Nottingham Trent Left Bank FAS Environmental Statement

APPENDIX B – ATTENBOROUGH, EREWASH AND RYLANDS

OCTOBER 2008

Reference number IMMI000642

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME ENVIRONMENTAL STATEMENT

APPENDIX B
ATTENBOROUGH, EREWASH & RYLANDS

CONTENTS

A list of abbreviations, a glossary and a list of references are included in *Sections 14 to 16, Volume 1*.

List of Tables

List of Figures

In Main Text

In Annex B1

In Annex B3

B1. INTRODUCTION

B1.1 Background to the Project

Nottingham is located on the banks of the River Trent and currently some 16,000 properties are at risk of flooding. The city has a long history of flooding with notable events occurring in 1795, 1875 and 1947. The latter prompted construction of the current defences during the 1950s. The most recent flood event was in November 2000, which was classified as an event with a 3%[1] (1 in 33) annual probability of occurrence. The summer of 2007 saw significant flood events elsewhere in England while on the River Trent through Nottingham flooding was not more than a 50% (1 in 2) annual probability of occurrence.

An appraisal of the flood risk in Nottingham was published by the Environment Agency in 2005. The study, known as the Fluvial River Trent Flood Risk Management Strategy (the Fluvial Trent Strategy), included inspections of the existing defences, topographic surveys, ground investigations, computer modelling of the river, economic analyses and a review of options. The work confirmed that the standard of protection of the existing defences is low in places and that some of the defences are approaching the end of their useful life. A business case has been approved by the Environment Agency's Board to undertake works to manage flood risk and increase the standard of protection to protect against a flood event with a 1% annual probability of occurrence.

Works to improve the defences on the left bank of the River Trent through Nottingham are being proposed as part of the Nottingham Trent Left Bank Flood Alleviation Scheme (FAS). The scheme will involve raising existing flood defences and constructing new ones where required. The whole of the left bank of the River Trent through Nottingham is a single 'flood cell'. By this term we mean that a breach at the defences at any location could, in theory, flood the whole cell. The cell extends a distance of 27km from the M1 at Sawley to the Radcliffe Railway Viaduct; refer to *Figure 1.1, Volume 1*. Only upon completion of the entire works will the whole flood cell be protected.

The works span the boundaries of four local planning authorities. As a result, *Volume 1* of the Environmental Statement (ES) is a 'front end' overarching summary document. It outlines the approach and scope of the Environmental Impact Assessment (EIA), and presents the overall results. It contains all background legislation and policy, survey methodology, any generic mitigation, the glossary, abbreviations and references. It also summarises the consultation undertaken, the proposed environmental enhancements and the Health Impact Assessment (HIA).

There are four separate appendices, each of which relates to the specific works within each planning authority. This is illustrated in Table B1.1.

[1] Floods are categorised by the likelihood they will occur in any given year. This is expressed as a '% annual probability'. Therefore a flood event that has a 1% annual probability of occurrence will have a probability of 1 in 100 of occurring in any given year.

Table B1.1 Scheme Areas and Local Planning Authorities

Appendix	Scheme Area	Local Planning Authority
A	Sawley and Trent Meadows	Erewash Borough Council
B	*Attenborough, Erewash and Rylands*	Broxtowe Borough Council
C	Meadows and Colwick Country Park	Nottingham City Council
D	Colwick	Gedling Borough Council

This is *Appendix B* and it describes the EIA for works within Broxtowe Borough Council's jurisdiction; the area is referred to in this appendix as 'Attenborough, Erewash and Rylands'. This appendix contains a description of the baseline conditions, the proposed works, their associated impacts and the proposed mitigation measures for the Attenborough, Erewash and Rylands scheme area. It should be read in conjunction with *Volume 1*.

B1.2 Environmental Statement April 2007: Changes to the Outline Design

In April 2007 we published our proposals for the original scheme and produced an Environmental Statement.

In October 2007 as part of the Nottingham Strategic Flood Risk Assessment a remodelling exercise was completed using a revised modelling technique. The new model has improved the accuracy of our flood predictions and led to changes in the original outline design detailed in April 2007. Other changes have resulted from consultations during the development of the scheme to improve the landscape and recreational value of the flood defence. The most significant changes to the Erewash, Attenborough and Rylands scheme areas are as follows:

- The existing flood embankment and wall along the Nottingham and Beeston Canal will be raised as it does not provide protection from a flood with a 1% annual probability of occurrence.
- A flood wall will be constructed around the western side of the Siemens site as the new model has shown that ground levels are not sufficient to defend against a flood event with a 1% annual probability of occurrence.
- The levels of the walls and embankments have increased along several sections of the scheme, however, their alignment remains unchanged.

Therefore, we have re-assessed the scheme and produced this Environmental Statement for our revised proposals.

B1.3 The Study Area

The study area is defined by the area of the left bank of the River Trent with a 1% annual probability of flooding. The study area is within the boundary of Broxtowe Borough Council between the River Erewash and the Boots site at Rylands; refer to Figure B1.1.

ATTENBOROUGH, EREWASH & RYLANDS

BOOTS

SIEMENS

LILAC GROVE STW

CHILWELL MANOR GOLF COURSE

NOTTINGHAM AND BEESTON CANAL

BEESTON MARINA AND MOBILE HOME COMPLEX

CEMEX WORKS SITE

ATTENBOROUGH, EREWASH & RYLANDS SCHEME AREA

A6005

ATTENBOROUGH VILLAGE

TOTON SEWAGE WORKS

SAWLEY & TRENT MEADOWS SCHEME AREA

RIVER EREWASH

TURNOVER BRIDGE

BEESTON WEIR

Beeston Pond

Delta

Works Pond

Main Pond

Church Pond

Tween Pond

Coneries Pond

Clifton Pond

A B C D E F G H I J

N

SCALE

0km 0.5km 1km

Key

PROPOSED DEFENCES

- New Wall
- Raise Existing Wall
- New Embankment
- Raise Existing Embankment
- High Ground / No Works Required
- Raise Road
- A — Site Compounds
- Access Route
- River Trent
- Other Watercourses
- Barge Channel Route
- Study Area (floodplain with a 1% annual probability of flooding)
- Attenborough Nature Reserve Lakes
- Scheme area boundary

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Attenborough, Erewash & Rylands Study Area

Environment Agency

Scale: 1 : 17,000 @ A3

Figure: B1.1

P:\108806 - Left Bank Detailed Design\60_Generated documents\62_Generated Drawings\MapInfo\Env Statement Updated\Att_Ere_Ryl_Study Area_V0.WOR Aug 08 NG ISSSUED 24/10/08

This page is intentionally blank

B1.4 Description of the Scheme Area

The FAS proposes development to provide flood protection to the left bank of the River Trent through Nottingham against floods with a 1% annual probability of occurrence. This includes the Attenborough, Erewash and Rylands scheme areas. For the purposes of our work, these areas are split into a number of reaches, which are characterised by the type of works proposed. The scheme area is divided into 12 reaches as shown in Plates B1.1 to B1.15 and Figure BB3.1 and BB3.2 in *Annex B3*.

- Reach 1: Toton Treatment Works South
- Reach 2: Toton Treatment Works North
- Reach 3: Field South of Nottingham Road
- Reach 4: Nottingham Road Properties and Manor Road Garage
- Reach 5: River Erewash to Barton Lane
- Reach 6: Barton Lane to St. Mary's Close
- Reach 7: St. Mary's Close to The Strand
- Reach 8: The Strand
- Reach 9: The Strand to Cemex Works Site
- Reach 10: Cemex Works Site to Siemens
- Reach 11: Chilwell Manor Golf Course
- Reach 12: Siemens to Beeston Lock
- Reach 13: Beeston Lock to Turnover Bridge
- Reach 14: Turnover Bridge to Opposite Boots

The description of the scheme area considers the following factors:

- the characteristics and land use;
- the presence or absence of existing flood defence;
- the standard of protection that the existing flood defence provides.

B1.4.1 Erewash

The Erewash scheme area is located to the south-west of Nottingham, and comprises the left (east) bank of the River Erewash up to the A6005, Nottingham Road. There are several horse pasture fields nearby with Chilwell Retail Park and Toton Sewage Treatment Works adjacent to the proposed works.

Floods caused by the River Trent back up the River Erewash and consequently properties up to Nottingham Road are at risk of floods from both the Rivers Trent and Erewash. The existing minor flood defences, which are only in isolated sections, are inadequate to prevent flooding from either river.

The Erewash scheme area is divided into Reaches 1 to 4, shown in Plates B1.1 to B1.4 and Figure BB3.1, *Annex B3*.

The proposed works along the River Erewash are designed to reduce the risk of flooding from the River Trent. The reduction in flood risk from the River Erewash in this local area will be an additional benefit to this primary purpose. A

separate detailed study to investigate the flood risk along the River Erewash has been commissioned. For more information on this separate study please contact:

Morgan Wray
Asset System Management Team Leader
Environment Agency
Olton Court
10 Warwick Road
Olton
Solihull
B92 7HX

Or by email at: Nottingham.FAS@environment-agency.gov.uk

Reach 1: Toton Treatment Works South currently has no formal flood defence. It is a small area of low lying grassland to the south of Toton Sewage Treatment Works, adjoining the main line railway.

Plate B1.1 Erewash Reach 1

Reach 2: Toton Treatment Works North has an existing embankment which does not provide flood protection for an event with a 1% annual probability of occurrence. The defences provide protection from a flood event with a 3% annual probability of occurrence. Chilwell Retail Park does not have formal flood defences, but the existing ground level is above the level of a flood event with a 1% annual probability of occurrence.

Plate B1.2 Erewash Reaches 2 and 3

Reach 3: Field South of Nottingham Road does not currently have a formal flood defence. This land is used for grazing horses and provides an access across the River Erewash, to further pasture. The old route of the River Erewash runs through this field.

Plate B1.3 Erewash Reach 3

Reach 4: Nottingham Road Properties and Manor Garage. Many of the 18 residential properties have an existing minor flood embankment, constructed by Severn Trent Water. Most properties also have access to the river. Manor Garage and 365 Nottingham Road do not currently have a formal flood defence. The Manor Garage complex consists of several garages and storage buildings. The garden of 365 Nottingham Road has a boundary of conifer trees and a mature orchard.

Plate B1.4 Erewash Reach 4

B1.4.2 Attenborough

The Attenborough scheme area is located to the south west of Nottingham. The area consists mainly of Attenborough Gravel Pits Site of Special Scientific Interest and Nature Reserve (Attenborough SSSI), Attenborough village, the Cemex Works Site to the north-east of the village and the Long Lane residential area of Beeston.

The village of Attenborough currently has no formal flood defence measures in place. There is, however, a small section of existing embankment in the vicinity of Ferndale Close that provides flood management to an area of the village against a flood with a 4% annual probability of occurrence. A railway embankment acts as the flood defence for the communities of Long Eaton and Beeston but it only provides flood protection against a flood with a 4% annual probability of occurrence.

The properties between Long Lane and Chilwell Manor Golf Course are at risk of flooding both from the River Trent and its tributary Chilwell Brook. There are low level flood banks along Chilwell Brook as it passes through Chilwell Manor Golf Course but these only typically provide protection against a flood event with a 10% annual probability of occurrence. Once the floodwaters have overtopped the river bank Chilwell Brook has the potential to flood areas of Long Lane.

The area is divided into the seven separate reaches (Reach 5 to Reach 11), with the numbering system continuing on from the Erewash scheme area; refer to Plates B1.5 to B1.11 and Figures BB3.1 and BB3.2, *Annex B3*.

