 200 or 1 in 300-year tidal flood events. This means that the risk of overtopping during tidal flood events remains unchanged for these areas as a result of the Scheme. Phase 5 of the BCS (C/3/4) provides for the raising of the embankments along the Haven downstream of the proposed barrier in the future, when necessary and in response to future sea level rises.

(b) specifically with regards to Wyberton Road, on completion of the barrier a tidal surge would be excluded from the Haven upstream of the barrier thus significantly reducing flood risk from water overtopping the flood defences during a 1 in 100, 1 in 200 or 1 in 300-year tidal flood event. The proposed flood walls between the barrier and Maud Foster Sluice (on the left bank) and the WPD operational site (on the right bank) keep the 1 in 100, 1 in 200 and 1 in 300-year tidal flood event within the Haven banks, reducing the flood risk for the residential areas along Wyberton Road.

13.5.2 When the proposed barrier closes to prevent a surge tide travelling further up the Haven, the water that is held back by the barrier would effectively dissipate throughout the lower reaches of the Haven and more generally in the Wash. There would be some very small local increases in peak water levels as a result of the
barrier closing but these will be 0.02mm for a 1 in 300 surge event on top of a high spring tide and in effect negligible.

13.5.3 The standard of service provided by the banks will be the same as it is now with continued maintenance of the bank. Reductions in the standard of protection due to sea level rise will be addressed periodically by wholesale raising of the banks at an appropriate time in the future.

13.6 **Flood banks**

13.6.1 Third parties have suggested that the height of downstream flood banks should be increased now, at the same time as the proposed barrier is constructed, and also that these banks will otherwise not be effective.

13.6.2 The Agency is currently progressing works to maintain existing tidal defences downstream of the proposed barrier and the proposed flood wall, by addressing a number of identified low spots to maintain the existing standard of protection.

13.6.3 All of the (barrier) options considered would provide the same standard of protection for tidal flood risk management, i.e. they would be designed to reduce the risk of tidal flooding to a 1 in 300 (0.33%) chance each year over the 100 year appraisal period. For all of the options there would be significant capital cost involved in altering the maximum effective height of the barrier gates and associated structure to deal with climate change in future, whereas the incremental costs for small increases in height during construction are small. A precautionary approach has therefore been adopted for dealing with future climate change by allowing for sea level rise in the outline designs for the barrier and associated tie in to existing defences at Maud Foster Sluice and opposite the Wet Dock Entrance.

13.6.4 The downstream defence raising (Phase 5 of BCS (C/3/4)) would follow the adaptive approach to climate change recommended in the BCS with defence raising delayed until future years when the risk of overtopping due to sea level rise increases.

13.7 **Navigation – predicted increased flow rates**

13.7.1 Third parties have raised concerns about the effect of decreasing the width of the Haven at the location of the proposed barrier and in particular, that this will increase the flow rates and the velocity of ebb and flood tides in the river channel, creating a funnel effect.

13.7.2 Flows in and around the proposed barrier have been modelled for the pre-construction (baseline), construction and post-construction phases, and a summary can be found within Appendix B: Non-Technical Modelling Report provided with the Estuarine and Geomorphology Technical Report (Volume 2b) (A/17/2b).

13.7.3 The modelling for the Scheme has been developed over time by a number of consultants including those who worked on the Lower Witham modelling study (Royal Haskoning), those who worked on the BCS (Halcrow, now known as CH2MHILL) and those specifically working on the Barrier (Mott MacDonald) in line with appropriate standard practice. The model has been reviewed and approved by the Agency’s modelling and forecasting team. The models are considered to be
accurate and have been calibrated against historical conditions including known flood events. Therefore the extent of hydraulic modelling is considered sufficient for the assessment of flow velocities in and around the proposed Barrier.

13.7.4 Flow modelling was undertaken for both ‘normal’ summer and winter spring flood and ebb tides and ‘difficult’ navigation conditions as reported by the river users. The modelling takes account of the width and depth of the gap and the angle of the gap in relation to river alignment, producing a two-dimensional model of flow velocity and direction in and around the proposed barrier and regions upstream and downstream of the proposed barrier.