Reach 5: River Erewash to Barton Lane runs along the north-western edge of Attenborough SSSI parallel to the railway line embankment and a quarried lake (Coneries Pond). The railway embankment forms an informal flood defence along this reach. Underground high voltage cables also run along this reach.

Plate B1.5 Attenborough Reach 5

Reach 6: Barton Lane to St. Mary's Close continues along the edge of Attenborough SSSI. The railway embankment and high voltage cables plus a second redundant quarried lake (Church Pond) all continue through this reach. The railway embankment provides an informal flood defence throughout the reach.

Plate B1.6 Attenborough Reaches 5 and 6

Reach 7: St. Mary's Close to The Strand is the south-western edge of Attenborough village. The fields to the south of the church contain medieval fishponds and are classified as a Scheduled Monument. This area falls within the Attenborough Village Conservation Area designated in Broxtowe Borough Council's Local Plan; refer to Figure BB3.6 in *Annex B3*. There are no existing flood defences along this reach.

Plate B1.7 Attenborough Reaches 6 and 7

Reach 8: The Strand is a residential street on the south-eastern edge of Attenborough village. There are no existing flood defences along this reach. It is adjacent to the Village Green which is used as a cricket and football pitch. The Strand is also the access road to the Cricket and Bowling Clubs and the Attenborough Preparatory School. It is within the Attenborough Village Conservation Area as designated in Broxtowe Borough Council's Local Plan; refer to Figure BB3.6, *Annex B3*. The underground high voltage cables continue parallel to The Strand.

Plate B1.9 Attenborough Reach 8

Reach 9: The Strand to Cemex Works Site is the north-eastern edge of the village. The area is bounded by a quarried lake (Works Pond) which Cemex use as a silt settling pond for their gravel processing washings. A small flood embankment was constructed on the verge of Ferndale Close in 2003, to reduce flood risk to this area of the village against a flood event with a 4% annual probability of occurrence.

Plate B1.10 Attenborough Reach 9

Reach 10: Cemex Works Site to Siemens includes the Cemex processing yard and dense woodland within Attenborough SSSI. The railway embankment runs parallel to the reach throughout and provides an informal flood defence. Another redundant quarried lake (Beeston Pond) is present at the downstream end. Chilwell Brook discharges to the River Trent by a flapped outfall by Meadow Lane.

Reach 11: Chilwell Manor Golf Course is the southern edge of the golf course along the boundaries of the Long Lane properties. The golf course acts as a natural flood storage area for Chilwell Brook and there are no existing flood defences along this reach.

Plate B1.11 Attenborough Reaches 10 and 11

B1.4.3 Rylands

The Rylands scheme area is located to the north-east of Attenborough SSSI. The area includes a large industrial complex, a caravan site and residential areas. There are also amenity areas along the reach such as allotments, large recreation grounds and the Nottingham and Beeston Canal.

The existing defences and high ground currently provide flood protection against events with between a 2% and 1% annual probability of occurrence.

The site is divided into three separate reaches (Reaches 12, 13 and 14), with the numbering system continuing on from the Attenborough reaches; refer to Plates B1.12 to B1.15 and Figure BB3.2 in *Annex B3*.

Reach 12: Siemens to Beeston Lock. The reach begins at the north western corner of the Siemens site where the exisiting flood defence is provided by high ground. The reach continues with an embankment through Rylands allotments and the Beeston Marina and Mobile Home Complex. It then goes across Riverside Road and around the recreation grounds to Beeston Lock. All existing defences and ground levels are below the level of a flood with 1% annual probability of occurrence.

Reach 13: Beeston Lock to Turnover Bridge. Reach 13 begins at Beeston Lock, where the Nottingham and Beeston Canal meets the River Trent. The lock gates currently protect against a flood event with a 2% annual probability of occurrence. There is an existing flood wall around Beeston Lock Cottage. An embankment extends from Beeston Lock Cottage to Turnover Bridge and is located immediately adjacent to the Nottingham and Beeston Canal.

Plate B1.12 Rylands Reach 12

Plate B1.13 Rylands Reaches 12 and 13

Reach 14: Turnover Bridge to Opposite Boots

Along the Nottingham and Beeston Canal is an existing flood wall adjacent to the canal towpath, which is below the required 1% annual probability defence level.

Plate B1.14 Rylands Reaches 12 and 13

Plate B1.15 Rylands Reach 14

B1.4.4 Future Status of Attenborough, Erewash and Rylands

Should the proposed flood defence improvements not proceed, there will be long-term effects of flooding on Attenborough, Erewash and Rylands. The standard of protection currently provided to the majority the scheme area is less than that recommended by the Department of Environment, Farming and Rural Affairs (Defra). Over time, the existing defences in Rylands and Erewash would deteriorate and the risk of flooding would increase for the whole scheme area. This would be compounded by the effects of climate change. Should the defences fail, 16,000 properties on the left bank of the River Trent in Nottingham would be at risk from a flood event with a 1% annual probability of occurrence and subject to an increased frequency in flood risk in the future.

As most of the land in front of the defences is either designated as a SSSI or greenbelt and/or is in the floodplain, it is unlikely that any further future development would be permitted in these areas[2]. However, without improvements to the flood risk management through Attenborough, Erewash and Rylands most development on the land behind the defences is unlikely to be permitted under Planning Policy Statement 25 (PPS25), which sets out Government policy on development and flood risk, as the area would be at risk from a flood event with a greater than 1% annual probability of occurrence.

[2] It is Environment Agency policy not to agree to any new floodplain development as it reduces flood storage capacity and can increase flood risk.

This page is intentionally left blank

B2. PROJECT PROCESSES, RESIDUES AND EMISSIONS

B2.1 Physical Characteristics

18 alternative flood risk management options were considered during the scoping stage of the Fluvial Trent Strategy (Environment Agency, 2005). During the development of the FAS other alternative options have also been considered following consultations with landowners and statutory bodies. *Section B2.5* describes the alternative options considered for Attenborough, Erewash and Rylands.

A summary of the proposed construction works is shown on the General Arrangement Figures (BB3.3 to BB3.10) in *Annex B3.*

B2.1.1 Works at Attenborough, Erewash and Rylands

The proposed works at Attenborough, Erewash and Rylands will comprise the following:

- constructing 4.78km of new walls in Reaches 2, 4, 5 to 10, 12 and 13;
- 1.10km of new embankment in Reaches 1, 2, 3, 7, 9 and 11;
- 2.75km of groundwater sheet pile cut-off in Reaches 5 to 10;
- raising of 935m of existing flood embankments and 650m of existing wall in Reaches 12, 13 and 14;
- local road raising in Reaches 5, 8 and 12;
- replacing and raising the lock gates at Beeston Lock in Reach 13.

An outline of the works for each reach and the alternative options considered are provided in Table B2.1.

Table B2.1 Proposed Works at Attenborough, Erewash and Rylands

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
EREWASH					
1 – *Toton Sewage Treatment Works South*	Construct new flood embankment	A new 0.6m high flood embankment will be built on the left bank of the River Erewash upstream of the railway bridge.	25m	From Barton Lane through the sewage treatment works site.	Construct a flapped outfall structure on the River Erewash as it passes beneath the railway bridge to prevent the River Trent floodwaters flowing upstream. Refer to *Section B2.5.1*
2 –*Toton Sewage Treatment Works North*	Construct new flood wall	Two lengths of new flood wall up to 1m high will be built where there are space restrictions due to an existing tank and overhead pylons. The southern length of flood wall ties into high ground.	60m		
	Construct new flood embankment	A new embankment up to 0.8m high is to be built from the high ground at the southern end of Chilwell Retail Park, along the western boundary of the sewage treatment works, into a length of new flood wall.	220m		
3 – *Field South of Nottingham Road*	Construct new flood embankment	A new 1.4m high embankment is to be built from the high ground at the western end of Chilwell Retail Park, along the northern boundary of the field, to No. 317 Nottingham Road where it ties into the new flood wall.	265m	Gated entrance off Nottingham Road.	

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
4 – *Nottingham Road Properties and Manor Garage*	Construct new flood wall	A new flood wall up to 1m high is to be built along the boundaries of Manor Garage and 18 properties on Nottingham Road at an offset of 2m from the riverbank. Sections of sheet piling may be required to prevent seepage.	380m	Gated entrance off Nottingham Road and through Manor Garage site.	
ATTENBOROUGH					
5 – *River Erewash to Barton Lane*	Construct new flood wall	A new flood wall up to 0.9m high will be built at a 1m offset from the railway boundary fence, parallel to the railway line. The wall will be within the current Attenborough SSSI boundary.	715m	From Barton Lane.	Construct a new wall and sheet piling on an alternative alignment. Refer to *Section B2.5.2* and *B2.5.3*
	Sheet piling cut-off	Sheet piling at a 12 - 35m offset from the wall will be required for 128m of Reach 5. The offset in the northern section is to avoid underground high voltage cables running parallel to the new flood wall. A buried geomembrane cover will tie in the sheet piles to the flood wall creating an impermeable barrier to flood water seepage. The geomembrane will be at a depth of approximately 0.3m below the re-instated ground level.	130m		
	Raise existing road.	The road level of Barton Lane is to be raised by 0.68m. This will require a 50m ramp to comply with road safety requirements.	5m Road width		

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
6 – *Barton Lane to St. Mary's Close*	Construct new flood wall	A new flood wall up to 1.8m high will be built around the eastern edge of Church Pond and then at a 1m offset from the railway boundary fence, parallel to the railway line. The height of the wall parallel to the railway varies between 0.5m and 1.8m high but is typically 1m in height. The geomembrane will be at a depth of 0.3m below re-instated ground level.	495m	From Barton Lane or via St. Mary's Close.	Construct a new wall and sheet piling on an alternative alignment. Refer to *Section B2.5.2* and *B2.5.3*
	Install new flood gate	New flood gate situated to the east of the Gate House, kept locked and closed except for maintenance purposes.	4m		
	Sheet piling cut-off	Sheet piling up to 14m offset from the wall will be required for the entire length of Reach 6. A buried geomembrane cover will tie in the sheet piles to the flood wall creating an impermeable barrier.	495m		
	In-filling of lake	Temporary in-filling along sections of Reach 6 and the western edge of Church Pond is required to provide an adequate working area. New lake margins to be created from in-fill material upon completion of works. Refer to *Section B4*	300m		

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
7 – *St Mary's Close to The Strand*	Construct new flood wall	A new flood wall 0.4m to 2.7m high is to be built around the south-western corner of Attenborough village. A 137m length of this wall runs along the boundary of the Fishponds Scheduled Monument and around the boundary of St. Mary's Church. The footpath outside Ireton House is to have a flood gate installed across it.	460m	Various access points to this reach - Barton Lane to the south, St. Mary's Close, Church Lane next to Ireton House and from The Strand through grazing fields.	Construct a new wall and sheet piling on an alternative alignment. Refer to *Section B2.5.4*
	Construct new flood gate	A new flood gate 1.8m high will be placed in the flood wall to allow owners of Ireton House access to the lower part of their garden.	1.5m		
	Sheet piling cut-off	Sheet piling will be required for the entire length of Reach 7.	535m		
	Construct new flood embankment	A new 2.3m high embankment with sheet pile cut off is to be built across the southern half of Vale Cottage field. Flood defence works are not permitted on the northern part of the field due to the presence of archaeological earthworks.	75m		
	In-filling of lake	In-filling of the northern edge of Church Pond is required to provide an adequate working area. New lake margins to be created from in-fill material upon completion of works; refer to *Section B4.*	360m		
8 –*The Strand*	Construct new flood wall	A new flood wall up to 2.0m high (on wet side) is to be built along The Strand, parallel to the road and replacing the existing hedgerow.	345m	From The Strand	Construct a new wall and sheet piling on an alternative alignment. Refer to *Section B2.5.5*
	Reprofile existing road	Road to be raised to ensure that visual height of the flood wall is no higher than 1.5m high on dry side.	345m		

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
	Construct new flood gates	New flood gates will be located at the entrance to the Old Fisherman's Car Park (2.0m high), the entrance to Attenborough Cricket Club (up to 2.0m high), the entrance to the bowls club (up to 2.0m high), and across the footpath by 51 The Strand (up to 1.8m high).	width varies (1-8m)		
	Sheet piling cut-off	Sheet piling will be required for the entire length of Reach 8. From the Bowling Club pavilion to the entrance of No. 51 The Strand, the piles will be typically offset from the wall by 3m. A continuous buried concrete slab will tie in the sheet piles to the flood wall creating an impermeable barrier.	345m		
	Construct new pumping station	This will consist of a submersible pump within a buried chamber at the entrance to the Old Fisherman's Car Park. It will overpump surface water run-off in the event of a flood.	N/A		
	Garage to be demolished and rebuilt	An existing timber frame garage is to be demolished and a new one built on top of the new flood wall.	N/A		
9 – *The Strand to Cemex Works Site*	Construct new flood wall	A new flood wall up to 1.4m in height is to be built along the boundary of No. 51 The Strand and No. 7 Ferndale Close continuing along the edge of Works Pond.	320m	From The Strand and from Ferndale Close, off Allendale Avenue.	None considered during outline design.[2]
	Construct new flood embankment	A new 0.5-1m high embankment with sheet pile cut off is to be built from the end of the new flood wall at the north end of Ferndale Close to tie into a new floodwall adjacent to the railway line.	165m		

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
	Sheet piling cut-off	Sheet piling will be required for the entire length of Reach 9.	485m		
	In-filling of Lake	Permanent in-filling of the western edge of Works Pond is required to provide an adequate foundation for the new flood wall along the boundary of No. 51 The Strand and continuing the length of Ferndale Close.	280m		
		Temporary infilling of Works Ponds will also be required to provide an adequate working area.	442m		
10 – *Cemex Works Site to Siemens*	Construct new flood wall	A flood wall up to 2.5m in height will be built at a 1m offset from the railway boundary fence, parallel to the railway embankment. The average height of the wall will be 1.2-1.5m high. The wall will pass through the Cemex Works site.	1.28km	Through the Cemex works site off Long Lane. Potential access point via Siemens.	Construct a new wall and sheet piling on an alternative alignment. Refer to *Section B2.5.2* and *B2.5.3*
	Replace visual screening bund	After the wall is built, the visual screening of the Cemex Works will be replaced with replanting and/or fencing. The screen will be at a lower height than previous.	153m		
	Sheet piling cut-off	A continuous 750m length of sheet piling is required from the downstream end of Cemex to Siemens. The piles will be offset from the wall by 4m. A continuous buried concrete slab will tie in the sheet piles to the wall creating an impermeable barrier.	750m		
11 – *Chilwell Manor Golf Course*	Construct new flood embankment	A new 0.3m high embankment is to be built along the edge of Chilwell Manor Golf Course.	350m	From Lady Bridge Close, off Long Lane or from Meadow Lane.	None considered during outline design.[2]

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
RYLANDS					
12 - Siemens to Beeston Lock	Construct new flood wall	A new 0.4m high masonry flood wall, offset 1m from access road will be required along the western edge of the Siemens site.	400m	Through Siemens.	None considered during outline design.[2]
	Replace existing outfall structure	The existing outfall structure on Siemens Stream is to be replaced.	N/A		
	Raise existing embankment	A 75m length of the existing embankment through the western part of the Beeston Marina and Mobile Home Complex will be raised.	75m		
	Construct new flood wall	A new flood wall up to 2.3m high will be constructed through the allotment gardens.	100m		
	Raise existing road	The existing ramps across Riverside Road are to be extended by the allotments and eastern section of the Beeston Marina and Mobile Home Complex.	20m		
	Raise existing embankment	The existing embankment around the perimeter of the sports ground will be raised and widened.	260m		
	Construct new flood wall	A new 0.7m high bored pile flood wall will be required through the eastern section of the Beeston Marina and Mobile Home Complex.	40m	From Riverside Road.	
13 –*Beeston Lock to Turnover Bridge*	Replace and raise Beeston Lock Gates and associated structures	The existing flood gates will be replaced and raised. The wall by Beeston Lock landing stage will be demolished and replaced with a new 1.8m wall.	25m	From Canal Road.	

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
	Replace existing wall	Wall around Beeston Lock landing stage will be demolished and replaced with a 1.8m high wall.	25m		
	Replace existing wall	A new flood wall surrounding Beeston Lock Cottage is to be cast against the existing concrete wall.	90m		
	Construct new flood wall	A new 0.7m high bored pile flood wall will be required around the eastern side of the Beeston Lock Cottage garden.	65m		
	Raise existing embankment	Existing embankment adjacent to Beeston Canal will be raised and re-profiled up to Turnover Bridge to create a 2m wide berm along canal.	600m		
14 – Turnover Bridge to opposite Boots	Raise existing wall	Existing wall to be raised between 75 and 200mm	650m	Access along existing track off Thane Road.	

[2] Refer to *Volume 1* where the 18 flood management options considered in the Fluvial Trent Strategy are described and the options taken forward to the scoping stage identified.

B2.2 During Construction

Throughout construction the site activities will be actively monitored through the implementation of the Environmental Action Plan (EAP) and the appointing of an Environmental Clerk of Works. This will ensure that the environmental risks from emissions are minimal; refer to *Volume 1*.

B2.2.1 Timing and Sequence of Works

The works at Attenborough, Erewash and Rylands are programmed to take 36 months to complete. The level of flood protection will not be complete until this scheme area and all of the construction work on the Nottingham Trent Left Bank FAS is completed. An indicative construction programme is summarised in Table B2.2 and shows the likely duration of the works within each reach.

The current proposed start date is October 2009, with some areas of site clearance beginning in early 2009. However, the start date, duration and phasing of the works in each reach are indicative and subject to funding, planning approval and detailed design. Programming changes could also result from access restrictions or the working methods, or to realise efficiencies in the sourcing of materials. The programme should therefore be treated as indicative only.

The works for Reach 5 are likely to be carried out with the works for Reaches 11 and 12 in the Sawley and Trent Meadows scheme area; refer to *Appendix A.*

B2.2.2 General Working Arrangements

Working Hours
Normal working hours will be from 7.30am to 6pm, Monday to Friday. Construction activities outside of these hours, on weekends or public holidays will be avoided where possible. Any changes to the working hours will be agreed in advance with the local authority.

The works to Barton Lane (Reach 5), The Strand (Reach 8), Riverside Road (Reaches 12 and 13), works adjacent to the railway line (Reaches 5, 6 and 10) and adjacent to the Nottingham and Beeston Canal (Reaches 12 and 13) and Beeston Lock gates (Reach 13) may be affected by restrictions from Nottinghamshire County Council (Highways), British Waterways or Network Rail. Such restrictions may necessitate some out of normal hours working.

Table B2.2 Outline Construction Programme for Attenborough, Erewash and Rylands

REACH	2009									2010												2011												2012			
	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL
ATTENBOROUGH																																					
Reach 5																																					
Reach 6																																					
Reach 7																																					
Reach 8																																					
Reach 9																																					
Reach 10																																					
Reach 11																																					
RYLANDS																																					
Reach 12																																					
Reach 13																																					
Reach 14																																					
EREWASH																																					
Reach 1																																					
Reach 2																																					
Reach 3																																					
Reach 4																																					

Site Compounds and Delineation of Working Areas

Ten site compounds and storage areas are required for the works, see Table B2.3 for details. Compound C will be the principal compound and will be in use for the whole duration of the works. Temporary lighting, security and parking restrictions may be required for the safe operation of the site compounds.

Table B2.3 Details of Proposed Site Compounds

Compound Reference	Description	Figure Number
A	A satellite compound, approximately 40m x 50m, is to be established within the grazing field to the south of Reach 3. This will be used for the storage of plant, equipment and fuel during the works at Reaches 3 and 4. There will also be staff welfare facilities.	Figure BB3.3
B	A small storage area at the southern end of Reach 2, approximately 35m x 25m for plant and equipment.	Figure BB3.4
C	The principal site compound for the duration of the works. Approximately 50m x 70m will be established in the field adjacent to Toton Sewage Treatment Works (STW) off the STW access road. It will house the site offices, welfare facilities and car parking for approximately 10 staff and visitors to the site.	Figure BB3.4
D	Materials storage area, approximately 90m x 45m, in the receiving area/car park over the level crossing, off Barton Lane for works in Reaches 5 and 6.	Figure BB3.5
E	Materials storage area on existing area of hard standing in Old Fisherman's Car Park for works to Reaches 7 and 8. Access off The Strand. The area will be approximately 25m x 10m; refer to *Section B2.5.5*.	Figure BB3.6
F	Site compound and storage area within the Cemex Works Site for works to Reaches 10 and 11, approximately 40m x 40m in size. Access off Allendale Avenue.	Figure BB3.7
G	Materials and plant storage area at the south end of the works area for Reach 11, approximately 50m x 40m in size. Access off Long Lane.	Figure BB3.7
H	An area approximately 35m x 5m within the corner of the sports field off Riverside Road to service the works to the Beeston Marina and Mobile Home Complex and the existing embankment (Reach 12).	Figure BB3.9
I	Materials storage area adjacent to Weir Field Recreation Ground pavilion for works on Reach 13 approximately 25m x 35m in size. Access from Nottingham Power League (off Thane Road).	Figure BB3.9
J	A satellite compound, approximately 20m x 20m, for the works to Reach 14. Access will be from Nottingham Power League (off Thane Road).	Figure BB3.10

The site compounds, working areas and temporary haul roads will be secured using appropriate fencing. 2m high 'Heras', steel mesh construction site fencing will be used around all areas which interface with areas general to the public.

The welfare provisions in the compounds will reflect best practice in the Health and Safety Executive's Construction Information Sheets No. 18 and 46.

Haul roads will be wide enough to cope with the traffic expected along them and, if space is available, will allow for the safe passage of plant and machinery in two directions. There are to be designated turning points and a segregated pedestrian access route, where required. Where space is restricted, appropriate measures are to be taken to ensure that plant and pedestrian movements do not conflict.

All soft ground under site compounds, working areas and temporary haul roads will have a 0.15m layer of topsoil removed and then a temporary hard surface will be placed on the ground to protect it. The topsoil will be stockpiled and used to reinstate the land to its former condition following the works. The temporary hard surface will be used for subsequent areas of the works.

Access Arrangements for The Strand

The construction of the new flood wall along the line of The Strand (Reach 8) will necessitate a restriction and/or temporary closure of the road to allow for the safe passage of construction plant and material deliveries whilst maintaining a safe working zone from passing vehicles and pedestrians. Works along The Strand are programmed to take 10 months to complete. Road closures and access restrictions will not be required for all this time. One to one discussions are planned with local residents and community groups during detailed design to ensure this period is kept to an absolute minimum.