13.7.5 The width of the barrier structure opening will reduce the effective width of the existing river channel. The maximum velocities at the barrier location could reach between 0.9 knots (0.5m/s) and 1.2 knots (0.6m/s) under the Mean High Water Spring tide with a typical base flow with the Barrier in place (gate fully lowered i.e. open). The maximum velocities in the proposed barrier area are predicted to be higher than velocities in the existing channel. However, the velocities are approximately the same as those observed at the Swing Bridge for the majority of the tide and are similar to velocities currently experienced at the Haven Bridge (A16 Crossing) throughout the whole tide. These findings correspond with velocity tests undertaken.

13.7.6 The outcomes of the modelling and the simulation study accord with the expectations of the Agency. As such, the Agency is confident that those wishing to transit through the proposed barrier will be able to do so successfully in a range of conditions, with the change in flow regime having limited impact on the ability of vessels to navigate the proposed barrier.

13.8 Navigation – Safety during construction and operation of the proposed barrier

13.8.1 A number of third parties expressed concerns about navigational safety during construction and operation of the proposed barrier. In particular the combination of the narrowing of the channel width, the location of the proposed barrier on a bend which will impact on sight lines, and increased velocities causing a funnel effect on the ability of vessel’s to navigate safely past the proposed barrier and avoid collision with the barrier or other vessels were matters raised.

13.8.2 The impact of the proposed barrier on navigation during construction has been assessed and is set out in the Navigational Impact Assessment (NIA) (A/17/2d) produced and submitted with the TWAO Application. The model has been reviewed and approved by the Agency’s modelling and forecasting team. In addition, data from actual events recorded in September 2013, January 2016, and March 2016 was used where regular river users reported having difficulties with navigation in existing conditions without the proposed barrier in place. The modellers calibrated the model to these events using the other data recording devices on flow volume etc. Therefore, this shows that the model conforms to the existing situation and would provide an accurate representation of the situation during normal conditions.

13.8.3 In summary, the NIA has shown that there are likely to be significant effects on navigational safety during construction and operation of the Scheme. However, the
NIA also concludes that with the implementation of mitigation measures potentially significant impacts could in most instances be reduced to non-significant. The NIA sets out a number of identified significant effects and details mitigation measures that the Agency proposes be employed to address those effects.

13.8.4 The Agency intends to produce, in advance of the public inquiry, a draft Navigational Management Plan to document and commit to mitigation measures identified within the NIA and proposed to be implemented.

13.8.5 The navigational conditions predicted during construction and operation of the proposed barrier, including increased velocity, reduced sightlines and width of the navigation channel, have been tested further in a full bridge real time navigation simulation to investigate the ease of navigating through the cofferdam by-pass and the barrier opening. Full bridge simulation is widely regarded as the best tool available for investigating navigational aspects of marine developments.

13.8.6 The following conditions were modelled in the navigation simulation:

- Typical summer conditions – mean spring tide, $4m^3$ from Grand Sluice, $2m^3$ from Black Sluice
- Difficult summer conditions – 20 September 2013 conditions, ‘large’ tidal range, ‘low’ fluvial flow
- Typical winter conditions – mean spring tide, $55m^3$ from Grand Sluice, $19m^3$ from Black Sluice
- Difficult winter conditions – 10 March 2016 conditions, smaller than mean spring tide, ‘high fluvial flow

13.8.7 To calibrate and validate the simulations, the simulator configuration was tested in order to ensure that the simulation works in line with expectations. Furthermore, the ship manoeuvring models were tested using standard trials such as turning circle and emergency stop tests. The results of these tests were considered to be consistent with the known and assumed behaviour of similar vessels during construction and operation. The master mariner from HR Wallingford and the Agency’s in-house expert, who undertook the simulations, also verified the performance of each of the modelled vessels using a series of test manoeuvres in a range of conditions.

13.8.8 In addition a series of standard simulator set-up verification tests were undertaken to confirm that all components of the simulation were configured correctly and were interacting as expected.

13.8.9 The simulation determined that during construction the by-pass channel is suitable for one-way traffic only. For larger vessels, such as the fishing boats and the Boston Belle, they should only transit the cofferdam structure when the vessels are going against the current or at high water when the tidal influence on flows is lowest, while smaller craft, such as 6.5m yachts, could pass through the cofferdam by pass while travelling in the same direction as the current.
13.8.10 In addition, the simulation confirmed that all vessel movements passing the cofferdam should be pre-arranged.