Figure B2.1 shows the outline plans for the access arrangements which are described below:

- Temporary/partial road closures will be restricted to between 9.00am and 5.00pm. Access to the driveways along the Strand will be maintained by:

    a) off-peak closures of the road, re-opening the road during the weekends and before 9am and after 5pm Monday to Friday; and
    b) an alternative access route to by-pass the construction works will be provided by installation of a temporary aluminium roadway over the playing fields, parallel to the works. This temporary roadway will extend the full length of the Village Green; it will link the western end of The Strand to the access track leading to Old Fisherman's Car Park and maintain access for vehicles into both of the sports club facilities and to Attenborough Preparatory School. The aluminium temporary roadway is easily lifted and will not cause rutting of the ground beneath. However, there will be a detrimental effect on the grass if left for a period of time.

- A full road closure will be required for approximately two weeks to lay the tarmac on the raised road. During this time residents will not be able to access their houses by car. Measures will be implemented to accommodate pedestrian access to houses, provide alternative parking sites and provide assistance where required.
- Due to the restricted width of The Strand at the north-eastern end (Nos. 37 to 51), access will, at times, be a via a temporary access track along the edge of Works Pond from Ferndale Close.

Access to the Bowls Club car park will not be possible whilst the section of wall up to and past the car park entrance is being constructed. During this period access to the Cricket Club/Football Club car park would be maintained and an additional temporary parking area provided to compensate for the temporary loss of spaces within the Bowls Club car park.

Restrictions on large plant and materials deliveries will also be put in place to reduce the impact of heavy lorry movements within Attenborough village at peak periods. These delivery periods would generally be between 9am and 5pm.

It is important to note that working arrangements are likely to be conditioned in the planning decision and any changes will require Local Authority approval.

Works within Residential Boundaries

Where flood walls and embankments are to be constructed within residential boundaries extensive consultation will be undertaken with the affected resident to ensure that works are completed sensitively. A Public Liaison Officer will be appointed to discuss the works with the affected residents and maintain a high level of communication. Monitoring of noise and vibration levels and pre-construction and post-construction structural surveys of buildings will be conducted.

Following construction gardens will be reinstated to their existing condition or same cost alternative agreed with landowner.

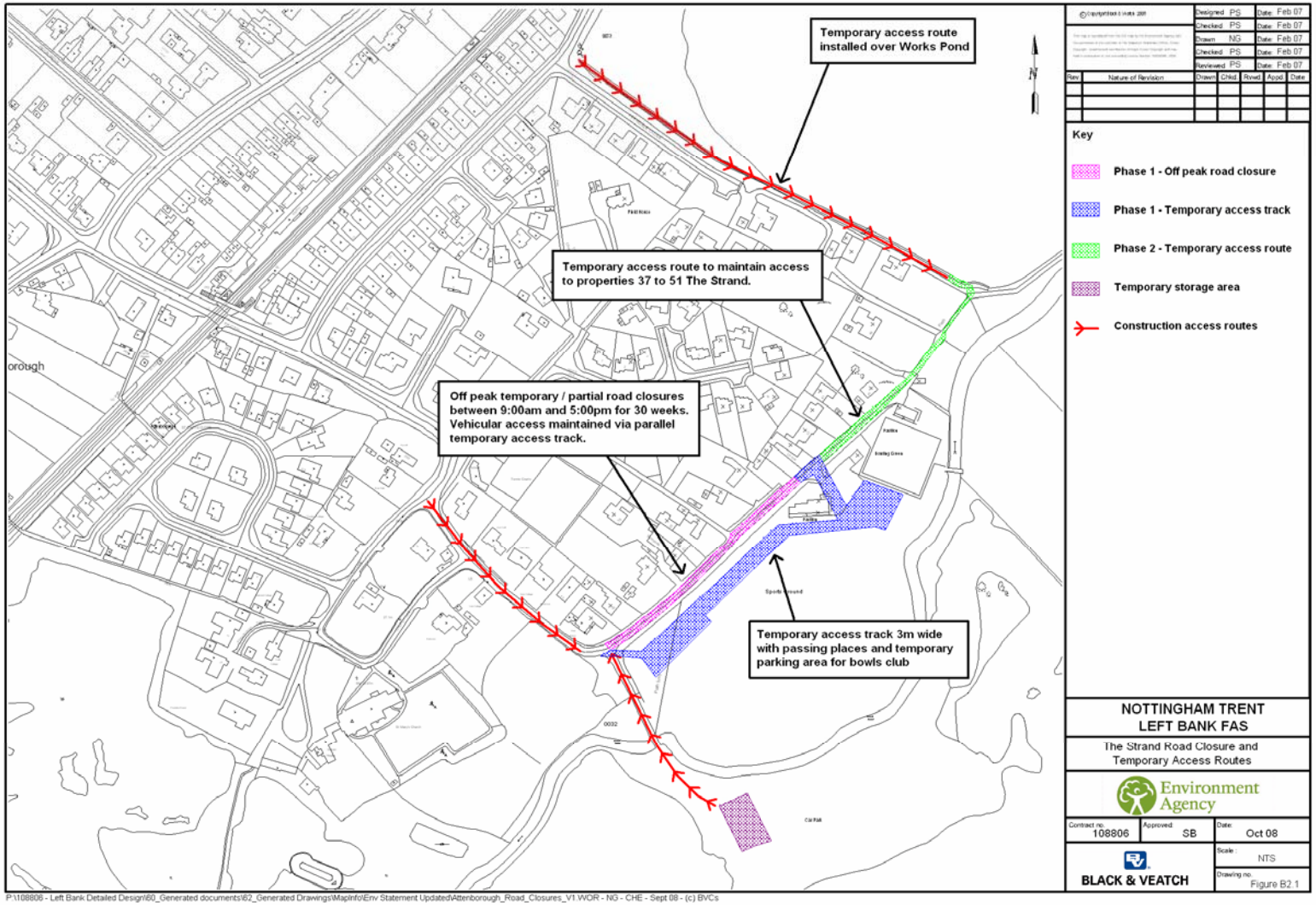


Figure B2.1 Plan of the Access Arrangements for The Strand

B2.2.3 Outline Construction Methodology

The works in each reach will comprise site establishment and reinstatement at completion, together with one or more of the following activities, as outlined in Table B2.1:

- construct new wall (without sheet pile cut-off);
- construct new wall (with sheet pile cut-off);
- infilling of lakes;
- construct new embankment;
- raise existing road;
- raise existing embankment;
- raise existing wall;
- replace existing outfall structure;
- replace Beeston Lock gates;
- construct new pumping station.

The construction methodologies for these activities are outlined in *Section 3.4, Volume 1*. Table B2.4 summarises the work activities within each reach of Attenborough, Erewash and Rylands.

Table B2.4 Type of Works per Reach

Typical Works	Reach													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Construct new wall (without sheet pile cut-off)					✓					✓		✓	✓	
Construct new wall (with sheet pile cut-off)		✓		✓		✓	✓	✓	✓	✓				
In-filling of lakes						✓	✓		✓	✓				
Construct new embankment	✓	✓	✓				✓		✓		✓			
Raise existing road					✓	✓		✓	✓			✓		
Raise existing embankment												✓	✓	
Raise existing wall													✓	✓
Replace existing outfall structure												✓		
Replace Beeston Lock gates													✓	
Construct new pumping station								✓						

Estimated approximate quantities of main materials required for the above works are set out below:

- **5,975 m^3** of concrete for the new walls;
- **355 m^3** of steel for the 2750m of sheet piling required for the cut-off;
- **113,650 m^3**of fill material for the earth embankments;
- **25,550 m^3**of fill material for the works in Attenborough Lakes.

Section B13 details the types of materials to be used in the proposed works.

B2.3 When Operational

The scheme is designed to be low maintenance. Planned inspections of the flood walls and embankments will be required annually. Access easements between 1-5m will be maintained alongside all flood walls for maintenance and inspection purposes. The crest on the top of raised and new embankments will generally be 3m wide for maintenance and inspection access.

Sluices, flood gates and other structures will be inspected and maintained in accordance with Environment Agency procedures and the manufacturer's recommendations. Access to these will be via the routes along the flood defences. The Environment Agency will be responsible for shutting the flood gates. There is approximately 24 hours warning time before a large flood event of the River Trent in Nottingham.

B2.4 Residues and Emissions

These comprise discharges to water, emissions to air and noise and vibration from the proposed construction works. Discharges and emissions from operation and maintenance of the flood defences would be negligible.

B2.4.1 Discharges to Water

During installation of the temporary works for replacement of the lock gates (Reach 13), there could be some disturbance and mobilisation of silt within the canal from the pumping out of water from the works chamber.

Elsewhere, the areas of works where the risk of discharges to water is higher are:

- construction of new defences along the left bank of the River Erewash in Reaches 1 to 4;
- construction of a new wall along the lakes in Attenborough SSSI in Reaches 5 to 7, 9 and 10 and wider habitat creation within the SSSI;
- the raising of the existing embankment in Reach 13 and raising of the wall in Reach 14 affecting the canal.

Other potential discharges to surface waters could arise from the construction works near to other watercourses, including Reach 11 (next to Chilwell Brook) and Reach 12 (next to Siemens Stream), and Reach 7 (next to The Brook)

Section B8 details the assessment of these impacts on the water quality and the required mitigation.

B2.4.2 Emissions to Air

The main types of emissions will be those produced by construction vehicles travelling from and on the site and dust generated by the construction activities.

Section B6 assesses the impacts these will have on the local air quality.

B2.4.3 Noise and Vibration

During construction, delivery vehicles accessing the site and plant operating on the site will cause some disturbance to the local environment. The main operations causing noise and vibrations will be the steel sheet piling, the movement of plant on site and to/from site and the operation of plant and machinery on site.

Steel sheet piling is required through 2.75km of the Attenborough, Erewash and Rylands scheme area to provide a cut-off against groundwater flow under the proposed new flood defences.

Section B5 assesses the noise and vibration impacts from the construction activities and the required mitigation.

B2.4.4 Light

Works will be carried out from 7.30am to 6.00pm during daylight hours although in winter temporary lights may be needed when the days are shorter for urgent/emergency works or works during rail possessions in non-daylight hours. Lights will be positioned and shielded so as to minimise any disturbance to neighbouring properties and wildlife.

B2.5 Alternative Alignment Options Considered

Section 2, Volume 1 describes the 18 flood risk management options considered as part of the Fluvial Trent Strategy. It explains the rationale behind the selection of the preferred option, which is to raise existing defences and build new defences to protect against flood events with a 1% annual probability of occurrence.

The Scoping Report (Environment Agency 2005) presented a number of alternative defence alignments, which are described below. The process of selecting the preferred alignment is set out in the option matrices in *Annex B2*.

B2.5.1 Alignment Options Considered for Reaches 1 to 4 (River Erewash)

Early in the design process, a new large flapped outfall was considered for where the River Erewash flows beneath the railway bridge at Attenborough Junction. The structure would prevent the floodwaters of the River Trent flowing up the River Erewash and flooding properties within the Chilwell area of the flood cell.

This option was discounted for technical and economic reasons. When the River Trent is in flood and the proposed flapped outfall shut, the River Erewash will back up to water levels similar to those in the River Trent and flood properties in Chilwell. To prevent this flooding, a pumping station would be required to overpump the River Erewash into the River Trent whilst the River Trent is in flood. A flapped outfall structure together with a pumping station is uneconomical.

B2.5.2 Flood Defence Alignment Options Considered for Reaches 5 and 6 - River Erewash to St. Mary's Close and Reach 10 - Cemex Works Site to Siemens

Several alternative alignment options were considered for the proposed defences

through Attenborough SSSI, parallel to the existing railway. Reaches 5, 6 and 10 all have lakes and underground high voltage electrical cables in close proximity to the railway. The alternative options considered were as follows:

- Build a flood embankment on an in-filled margin of the existing lake. The embankment toe would typically be 15m from the existing railway boundary fence and beyond the outer electrical cable. This was presented on Figure 4a in the Scoping Report as 'Alignment Choice A'.
- Build a new flood wall on the verge of the existing lake, typically 15m from the railway boundary fence and beyond the outer electrical cable. This was presented on Figure 4a in the Scoping Report as 'Alignment Choice B'.
- Build a new flood embankment with the toe at the railway boundary fence. The defence will be located directly above the high voltage electrical cables. This was presented on Figure 4a in the Scoping Report as 'Alignment Choice C'.
- Construct a new flood wall offset by 1 to 3m from the railway boundary fence. This was presented on Figure 4a in the Scoping Report as 'Alignment Choice D'.
- Replacing the railway boundary fence with a new flood wall. This was presented on Figure 4a in the Scoping Report as 'Alignment Choice E'.

A cross-section of these alignments are shown in Figure B2.2

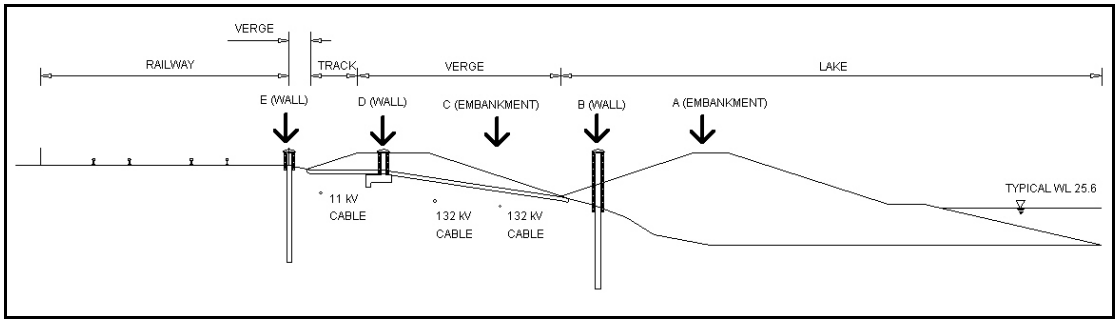


Figure B2.2 Alternative Alignments Considered for Attenborough SSSI (Reaches 5, 6 and 10)

Alignments A, B, C and E were discounted for the following reasons:

- Alignment Choices A, B and C have an unacceptable impact on Attenborough SSSI and loss of floodplain;
- Alignment Choice C has a detrimental impact on the underground high voltage electrical cables;
- there are health and safety issues associated with maintenance inspections of a flood wall acting as the Network Rail boundary fence (Alignment Choice E).

The preferred alignment is Alignment Choice D. The exact alignment has been selected to avoid impacting on the underground electrical cables.

B2.5.3 Sheet Piling Alignment Options Considered for Reaches 5 and 6 - River Erewash to St. Mary's Close and Reach 10 - Cemex Works Site to Siemens

A sheet pile cut-off is required through much of Attenborough SSSI to prevent seepage flooding via gravel strata beneath the flood wall (refer to *Section B11.2.3*). The alternative options considered to prevent seepage flooding and the reasons they were discounted are as follows:

- Option 3 - Locating the sheet piles immediately beneath the line of the flood wall - the sheet piles cannot be safely installed without possession of the adjacent railway line, which is uneconomical.
- Option 4 - Locating the sheet piles on the landward side of the railway line - the sheet piles would be offset a sufficient distance from the railway so that they could be installed without possession of the railway line. A second flood wall would be required above the sheet piles to prevent flooding from seepage between the main flood wall and the railway line. For Reaches 5 and 6, this option was discounted as there was no high ground to tie the sheet pile flood wall into and therefore, the seepage could not be contained. For Reach 10, this option was discounted due to significant construction impacts on 84 residential properties along Long Lane.
- Option 5 - Areas at risk from seepage flooding would be covered with a clay cap and/or raised to provide protection. The area potentially at risk extends to Nottingham Road for Reaches 5 and 6 and includes all of the Long Lane properties in Reach 10. The urban nature of this area and the extent of capping and raising works required, means this option is impractical.

A cross-section of these alignments is shown in Figure B2.3.

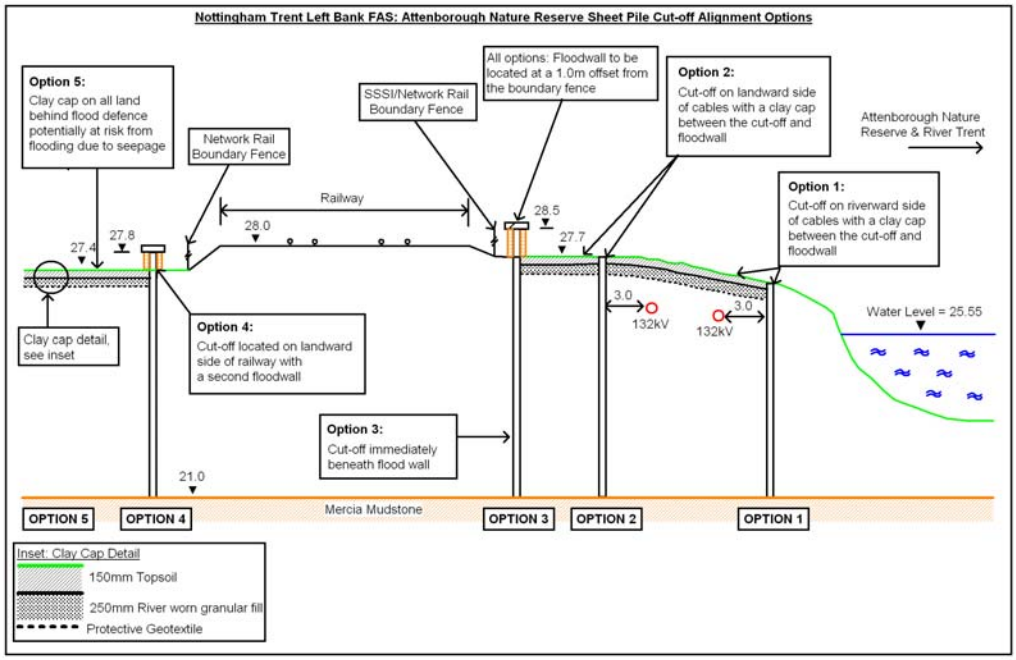


Figure B2.3 Sheet Pile Alignments Considered for Attenborough SSSI (Reaches 5, 6 and 10)

- Options 1 & 2 - The preferred option to prevent seepage through Reaches 5, 6 and 10 is offsetting the sheet pile cut-off from the flood defence wall. The offset of the sheet piles varies throughout the reaches. The impact on the SSSI, the location of buried high voltage cables and Network Rail requirements for piling near railways all influence the final alignment.

Detailed drawings of the preferred alignment for Attenborough village are presented in *Annex B3*.

B2.5.4 Alignment Options Considered for Reach 7 - St. Mary's Close to The Strand

The following alternative alignments were considered:

- Construct a new flood defence to follow the naturally high ground via the shortest route across Church Lane and alongside St. Mary's Church. This was presented in the Scoping Report as 'Alignment Choice F for Reach A5'.
- Construct a flood wall around the perimeter of Poseidon House and Ireton House and an embankment along the southern edge of the church yard. This was presented in the Scoping Report as 'Alignment Choice G for Reach A5'.

These alignments are shown on Figure B2.4.

The preferred alignment is Alignment Choice G. Alignment Choice F was discounted due to several properties in Attenborough village being isolated during a flood event. It was also discounted because archaeological investigations revealed the presence of upstanding earthworks and the buried remains of medieval and post-medieval settlements in Attenborough in the northern part of the field adjacent to St Mary Church. The investigations found that the greatest density of archaeological finds were located in the northern part of the field and constructing a wall along the northern boundary would cut off the archaeological features from the main village. There would also be severe construction impacts on the Grade II listed St. Mary's Church which would not be permitted under the Ancient Monuments and Archaeological Areas Act 1979.

B2.5.5 Alignment Options Considered for Reach 8 - The Strand

The alignment of new flood defences through this reach has to address the local human, historic and nature conservation issues. Extensive consultation with Natural England (NE), Nottinghamshire Wildlife Trust (NWT), the Attenborough community, Nottinghamshire County Council and Broxtowe Borough Council identified the following constraints, which the preferred flood defence alignment needed to address:

- visual impact on the Attenborough village Conservation Area;
- permanent loss of SSSI habitats;
- temporary construction impacts on the Attenborough community and the SSSI;
- permanent loss of a hedgerow and trees;
- impact on access to the SSSI, the Cricket Club and Bowling Club;
- impact on the use of the sports ground and bowling green;
- consideration on impacts to the high voltage electrical cables running along The Strand.

Scoping Stage

Before reaching the preferred alignment, the following alternatives were considered:

- Build a flood defence along the alignment of the existing hedgerow along The Strand. This was presented in the Scoping Report as 'Alignment Choice H for Reach A5'.
- Build a flood defence around the southern boundary of the cricket pitch along a route to minimise impact on both the existing trees and the cricket pitch. This was presented in the Scoping Report as 'Alignment Choice I for Reach A5'.
- Build a flood defence through the Attenborough SSSI, across the Old Fisherman's Car Park and a grassland meadow (referred to as Glebe Field). This was presented in the Scoping Report as 'Alignment Choice J for Reach A5'.

These alignments as presented in the Scoping Report are shown in Figure B2.4.

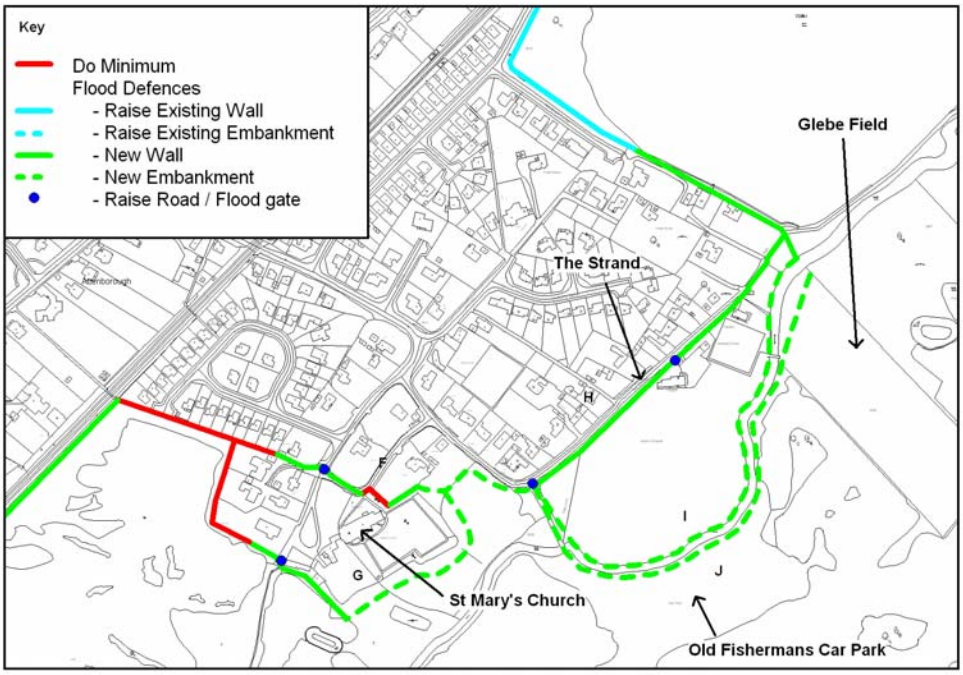


Figure B2.4 Alternative Alignments Considered for Attenborough Village (Reaches 7 and 8)

At scoping stage it was unclear whether a flood wall along The Strand could be safely constructed, given the close proximity of the underground high voltage cables. The alignment choices I and J were therefore included as alternatives. However, following considerable consultation (refer to *Appendix E*) and detailed surveys, the alignments I and J were discounted for the following reasons:

- Alignment Choice J has a significant detrimental impact on the SSSI. Planning Policy Statement (PPS) 9 'Biodiversity and Geological Conservation' recommends that development should not take place within a SSSI, where there are alternative options.
- The scale of permanent loss from Alignment Choice J on the unimproved floodplain grassland in Glebe Field and the species rich open water within The Brook can not be easily replaced or compensated for. The semi-natural grassland within Glebe Field is possibly the rarest type remaining in the region.