13.8.11 The simulation showed that during operation of the proposed barrier, when a 25m wide Barrier navigation channel will be in place, one-way traffic is most suitable in the case of larger vessels (such as fishing boats, the PoB dredger and the Boston Belle) but that smaller craft, such as a 6.5m yachts, could pass side-by-side through the proposed barrier.

13.8.12 With regards to sightlines around the proposed barrier, these would be similar to the situation at present when a Grain Ship is moored on the Silo Berth. It is understood that the Grain Ship is moored on an ad hoc basis with no warning at the Silo Berth once or twice a month for a week in duration during the summer.

13.8.13 Extensive consultation and engagement regarding safety of navigation during both construction and operation has been undertaken with the Harbour Authority. The Harbour Authority has jurisdiction of traffic (boat movements/navigation) in the Haven and will retain responsibility to manage the traffic during construction and through the bypass channel. However, during construction the contractor will also put measures in place that will ensure that navigational safety is not compromised. In addition the Harbour Authority has a statutory duty and role which they will enforce in terms of safe navigation. The Agency’s appointed contractors will work with the Harbour Authority to ensure appropriate safety arrangements are in place during construction and operation of the Barrier.

13.8.14 In summary, the Agency will take all reasonably practicable steps to ensure that navigational safety in the Haven, through the site of the proposed barrier, can be effectively maintained during the construction and operational phases of the Scheme.

13.9 **Securing navigation mitigation measures**

13.9.1 Concerns have been raised that there is insufficient detail on the proposed navigational mitigation and that it has not been secured within the TWAO Application. Some third parties also argue that the measures proposed will not be effective.

13.9.2 As mentioned previously within this Statement, the Agency intends to prepare a draft Navigational Management Plan to document and commit to the mitigation measures proposed to be implemented. The Navigational Management Plan will consider mitigation during the construction and operational phases of the Scheme. The Agency also intends to propose a new planning condition that would require it to comply with the provisions of the Navigational Management Plan, once finalised.

13.9.3 The mitigation measures identified within the NIA were confirmed appropriate within the subsequent real-time navigation simulation exercise, where sight lines, visual impact on navigators, and physical form of the Barrier structures were all investigated. The Agency will demonstrate that the proposed mitigation measures are effective in evidence to the Inquiry.
13.10 Removal of Water Level Management

13.10.1 Third parties have also provided comments regarding the removal of WLM from the scope of the Scheme. Some parties have expressed concern that progressing a flood risk management only barrier will result in a loss of benefits to the local area, including loss of long term investment opportunities and the opportunity to deliver wider waterway network improvements.

13.10.2 The Agency has explained the reasons why the Scheme is progressing on a flood risk management basis in Chapter 3 of this Statement. As was explained there, whilst delivery of the waterways objective set by the BCS was removed from the scope of the Scheme it remains a strategic objective of the Agency and its project partners (including LCC and BBC) to deliver the waterway elements of the BCS in the medium to long term. The Agency has sought to develop the Scheme so as not to preclude the future delivery of the shared strategic objective to utilise the proposed barrier for WLM purposes in the future.

13.11 Inclusion of a lock

13.11.1 Third parties have also submitted representations requesting that a lock be provided as part of the Scheme. The delivery of a lock is not required to facilitate the improved flood risk protection that the Scheme seeks to deliver.

13.11.2 The inclusion of a lock within the area immediately adjacent to the proposed barrier was considered by the Agency during early development work, when a multi-functional barrier was under consideration. A lock was considered to see whether it might assist to mitigate against possible adverse effects that might arise if the barrier was utilised for WLM purposes.

13.11.3 In 2011, consultation with river users suggested that the provision of a lock offered limited resolution to the potential impacts of using a barrier to achieve WLM on river users such as the local fishing fleet. The feedback from the 2011 consultation was subsequently confirmed by technical work undertaken by HJA following technical consideration and the Agency decided not to progress proposals for a lock further.

13.11.4 Whilst the provision of a lock does not form part of the Scheme, the Agency recognises that some third parties would like to see a lock form part of future plans for WLM. The Agency has designed the Scheme, through repositioning of the proposed barrier control building, to allow for the future provision of a lock (if deemed appropriate) by providing sufficient space alongside the proposed barrier.