- Alignment Choice J would involve significant permanent land take and construction disturbance to the dry flower-rich grassland found within the Old Fisherman's Car Park. This area is part of the SSSI and supports plant species which are not found elsewhere in the SSSI. It is also one of the only areas within the SSSI which is used extensively for environmental education by students from the nearby Attenborough Nature Centre.
- Alignment Choice J does not comply with the principals of PPS 25 'Development and Flood Risk' and its recommendation to direct development away from the floodplain.
- Alignment Choice J did not receive the full support of statutory stakeholder including NE, English Heritage and Nottinghamshire County Council.
- Alignment Choice I would impact on existing mature trees and the usability of the sports ground for both cricket and football. This would cause a significant permanent impact on the landscape character and visual amenity between the perimeter of the Village Green and the Old Fisherman's Car Park.
- Alignment Choice I does not comply with the principals of PPS 25 and it did not receive the full support of statutory stakeholders.

The Scoping Report identified that the preferred alignment is 'Alignment Choice H for Reach A5'.

Detailed surveys of the cables and consultation with Central Networks have subsequently confirmed a design solution and construction method for a wall along The Strand is possible without compromising the high voltage cables.

Further Options Review

Following the production of the Scoping Report and throughout the development of outline design a number of further sub-options were considered for Reach 8 which are described below:

Avoiding Glebe Field and The Strand (Control Structures)

This option would involve the construction of an embankment or flood wall through the Old Fisherman's Car Park as per Alignment Choice J. The flood defence would differ from Alignment Choice J, however, as the alignment would cross The Brook and avoid Glebe Field. The defence would cross The Brook twice and this would involve the construction of flow control structures for these crossings. The defence would then continue as a flood wall around the rear of the Bowl's club. This option was rejected for a number of reasons:

- The alignment reduces the available floodplain in the area by protecting Attenborough Village Green and goes against PPS 25 'Development and Flood Risk'.
- The alignment goes against PPS 9 'Biological and Geological Conservation' which recommends that development should not take place in a SSSI where there are alternative options.
- Installing two water control structures across The Brook will involve the removal of some mature willow trees and would affect the passage of fauna including otters through The Brook. The structures would also impact on the species-rich open water community associated with this natural paleochannel

which forms part of the open water special interest feature of the SSSI. The structures would be a significant visual intrusion on the setting of the Village Green, and would lead to a section of The Brook being cut off from the main area and the SSSI.

- The flood defence would increase the shading on The Brook. Reducing the shade to the Brook is highlighted as an enhancement measure as part of the scheme to improve biodiversity.
- The extension of the embankment footprint into the lake would result in the loss of important aquatic fringe habitat.
- The current section of land between the lake and brook is narrow, tree lined and meandering. The introduction of the proposed bund would create a strong physical and visually negative barrier out of character with this section of the SSSI and surrounding flood plain, which is in the Conservation Area.
- The footprint of the embankment within the Fisherman's Car Park would be approximately 20m wide and would involve permanent land take into Attenborough SSSI.
- The alignment would involve significant permanent land take to the dry flower-rich grassland found in the Old Fisherman's Car Park, which is extensively used for environmental education. This area supports plants which, although not notified features of interest, are not found elsewhere in the SSSI and it would be unlikely that the loss could be compensated.
- There would be significant tree loss when compared against the alignment along The Strand. 25 to 30 mature willow trees will need to be felled compared to 10 to 15 for the option along The Strand.
- Possible increased disturbance to waterfowl using the SSSI from the raised footpath on top of the embankment.
- The embankment through the car park would obscure views from the SSSI towards the village and significantly alter the character of this section of both the SSSI and Conservation Area.
- The need for protective hand-railing would need to be investigated to prevent members of the public from falling into water. Any railing would have a negative visual impact on the SSSI and when viewed from The Strand.
- Temporary and potentially permanent land take of the bowling green. The Bowls Club have advised any impacts on the bowling green will require several seasons to reinstate to the existing standard.
- The alignment to avoid Glebe Field will significantly impact on the garden of 49 The Strand.
- A 2-3m high secluded wall would be likely to attract graffiti.
- It would require approximately 100m of additional defences than the option along The Strand.

Avoiding Glebe Field and The Strand (Brook Realignment into Fisherman's Car Park)

This option would involve constructing a 2-3m high flood embankment along the alignment of The Brook around the Village Green, from the access to Fisherman's Car Park round to Glebe Field. The tree line around the Village Green side of The Brook would be maintained whilst the trees on the SSSI would be lost. The Brook itself would be re-aligned through Fisherman's Car Park. The Brook will rejoin its existing alignment prior to Glebe Field where there would be a transition from embankment to a

flood wall. The wall would run along the rear of the bowling green before returning through private gardens back to The Strand.

The reasons for why this alignment was not chosen are broadly similar to the alignment involving control structures across The Brook, as above. Both require permanent land take within Attenborough SSSI and the reduction of floodplain storage area. Specific reasons against the realignment of The Brook into Fisherman's Car Park are given below:

- The realigned brook encroaches deeper into the SSSI and the loss of trees of the SSSI side of The Brook with a solid embankment replacing them will provide a stark contrast to the current Village Green environment.
- The toe of the dry side of the embankment will sit underneath the canopy of the existing tree crowns. This will increase compaction of the tree roots that would previously have been exposed on the brook's bank. This will significantly reduce the life expectancy of these trees. Significant replacement tree planting would have to be positioned to provide future screening.
- Soft ground under the alignment of the existing brook would need to be removed prior to placement of new embankment fill. This is also likely to damage existing tree roots and shorten their life expectancy.
- The realigned brook would need to be created within the existing lake leading to major disruption to aquatic life, although in longer term, with careful design, much of the value should return.
- The re-alignment will result in the loss of the original alignment of The Brook and could result in impacts to a paleochannel.

Variations to Alignment Choice H: Build a flood defence along the alignment of the existing hedgerow along The Strand

A number of variations to Alignment Choice H have also been considered during the consultation exercise; refer to *Appendix E*. The options considered included:

- Aligning the defences along the property boundaries of The Strand. However, this was discounted upon the advice of the majority of the local Attenborough community who wanted to minimise the temporary and permanent impacts on both properties and the bowling green.
- A 120m stretch of demountable flood defence along The Strand between the access lane to Attenborough (SSSI) and the cricket club pavilion was also considered. A demountable defence is a retractable barrier which is erected when a flood event is predicted. The key benefit of a demountable defence is that it has minimal visual impact when not in use. However, this system requires regular, intensive maintenance and a comprehensive operational strategy. Following the events of the 2007 flooding in Upton and the findings of the Pitt Report (Pitt *et al.*, 2008) demountable flood defences were discounted by the Environment Agency. A new national policy to ensure consistency in the criteria for their selection and use has been published. Demountables are only to be used where 'their residual risk, when using them instead of permanent defences is acceptable to the Environment Agency and does not compromise the overall integrity of the scheme'. The failure of the defence could potentially put 16,000 homes at risk of flooding. The use of demountable defences is now considered

to be too great a risk and they have been removed from the scheme, both at Attenborough and the Meadows.

- Raising the Village Green to reduce the visual impact of the wall was discounted because it reduced flood storage, the cricket pitch would be unusable for up to two years and there would be increased construction disturbance to the residents of The Strand from the transport of material which would need to be imported for the raising.
- Adding 500mm reinforced glass to the top of the wall to reduce its visual impact was also considered, a Fydro Self-Closing Flood Barrier System, hinged coping stones or gates or vertical sliding gates. These options were discounted due to maintenance and operational issues; refer to Table B2.5.
- Raising the level of The Strand by up to 500mm was considered as it could reduce the height of the wall to 1.5m on The Strand side. This option was adopted as it gives the potential for improvements to the road to be undertaken.

More detail on the options considered during Outline Design from Ireton House to 51 The Strand is available in the *Alignment Options Report Attenborough – Ireton House to 51 The Strand* (Black and Veatch, 2008).

Table B2.5 Sub-options Considered during Outline Design for Reach 8

Sub-Option	Description	For	Against
Avoiding Glebe Field and The Strand (Control Structures)	Constructing a flood defence through the SSSI but avoiding Glebe Field by crossing over the Brook twice and continuing around the bowling green.	Avoids The Strand and will have minimal visual intrusion on the village setting. Supported by local residents who are most affected by the scheme both during construction and in the long term. Glebe Field is preserved. Long term flood protection to cricket pitch and bowling green.	It contravenes Planning Policy Statement 9 'Biodiversity and Geological Conservation' and Planning Policy Statement 'Development and Flood Risk'. Temporary and permanent loss of habitat. The flood defence footprint is likely to extend into the lake. Visual and hydrological impacts of two flow control structures where the flood defence crosses The Brook. Negative visual impact of the defence within Conservation Area.

Sub-Option	Description	For	Against
Avoiding Glebe Field and The Strand (Brook realignment into Fisherman's Car Park)	Realigning The Brook into Fisherman's Car Park and constructing an embankment along the existing alignment of The Brook.	As for the sub-option above. Opportunities to improve the amenity value of The Brook. No intrusive control structures required where the flood defence crosses The Brook.	It contravenes Planning Policy Statement 9 'Biodiversity and Geological Conservation' and Planning Policy Statement 'Development and Flood Risk'. Temporary and permanent loss of habitat. The flood defence footprint is likely to extend into the lake. Loss of original alignment of brook; impacts on paleochannel. Negative visual impact of defence and view within Conservation Areas.
Variations to Alignment Choice H: Build a flood defence along the alignment of the existing hedgerow along The Strand	Aligning the flood wall along the boundaries of The Strand.	Avoids the Village Green and the removal of the hedgerow.	Disruption to garden boundaries, driveways and residents and the Bowls Club.
	Demountable defences.	Reduces visual impact from both The Strand and Village Green.	Increased operational resources. Risk of failure too high.
	Raising the Village Green.	Reduces the visual impact of the wall to 1.5m on the Village Green side.	No reduction of visual impacts from The Strand. Reduced flood storage.
	Adding 500m to the top of the wall by a variety of methods.	Reduces visual impact from both the Village Green and The Strand.	Regular maintenance required and some of the methods are still to be tested and could result in failure.
	Raising The Strand.	Reduces the visual impact of the wall to 1.5m on The Strand side. Raising the road involves minimum disruption to boundaries and properties.	No reduction of visual impacts from the Village Green. Drainage issues.

The preferred alignment for Attenborough village Option H – Build a flood wall along the alignment of the existing hedgerow along The Strand with road raising to reduce the visual impact. This is presented on the General Arrangement Figure BB3.5 in *Annex B3*.

B2.5.6 Alignment Options Considered for Reaches 9 and 11 to 13

For Reaches 9, 11 and 13, a single alignment to maximise floodplain storage has been considered. The alignment choice through these reaches is constrained by existing developments; refer to Fluvial Trent Strategy and the Scoping Report for more details.

This page is intentionally blank

B3. HUMAN POPULATION

This section addresses the impact of the development on the local population of Attenborough, Erewash and Rylands, the recreational resources and the key local businesses and commerce. The visual impacts of the scheme and the disturbance effects on the human population, arising from noise and vibration, air quality and traffic and transport are considered in separate chapters of this appendix, namely *Sections B5, B6* and *B9* respectively.

The results of the Health Impact Assessment are presented in *Section 7.4, Volume 1*.

B3.1 Method of Assessment

Information on the local community was collated through site visits, consultation with local authorities and landowners and a review of data within the Broxtowe Borough Council Development Plan. A qualitative evaluation of the impacts on the human population during construction and operation has been undertaken using constraints mapping.

The 'local community' is defined as that which would be directly affected by the construction works and who live within 200m of the works. This area of influence has also been considered for noise and vibration impacts. The 'local population' is defined as that which falls within the study area; refer to *Section B1.3*. *Section 7.3.2, Volume 1* sets out the methodology for assessment in more detail.

B3.2 Baseline Conditions

B3.2.1 Local Population

The urban communities of Chilwell, Attenborough, Long Eaton, Beeston and Rylands form much of the study area. They comprise mostly residential properties with many industrial/commercial business parks along the northern side of the railway line. Approximately 3,200 properties and businesses are presently at risk of flooding from an event with a 1% annual probability of occurrence through Attenborough, Erewash and Rylands.

There are approximately 1,194 residential properties within 200m of the proposed works; refer to Table B3.1. Assuming that each property contains an average of 2.36 people, the estimated local population is approximately 2,818 (Source – 2001 Census).

B3.2.2 Critical Infrastructure

Toton STW, Lilac Grove STW and Attenborough and Beeston train stations are within the floodplain with a 1% annual probability of flooding.

B3.2.3 Key local businesses and employment

Within the local community the key local businesses directly affected by the works are Toton STW, the Cemex Works Site, the Siemens site and Manor Garage.

Table B3.1 Human Receptors within 200m of the Proposed Flood Defenses

Distance from proposed flood defence (m)	Building Type (No. of buildings)						Total of all types
	Residential	Retail	Schools & Offices	Industrial	Leisure	Misc.	
Erewash (Reaches 1-4)_							
<50	25	3	-	1	-	1	**30**
50 - 100	27	7	-	1	2	2	**39**
100 - 150	48	2	-	-	-	2	**52**
150 - 200	60	-	-	-	1	-	**61**
Total	**160**	**12**	**-**	**2**	**3**	**5**	**182**
Attenborough (Reaches 5-11)							
<50	190	-	2	1	-	4	**197**
50 – 100	162	1	-	5	-	2	**170**
100 - 150	98	-	-	5	-	4	**107**
150 - 200	89	1	2	4	-	3	**99**
Total	**539**	**2**	**4**	**15**	**-**	**13**	**573**
Rylands (Reaches 12–14)							
<50	98	-	-	1	-	-	**99**
50 - 100	154	-	-	-	2	1	**157**
100 - 150	124	1	2	-	-	1	**128**
150 - 200	119	-	-	1	1	-	**121**
Total	**495**	**1**	**2**	**2**	**3**	**2**	**505**

B3.2.4 Local farming and commerce

The majority of land is managed for nature conservation (see *Section B4*). However the works for Reach 3 will directly affect pasture land used by St. Leonard's Riding School on Nottingham Road. The fields to the south of Ireton House and the west of St. Mary's Church are also pasture (Reach 7). The fields south of the existing embankment and wall in Reaches 13 and 14 are arable.

B3.2.5 Sensitive Sites

There is one church close to the works, St. Mary's Church in Attenborough (Reach 7). It is a focal point of the village, providing a meeting place for various interest groups and acts as a concert venue. Services are held throughout the week with regular worship on Sunday mornings. It also holds the annual village fete in summer, a biennial flower festival and a Christmas bazaar.

The Attenborough Preparatory School is a private, co-educational school of approximately 80 pupils, aged 4 to 11. The Upper School is located on The Strand and the Lower School adjacent to Attenborough Tennis Club on Shady Lane.

In the Attenborough scheme area, the land on the riverside of the railway line is dominated by Attenborough SSSI. This contains a series of inter-connected lakes, which were formed as a result of aggregate mining. Cemex still operate a works site to the north of the village. The nature conservation features of the area are set out in more detail in *Section B4.*

Attenborough Village Green (Reach 8) is adjacent to The Strand and is a key local recreation resource for the village. It is used all year round for cricket and football and by Attenborough Preparatory School as a playing field; refer to *Section B3.2.6*.

High voltage underground cables were recently installed through Attenborough SSSI and the village along the approximate alignment of the proposed defences (Reaches 5, 6 and 8).

Beeston Marina and Mobile Home Complex and an allotment site are located off Riverside Road in Rylands (Reach 12).

B3.2.6 Recreation

Attenborough SSSI is the area's key attraction for locals and visitors alike and receives up to 3,000 visitors per week during the peak summer season and up to 100,000 per year use the site. The network of footpaths and bridleways are well-used and the recently constructed visitor centre is a popular meeting place and education facility. Activities within the SSSI include bird-watching, cycling, walking, fishing and various water sports. The formal public rights of way (PRoW) are shown on Figure BB3.1 in *Annex B3*. Coneries Pond in Attenborough SSSI is used by Attenborough Sailing Club which is situated to the south of Barton Lane (Reach 5).

Next to The Strand in Attenborough village (Reach 8) there is the Village Green, which is used as a football pitch in winter and as a cricket pitch during summer, and adjacent to this is the bowling club. The Village Green is used by students of Attenborough Preparatory School. Attenborough Lawn Tennis Club is on Shady Lane. On the northern side of the railway line adjacent to the properties on Long Lane is Chilwell Manor Golf Course (Reach 11).

There are large playing fields along the Rylands scheme area and several footpaths link the Nottingham and Beeston Canal and the River Trent. The long distance footpath 'The Trent Valley Way' crosses into the scheme area in Reach 13 in Rylands and continues along the riverbank through Attenborough SSSI.

The River Trent is navigable upstream of Beeston Weir. Beeston Marina is situated on the left bank of the River Trent upstream of Beeston Lock.

A review of the Natural England Open Country and Registered Common Land Maps indicates that there is no common land or open access countryside in this area of the scheme.

B3.3 Impact Assessment

The assessment methodology for 'Human Population' is set out in *Section 7.3, Volume 1*.

B3.3.1 Construction Impacts

The following construction phase elements have the potential to temporarily affect the local population:

- establishment of a site working area and access, site clearance and associated construction activities (refer to *Section B2*);
- closure of local footpaths and bridleways;
- closure of Nottingham and Beeston Canal (Reach 13 only).

Impact on Local Properties as a Result of Construction Activities occurring in Close Proximity (less than 50m)

There will be disturbance to 313 residential properties within 50m of the works; refer to Table B3.2. The works will come within close proximity (less than 50m) to the following residential properties:

- 25 on Nottingham Road will be affected by the Erewash Works (Reaches 1-4);
- 190 in Attenborough Village and around Long Lane and Meadow Lane will be affected by the works to Attenborough (Reaches 5-11);
- 98 on Riverside Road, Canal Side, Cornwall Avenue plus permanent caravans in the Beeston Marina and Mobile Home Complex will be affected by the Rylands Works (Reaches 12-14).

Individual properties have low sensitivity but the impact on individual properties will vary from a medium to high magnitude. The overall significance of the impact has been assessed as minor to moderate adverse; refer also to *Section B5 Noise and Vibration.*

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** (for general disturbance) to **moderate adverse (**for disturbance from works occurring in residents boundaries and/or restrictions on access to properties) and **short-term**.

Impact on Key Businesses as a Result of Construction Activities occurring in Close Proximity (less than 50m)

- Reach 4 - Manor Garage; works occurring within its boundary.
- Reach 2 - Toton STW; works occurring within its boundary and Site Compound C which will be based there for the duration of the works.
- Reaches 9 and 10 - Cemex; works within its boundary and restrictions on access road, especially when raising works occur on access track to the west.
- Reach 12 - Siemens; works within its boundary and restrictions on the access road to the west of the site.

The sensitivity of the businesses is low (Siemens and Manor Garage) to medium (Toton STW and Cemex) and the magnitude of the impact is considered medium as all businesses will be able to continue to operate during construction.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor** (Siemens and Manor Garage) to **moderate** (Toton STW and Cemex) **adverse** and **short-term**.

Table B3.2 Summary of Local Properties within 50m of Construction Activities

Reach	Disturbance within boundaries and/or to access and duration[1] (High magnitude of impact)	General disturbance and duration[1] (Medium magnitude of disturbance)
Erewash (Reaches 1-4)	• Disturbance to 17 properties on Nottingham Road due to construction works within their boundaries for up to eight months (Reaches 3 and 4).	• General disturbance to eight properties also along Nottingham Road, which are less than 50m from the construction works for up to eight months (Reaches 3 and 4).
Attenborough (Reach 5-11)	• Disturbance to Ireton House, Poseidon House, two properties on Adenburgh Drive, and 7 Ferndale Close due to construction works within their boundaries for up to six months (Reach 7). • Disruption of vehicular access to all properties along The Strand for up to 10 months (Reach 8). • 49 and 51 The Strand will experience significant construction disturbance due to works occurring within their boundaries during the works for Reaches 8 and 9. The works on these reaches is programmed to take 17 months to complete.	• Residents along the Strand will be significantly impacted from accessing their houses for up to ten months (Reach 8). • General disturbance to 183 properties in Attenborough Village, around Long Lane and Meadow Lane and the Gate House on Barton Lane, which are less than 50m from the construction works (Reaches 5-11). Durations of works to each reach will not exceed 10 months.
Rylands (Reaches 12-14)	• Disturbance to the Lock Keeper's Cottage and due to construction works within boundary for up to three months (Reach 13).	• General disturbance to a further 97 properties, which are less than 50m from the construction works (Reach 12-14). Disturbance will last up to six months. • Disturbance to the permanent moorings on Nottingham and Beeston Canal for up to 4 months (Reach 13).

[1] durations given are indicative only and are worst case as not all works in one reach will affect the properties all of the time. Refer to *Section B.2.2.1* for the indicative construction programme.

Impact on Local Farming and Commerce as a Result of Construction Activities

- Reaches 3 and 4: Reduction in grazing land due to the location of the site compound and working area and disturbance to St. Leonard's Riding School off Nottingham Road.
- Reach 7: Temporary loss of land during construction to the grazing fields south of St. Mary's Church.
- Reach 14: Temporary loss of arable land during construction to the south of the Nottingham and Beeston Canal.

All affected farmland is low sensitivity and the magnitude of the impact is considered medium as use of the wider farmland will continue.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** and **short-term**.