13.12 Permanent relocation of the fishing fleet

13.12.1 As explained in the Consultation Report (A/5) submitted as part of the TWAO Application, the Agency has held regular meetings with representatives of the BDFA in order to inform them about the Agency’s developing proposals for a barrier and to seek their views.

13.12.2 During these discussions, the main concern raised by the BDFA concerned the Agency’s preferred location for the proposed barrier and the possible need to relocate the local fishing fleet from the quay it currently operates from, which is
located upstream of the proposed barrier location. The fishing fleet raised concerns about their ability to navigate through the stretch of river within which the barrier was proposed to be constructed.

13.12.3 When the Agency was proposing to deliver WLM, consideration was given to permanently relocating the fishing fleet to a new location within the Port estate, downstream of the proposed barrier. As the Scheme now proposes a barrier for flood risk management purposes only, the Agency does not consider it necessary to permanently relocate the fishing fleet downstream of its proposed location.

13.12.4 The Agency is proposing to temporarily relocate the fishing fleet within the Port during the construction of the proposed barrier. However, having undertaken a detailed assessment of the likely significant effects of the Scheme the Agency is of the view that with mitigation in place the fishing fleet will be able to safely navigate through the barrier’s location once the Scheme is operational.

13.13 Impact on the Port of Boston

13.13.1 Whilst PoB submitted a letter of objection in response to the TWAO Application, this noted that it was in discussions with the Agency with a view to reaching agreement on all matters relating to the Scheme and the Port and enabling it to withdraw its objections.

13.13.2 The parties have continued positive discussions and agreement is close to being reached. The Agency has no reason to believe there will be issues outstanding at the commencement of the inquiry.

13.14 Impact on Frontier Agriculture Limited

13.14.1 Frontier, who currently occupy an area within the Port, would be affected by construction works proposed to be undertaken. In particular, it would be necessary to dismantle the existing grain tower conveyor which is located on the left bank of the Haven, within the Port.

13.14.2 This loading facility is currently utilised by Frontier Agriculture Limited (Frontier). It is the Agency’s intention to relocate the grain conveyor to a new location approximately 100m downstream and to construct new towers to enable a single aerial conveyor to be installed between Frontier’s operational site and the quayside. These works are described as Work Nos. 8A and 8B within the scheduled works described in Schedule 1 to the Order.

13.14.3 Frontier has expressed concerns about the precise detail of the facilities proposed to be delivered. Discussions continue with both Frontier and PoB. It is the Agency’s objective to identify a solution for the replacement facility which satisfies both Frontier (as the operator of the facility) and PoB (as the owner of the land in question) and it remains confident that such a solution can be achieved.

13.14.4 In the event that Frontier does not consider that impacts on its land interests have been adequately mitigated, compensation can be claimed under and in accordance with the compensation code.
13.15 **Impact on utilities**

13.15.1 WPD has raised a number of concerns regarding possible impacts on its apparatus within the Order Limits. The Agency is in discussion with WPD regarding any possible impact and an agreement is likely to be reached. The Agency has no reason to consider that any issues will be outstanding at the inquiry.

13.15.2 Anglian Water Limited has also submitted a representation in response to the TWAO Application although this does not raise any specific concerns regarding the Scheme. The Agency does not anticipate that there will be any adverse effects on Anglian Water’s infrastructure and is working with Anglian Water to demonstrate that.

13.16 **Impact on cultural heritage**

13.16.1 Historic England has made a number of comments regarding cultural heritage. Historic England has acknowledged that mitigation measures incorporated into the design of the Scheme (namely the embedding of sheet piling into the right bank) have significantly reduced the predicted impact and therefore concluded that the Scheme would not give rise to substantial harm to the value of the heritage assets.

13.16.2 Historic England does not support ornamentation or continuous or near continuous artwork in the path side of the wall and has asked that the interpretation should be discreetly designed and situated only at particular points along the wall, where appropriate. This will be taken into account when specifying, designing and installing any interpretation or art work related to the Scheme.

13.16.3 Historic England remains concerned over the introduction of WLM and ask that this be considered as a standalone project and consenting process. WLM will not be delivered through the Scheme and will therefore be subject to a further consenting process were it to be introduced in the future.

13.16.4 Overall, Historic England has recognised that the Scheme will provide significant public benefits, including to the historic environment. Therefore, under the terms of the NPPF, Historic England has not raised an objection to the Scheme based on a balanced judgement, taking into account these significant public benefits and the less than substantial harm caused to St Nicholas Church and Skirbeck Conservation Area by the Scheme.

13.17 **Consultation**

13.17.1 A number of third parties have criticised the level of engagement undertaken by the Agency.

13.17.2 Throughout the development of the Scheme the Agency has demonstrated its commitment to ensuring that all interested parties were given adequate opportunity to express their views through the consultation and local engagement it has undertaken. Further detail of those activities is provided in chapter 8 of this Statement and within the Consultation Report (A/5) produced with the TWAO Application.
13.18 **Alternative locations**

13.18.1 A number of third parties have questioned whether the preferred location identified for the proposed barrier is the best option, in light of the potential impacts on navigation.

13.18.2 As explained in Chapter 7 of this Statement, and set out in chapter 2 of the Environmental Statement: Main Report (A/17/2a) in determining the location of the proposed barrier the Agency has undertaken a detailed and thorough selection assessment and considers that the best location for the proposed barrier has been selected.

13.19 **Royal Mail**

13.19.1 Royal Mail Group plc has sought clarification from the Agency that its operational and statutory duties will not be adversely affected by the Scheme. The Agency has provided Royal Mail with the information it has requested and is of the view that there will be no adverse impacts on Royal Mail's duties. The Agency has no reason to believe there are any issues outstanding.

13.20 **Witham Forth IDB**

13.20.1 Witham Forth IDB has submitted a representation seeking confirmation that the Agency’s works would not prevent it from carrying out its functions. The Agency will continue to work with Witham Forth IDB to ensure that, as far as reasonably practicable, access to its existing apparatus is maintained and that the Agency will not impede the discharge of water from the existing apparatus in the Plots. It is anticipated by the Agency that any concerns that the Witham Forth IDB might have will be addressed prior to the inquiry.
14 CONCLUSIONS

14.1 Boston is an area at very high risk of serious and damaging flooding. The December 2013 flood event is an illustration of the severe impacts of flooding to the town. Flooding has historically posed a risk to Boston and is an event that is predicted to occur more frequently in the future due to climate change.

14.2 The Agency is taking action to ensure the level of flood protection is increased to better protect Boston from future flood events. The proposed barrier is considered to be the solution which will provide the best flood protection to Boston and will deliver considerable benefits to the local area.

14.3 The Scheme has strong political support both at central, regional and local level. Without exception, all those who have commented on the proposals to the Secretary State – objections and representations – accept that a barrier is necessary.

14.4 Consultation on the proposed barrier has been extensive, especially with those who are set to be most closely affected. The Agency recognises it will not be possible to address the needs of everyone and that it will never be able to entirely remove the potential impacts. However, it has sought to balance all interests and mitigate all impacts in developing a scheme that will offer sufficient flood protection to Boston. The proposed barrier also keeps the option of a WLM scheme being introduced in the future even though it does not form part of the scheme itself.

14.5 Extensive modelling of the flood effects have been undertaken, with appropriate validation. The Agency is confident that the proposed barrier will work and will offer the protection needed to Boston.

14.6 Whilst the Agency has worked hard to try and demonstrate how the proposed barrier will work, and the level of protection it will offer, there are still some misapprehensions. For example, some still consider a location further downstream would offer a better level of flood protection. This is not correct.

14.7 There are very good substantiated reasons for locating the proposed barrier where it is currently proposed – with or without WLM. The Agency is confident that the assessments and consultations undertaken have identified the correct location for the proposed barrier, irrespective of how it would operate. Downstream locations would have greater costs and potentially greater environmental impacts than the proposed location. They would prejudice the operation of the PoB which is an important element of Boston’s economy which should not be compromised by the proposed barrier’s development.

14.8 For other rivers users, concerns remain over the impacts on them during the construction and operation of the proposed barrier. The barrier proposal has undergone numerous detailed assessments to identify what the potential effects will be. It is recognised that there will be some effects on navigation. The NIA (A/17/2d) reported these effects and mitigation measures that the Agency proposes be employed to address them. The Agency recognises that third parties have raised concerns about the effects of the barrier on navigation and is preparing a draft Navigational Management Plan to document and commit to the mitigation measures it proposes to implement. It is the Agency’s intention to propose a new Planning Condition that would require it to comply with the provisions of the Navigational Management Plan.
14.9 The Agency considers any residual effects to be not substantial and to be acceptable in light of the greater good of delivering improved flood protection for Boston. The Agency considers that the public interest in flood protection outweighs those residual effects. There is a compelling case in the public interest to construct the Barrier and to interfere with land and navigation rights necessary to construct and operate the Barrier. For those with interests in land that may be impacted by the proposed Scheme, compensation can be claimed under the compensation code.

14.10 The funding for the capital cost is in the Agency’s budget and the costs and operation and maintenance are committed to by the Agency. The proposed Scheme will have no greater effect on people than is necessary and is considered proportionate to the substantial public good to be achieved.
### Appendix 1: Glossary of Terms

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>ABI</td>
<td>Association of British Insurers</td>
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<td>AOD</td>
<td>Above Ordnance Datum</td>
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<td>AQMA</td>
<td>Air Quality Management Area</td>
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<td>BDFA</td>
<td>Boston District Fishermen's Association</td>
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<td>BBC</td>
<td>Boston Borough Council</td>
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<td>BCS</td>
<td>Boston Combined Strategy</td>
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<td>CFMP</td>
<td>Catchment Flood Management Plan</td>
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<td>CTMP</td>
<td>Construction Traffic Management Plan</td>
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<td>DCLG</td>
<td>Department for Communities and Local Government</td>
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<td>DEFRA</td>
<td>Department for Environment, Food and Rural Affairs</td>
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<td>Halcrow Jacobs Alliance</td>
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<td>Strategic Flood Risk Assessment</td>
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<td>Transport and Works Act Order</td>
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<td>Water Level Management</td>
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## Appendix 2: List of Documents

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<td>A/14</td>
<td>Order Plans</td>
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<td>Book of Reference</td>
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<td>Planning Direction Drawings</td>
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<td>A/17/1</td>
<td>Environmental Statement Main Report</td>
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<td>A/17/2a</td>
<td>Environmental Statement Volume 2a (Cultural, Land Use, Landscape and Noise and Vibration)</td>
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<td>Environmental Statement Volume 2b (Contaminated Land, Ecology and Nature Conservation, Estuarine and Geomorphology Processes and Surface Water and Flood Risk)</td>
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<td>A/17/2c</td>
<td>Environmental Statement Volume 2c (Flood Risk Assessment and Ground Investigation)</td>
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<td>A/17/2d</td>
<td>Environmental Statement Volume 2d (Air Quality, Navigational Impact Assessment, Outline Site Waste Management Plan and Traffic and Transport)</td>
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<td>A/17/3</td>
<td>Environmental Statement Non-Technical Summary</td>
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<td>Order Plans and Planning Direction Drawings</td>
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<tr>
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<td>Transport and Works Act 1992</td>
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<td>Planning (Listed Building and Conservation Areas) Act 1990</td>
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<td>B/4</td>
<td>Marine and Coastal Access Act 2009</td>
</tr>
<tr>
<td>B/5</td>
<td>Acquisition of Land Act 1981</td>
</tr>
<tr>
<td>B/6</td>
<td>Control of Pollution Act 1974</td>
</tr>
<tr>
<td>B/7</td>
<td>Climate Change Act 2008</td>
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<tr>
<td>B/8</td>
<td>Compulsory Purchase Act 1965</td>
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<td>B/9</td>
<td>Flood and Water Management Act 2010</td>
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<td>Environment Act 1995</td>
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<td>B/12</td>
<td>Transport and Works (Inquiries Procedure) Rules 2004</td>
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<td>Transport and Works (Model Clauses for Railways and Tramways) Order 2006</td>
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<td>Planning (Listed Building and Conservation Areas) Regulations 1990</td>
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<td>Construction Design and Management Regulations 2015</td>
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<td>B/19</td>
<td>The Ipswich Barrier Order 2012</td>
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<td>B/20</td>
<td>Water Resources Act 1991</td>
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<td>C</td>
<td>Policy and Guidance Documents</td>
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<td></td>
<td><strong>National Documents</strong></td>
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<tr>
<td>C/1/1</td>
<td>National Planning Policy Framework, DCLG (2012)</td>
</tr>
<tr>
<td>C/1/2</td>
<td>East Inshore and Offshore Marine Plans, DEFRA (2014)</td>
</tr>
<tr>
<td>C/1/5</td>
<td>Guidance on Compulsory Purchase and the Crichel Down Rules, DCLG (2015)</td>
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<tr>
<td>C/1/6</td>
<td>Flooding in England: A National Assessment of Flood Risk, EA (2009)</td>
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<tr>
<td>C/1/8</td>
<td>The National Flood and Coastal Erosion Risk Management Strategy for England</td>
</tr>
<tr>
<td>C/1/9</td>
<td>UK Marine Policy Statement</td>
</tr>
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<td></td>
<td><strong>Lincolnshire Documents</strong></td>
</tr>
<tr>
<td>C/2/1</td>
<td>Lincolnshire Minerals and Waste Local Plan Core Strategy and Development Management Policies (2016)</td>
</tr>
<tr>
<td>C/2/2</td>
<td>Draft South East Lincolnshire Local Plan 2011-2036 (2016)</td>
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<td><strong>Local Documents</strong></td>
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<tr>
<td>C/3/1</td>
<td>Boston Borough Local Plan (1999)</td>
</tr>
<tr>
<td>C/3/3</td>
<td>BBC Strategic Flood Risk Assessment, BBC (2010)</td>
</tr>
<tr>
<td>C/3/5</td>
<td>Boston Borough Council TWAO Application Report, Planning Committee 13 September 2016</td>
</tr>
</tbody>
</table>
### LBC | Listed Building Consent Application
---|---
LBC/1 | Listed Building Consent Application Letter
LBC/2 | Listed Building Consent Application Form
LBC/3 | Listed Building Consent Application Plans
LBC/4 | Listed Building Consent Conditions
LBC/5 | Design and Access and Heritage Statement
LBC/6 | Boston Borough Council Listed Building Report, Planning Committee 13 September 2016
LBC/7 | Boston Borough Council Planning Committee Minutes 13 September 2016

### I | Inquiry Documents
---|---
I/1 | Statement of Case of the Environment Agency (December 2016)
Appendix 3: Notice of Locations where documents referred to in Appendix 2 may be inspected

A copy of each of the documents listed in Appendix 2 to the Statement of Case may be inspected free of charge from 13 December 2016 until the commencement of the public inquiry by visiting the following locations at the times shown:

<table>
<thead>
<tr>
<th>Venue</th>
<th>Opening Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boston Barrier Community Hub</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Riverside Industrial Estate</td>
<td><strong>Boston Banner Community Hub</strong></td>
</tr>
<tr>
<td>Marsh Lane, Boston PE21 7PJ</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>Environment Agency</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Kingfisher House</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Goldhay Way</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Orton Goldhay</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Peterborough PE2 5ZR</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>Viewing is by appointment only.</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Please telephone 020 847 47371 to arrange an appointment.</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>There is no visitor parking on site but parking is available behind the building at the Orton Centre.</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>Boston Borough Council</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Municipal Buildings</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>West Street</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>Boston PE21 8QR</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>The Council offices will close at 1645 on Friday 23 December 2016 and will re-open at 0845 on Tuesday 3 January 2017</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>Bircham Dyson Bell LLP</strong></td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>50 Broadway</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td>London SW1H 0BL</td>
<td><strong>Venue</strong></td>
</tr>
<tr>
<td><strong>The office will also be closed on Wednesday 28 December 2016</strong></td>
<td><strong>Venue</strong></td>
</tr>
</tbody>
</table>

Arrangements will also be made for the documents served on the Environment Agency by others to be made available for inspection at the above locations.

Copies of any of these documents may be obtained from Bircham Dyson Bell LLP, 50 Broadway, London SW1H 0BL (Attention: Mrs Pam Thompson (t: 020 7783 3437; e: pamthompson@bdb-law.co.uk)). A charge may be payable.
Appendix 4: Figures, Photographs and Tables

Figure 1: Boston Haven Defence Level
Figure 2: Storm Surges

Storm surge occurs near high tide

Storm surge occurs near low tide
Figure 3: Extent of Flooding in Boston, December 2013
Figure 4: Scheme Location
Figure 5: Locations along the Haven
Figure 6: Shortlisted Options A to E
Figure 7: Preferred Location - Option B
Photograph 1: Flood Damage
Table 1: Proposed Construction Programme

<table>
<thead>
<tr>
<th>Construction works activity</th>
<th>Indicative programme and duration</th>
<th>Comment/assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling works</td>
<td>Pre November 2017 - 10 weeks</td>
<td>Cable diversions; Grain silo jetty on the right bank to be demolished before dredging starts.</td>
</tr>
<tr>
<td>Enabling dredging works</td>
<td>November 2017 - January 2018 - 9-12 weeks</td>
<td>Phase 1 dredging to produce a sufficient area to allow for a navigable by-pass channel (18m) and installation of temporary scour protection. Phase 2 dredging to level the area in front of the PoB (including area of proposed WSC mitigation). Dredging works would be carried out prior to the closure of the Wet Dock.</td>
</tr>
<tr>
<td>Phase 1 and Phase 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment of site</td>
<td>January 2018 – March 2018 - 6-8 Weeks</td>
<td>Left and right bank.</td>
</tr>
<tr>
<td>Construction of WSC facilities</td>
<td>March 2018 – September 2018 - 8-10 Weeks</td>
<td>Establishment of WSC temporary facilities including the slipway and mooring pontoon.</td>
</tr>
<tr>
<td>Wet Dock closure</td>
<td>January 2018 – September 2018 - 9 Months</td>
<td>Wet Dock to close on completion of Phase 2 Dredging Works carried out on Wet Dock would be undertaken on a 24 hour per day 7 days a week basis. PoB Riverside quays to remain operational.</td>
</tr>
<tr>
<td>Wet Dock opening</td>
<td>End September 2018 - -</td>
<td>-</td>
</tr>
<tr>
<td>Left bank quayside works, Tie into Wet Dock and barrier structure</td>
<td>October 2018 - November 2019 - 13 Months</td>
<td>Concrete flood wall works to be land based.</td>
</tr>
<tr>
<td>Installation of temporary scour protection along by-pass channel</td>
<td>September 2018 – October 2018 - 3-4 Weeks</td>
<td>Following completion of enabling dredging works.</td>
</tr>
<tr>
<td>Place cofferdam</td>
<td>October 2018 – December 2018 - 3 Months</td>
<td>Minimum by-pass channel at all times would be 18m.</td>
</tr>
<tr>
<td>Right bank works</td>
<td>April 2018 – Dec 2019 - 21 Months</td>
<td>All works to be land based.</td>
</tr>
<tr>
<td>Construction of barrier structure</td>
<td>January 2019 – July 2019 - 7 Months</td>
<td>Minimum by-pass channel width at all time would be 18m. By-pass would still be opened when the Wet Dock is closed and ships are relocated to riverside berths. By-pass channel would be closed to place the barrier gate. Barrier in operation when the tie-in to left bank works occurs.</td>
</tr>
<tr>
<td>Barrier completion: removal of the cofferdam/testing and commissioning</td>
<td>August 2019 – November 2019 -</td>
<td>Once the barrier works are completed, the by-pass would be closed and navigation traffic redirected.</td>
</tr>
<tr>
<td>Dredging Phase 3</td>
<td>November 2019 - 2-3 weeks</td>
<td>Dredging of the remaining volumes of areas Phase 3 Navigation is likely to be closed for safety reasons.</td>
</tr>
<tr>
<td>Installation of permanent scour protection</td>
<td>September 2019 – October 2019 - 6-8 Weeks</td>
<td>Installed upon completion of Phase 3 dredging Navigation is likely to be closed for safety reasons.</td>
</tr>
<tr>
<td>Construction works activity</td>
<td>Indicative programme and duration</td>
<td>Comment/assumption</td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>--------------------</td>
</tr>
<tr>
<td>Dredging Phase 4</td>
<td>November/Early December 2019</td>
<td>Final sweep dredging to remove any material from area Phase 4</td>
</tr>
</tbody>
</table>

Project completion December 2019