Impact on Sensitive Sites as a Result of Construction Activities occurring in Close Proximity (less than 50m)

- Reach 7: Disturbance to users of St. Mary's Church (low sensitivity).
- Reach 8: Restriction of access and use of Village Green to Attenborough Preparatory School for pupils and staff (medium sensitivity).
- Reach 12: Works occurring with the Beeston Marina and Mobile Home Complex (low sensitivity). Works are very close to a few caravans and it is possible that occupiers may need relocating during the works.
- Reach 12: Disturbance to the Rylands allotment holders (low sensitivity) and those plots adjacent to the works area. Land use impacts are discussed in *Section B12*.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor** to **moderate adverse** (for impacts along The Strand and caravans) and **short-term**.

Impacts on Local Recreational Resources as a Result of Construction Activities

- Temporary closure and diversion of six PRoWs, four footpaths and two bridleways, resulting in disturbance to regular users of these paths. The PRoWs are No.s 65, 74, 68, 69, 73, and 75; refer to Figures BB3.1 to BB3.10. The maximum duration of a diversion/closure will be six months. There is no requirement to permanently divert any footpaths or bridleways.
- A cycle path runs along the top of the existing embankment in Reach 13 and adjacent to the wall along Reach 14. It is not designated as a PRoW but will require temporary closure.
- Reach 5: Restriction of access to Attenborough Sailing Club at the south end of Coneries Pond and restriction of access into Attenborough SSSI car park from partial closures of Barton Lane.
- Reach 8: Restricted use of the Village Green (sports ground, cricket club pavilion and car park) for ten months and restricted access to the bowling green and pavilion. The grass on the Village Green could take one full growing season following the works to recover from the use of the aluminium roadway. Permanent loss of two stiles within the hedgerow by the Strand.

- Reach 11: Disturbance and restricted access to Chilwell Manor Golf Club for three months.
- Reach 13 and 14: Disruption to canal traffic using Beeston Lock as a result of closure of the lock for up to four months. Indirect disturbance to the boats using the moorings on the canal and restriction of use of tow path.

All recreational resources are of low sensitivity except Attenborough SSSI and the Nottingham and Beeston Canal (medium). Impacts on the Village Green and the canal and footpath closures are considered high. All other impacts are assessed to be medium as use of the resource will be able to continue.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate** to **major adverse** (canal closure) and **short-term**.

B3.3.2 Operational Impacts

Impact on Local Population as a Result of Reduction in Flood Risk

The risk of flooding will be reduced for approximately 3,200 properties and businesses in Attenborough, Erewash and Rylands. This has additional associated benefits to property values and future development of the industrial areas.

The *significance* of the *operational impact* has been assessed as being **moderate beneficial** and **permanent**. No mitigation required.

Impact on Flood Regime of Recreational Resources and Sensitive Sites Outside New Flood Defences

There will be a negligible increase in flooding in areas that will be unprotected by the new defences. During a flood event with a 1% annual probability of occurrence the depth of flooding will increase by approximately 0.07m. There would be no increase in the frequency of flooding.

The *significance* of the *operational impact* has been assessed as being **none**.

Impact on Villages Outside the Scheme Area

The impact of increased flood risk to villages further downstream is discussed in *Section 8, Volume 1*.

The *significance* of the *operational impact* has been assessed as being **moderate adverse** and **permanent.**

B3.4 Mitigation Measures and Monitoring

A public liaison officer will be appointed for the duration of the construction works to inform those affected by the scheme on progress and resolve any disputes or concerns.

Mitigation measures to address impacts related to landscape and visual amenity, local traffic as well as noise and vibration are addressed in *Sections B5, B7 and* B*9* of this appendix. Other mitigation measures for the potential impacts on the human population are listed in Table B3.3 and include scheduling of works to avoid important local events and prior notification of nature and programme of the construction. In addition, an Environmental Clerk of Works will be appointed to monitor the environmental impacts. Details on alternative access arrangements are provided in *Section B2.2*. General mitigation for the potential impacts on the human population are given in *Section 7.3, Volume 1*.

B3.5 Residual Impacts

Table B3.1 summarises the residual impacts on the human population. Residual impacts are those which remain after all identified mitigation has been implemented.

The **adverse** impacts to local residents, businesses and the Village Green caused by construction related disturbances will be **short-term**. Direct impacts on property or the Village Green cannot be avoided and will remain a **moderate adverse** impact but the magnitude of indirect impacts will be reduced to **minor** significance through the proposed mitigation. The duration of disturbance will be dependent upon the location of the working areas. Refer also to *Section B5 Noise and Vibration.*

Works will be timed to minimise the disruption to the canal which will reduce the impacts to **moderate adverse**.

Upon completion, the reduction in flood risk to properties and businesses, and the intangible benefits, such as a reduction in stress of the residents, is considered to be **moderate beneficial** and **permanent** impact.

Table B3.3 Summary of Impacts on Human Population

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
Construction Impacts			
Impact on local properties as a result of construction activities in close proximity	Minor to moderate adverse and short-term	• Alternative access arrangement; refer to *Section B2.2*. • Liaison with residents. • Minimise working areas within private properties. • Full re-instatement of gardens.	Minor to moderate adverse and short-term
Impact on key businesses as a result of construction activities in close proximity	Minor to moderate adverse and short-term	• Liaison with local businesses.	Minor to moderate and short-term adverse
Impact on local farming and commerce as a result of construction activities	Minor adverse and short-term	• Liaison with affected landowners.	Minor adverse and short-term
Impact on sensitive sites as a result of construction activities occurring in close proximity	Minor to moderate adverse and short-term	• Liaison with the church and its users. • Suitable access arrangements agreed with Attenborough Preparatory school. Alternative nearby recreation facilities sought for school's use; refer to *Section B2.2.2*. • Relocate caravan occupiers as required. • No construction activity during annual village fete, biennial flower festival and Christmas Bazaar. • Liaison with Rylands allotment plot holders adjacent to works area for Reach 12 and adequate advance notification of works.	Minor to moderate adverse and short-term
Impacts on local recreational resources as a result of construction activities	Moderate to major adverse and short-term	• Formal closure and temporary diversion where possible of footpaths and bridleways with clear signage provided. • Ensure access is maintained to Attenborough Sailing Club and Attenborough SSSI during works in Reaches 5 and 6. • Alternative nearby football pitches and cricket	Minor to moderate adverse and short-term

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
		facilities sought for construction period. • Use turf instead of seeding in Village Green to promote re-establishment. • Carrying out works to the Beeston Lock gates during low-season (October to January) with a break in works over the Christmas holidays, to minimise impact on canal users. • Reduce the working area for Reach 11 and carry out works during winter months to minimise impact on golfers. Ensure advance notification of works.	
Operational Impacts			
Impacts on local population as a result of reduction in flood risks	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
Impact on flood regime on local recreational resources and sensitive sites outside new defences	None	No mitigation required.	None
Impact on villages outside the scheme area	Moderate adverse and permanent	Refer to *Section 8, Volume 1.*	

B4. FLORA AND FAUNA

This section considers the impacts on local flora and fauna of the site and the surrounding area.

B4.1 Method of Assessment

The impacts are assessed using the IEEM Ecological Impact Assessment (EcIA) methodology (IEEM, June 2006) outlined in *Annex 2, Volume 1*. The baseline was established through a desk study, which took as its search area a distance of 2km from the proposed works. Consultation was also undertaken with nature conservation organisations and a number of field surveys were conducted, which are detailed in *Annex 2, Volume 1*.

B4.2 Baseline Conditions

B4.2.1 Statutory Sites of Nature Conservation Interest

There are two SSSIs within 2km of the proposed flood defence works at Attenborough, Erewash and Rylands.

The proposed flood defence works will run along the western border of **Attenborough SSSI**; refer to Figure B4.1. This 221.2ha site is notified for its lowland eutrophic open waters with emergent vegetation, wet floodplain woodland, unimproved floodplain grassland, a rich assemblage of breeding birds associated with lowland open waters and their margins, and wintering shoveler *Anas clypeata* and bittern *Botaurus stellaris*,

The gravel pits of varying ages illustrate the successional development of natural vegetation over 40 years and possess a diverse complement of terrestrial, marsh and aquatic habitats. Species in the margins of the large open water bodies include the nationally scarce short-leaved water-starwort *Callitriche truncata*, lesser pondweed *Potamogeton pusillus*, fennel pondweed *P. pectinatus* and fan-leaved water crowfoot *Ranunculus circinatus*. The landward margins of these ponds are frequently submerged during flood events and as a consequence have been colonised by emergent swamp and fen vegetation which in some places are species rich, containing such plants as purple loosestrife *Lythrum salicaria*, flowering-rush *Butomus umbellatus* and the locally uncommon marsh stitchwort *Stellaria palustris* and slender tufted-sedge *Carex acuta*.

On the lake fringes there are extensive stands of willow scrub characterised by grey willow *Salix cinerea*, common osier *S. viminalis* and sallow *S. caprea*. On the former silt-beds, peninsulas and islands in the north of the SSSI there are older stands of wet, seasonally flooded woodland which form the largest example of this scarce habitat in Nottinghamshire. Crack willow *Salix fragilis*, white willow *S. alba* and alder *Alnus glutinosa* dominate, with occasional ash *Fraxinus excelsior* and birch *Betula pendula*.

Small areas of species-rich grassland within the SSSI include an important example of a seasonally inundated floodplain grassland community which has been greatly reduced in extent across most of England. In Attenborough SSSI this

community is characterised by a diverse range of herbs and grasses. Species of note are salad burnet *Sanguisorba minor*, a plant more commonly associated with calcareous soil but is locally abundant here, and dropwort *Filipendula vulgaris*, which is now uncommon in Nottinghamshire.

The still water channel of the former River Erewash, together with other similar channels, contains a rich aquatic community of plants and animals, with water-plantain *Alisma plantago-aquatica* and yellow water-lily *Nuphar lutea* abundant in the open water. Substantial areas of marsh and reedswamp occur to the north of Attenborough village. A botanical survey of the potential working areas was carried out in summer 2006. The methodology is given in *Annex 2, Volume 1* and results given in *Section B4.2.3*.

The variety of breeding bird species is exceptional and includes common tern *Sterna hirundo*, kingfisher *Alcedo atthis*, little ringed plover *Charadrius dubius* and great-crested grebe *Podiceps cristatus*. The pits also provide, particularly on the southern lagoons, a very valuable refuge for passage and overwintering waterfowl, being notable especially for their wintering populations of bittern and shoveler. Results of breeding and wintering bird surveys carried out for this scheme are given in *Section B4.2.4*.

All of the wetland communities are currently in unfavourable condition, mainly due to poor water quality. The neutral grassland is classed as unfavourable-recovering and the woodland is in favourable condition. The Government has set a target of 95% of SSSI units in favourable or unfavourable-recovering condition by 2010.

Holme Pit SSSI lies 1.2km south of the proposed flood defence at its nearest point and on the right bank of the River Trent. The site contains some of the best remaining areas of marsh, reedswamp and open water in Nottinghamshire and is of 'National' importance. Additional interest is provided where broad-leaved woodland has developed and rock exposures show off local geology formations.

There are no Special Protection Areas (SPA), Special Areas of Conservation (SAC), or Ramsar sites in the 2km search area of the proposed works.

B4.2.2 Non-statutory Nature Conservation Designations

Twenty-eight designated non-statutory Sites of Interest for Nature Conservation (SINCs) lie within 2km of the proposed flood defences in Attenborough, Erewash and Rylands. Of these only Attenborough Pastures SINC has the potential to be affected by the proposed flood defences.

Attenborough Pastures SINC comprises a number of floodplain meadows totalling 25ha bordering the River Erewash and is dissected by several drains. The grassland is semi-improved neutral grassland and is currently used as grazing pasture for horses from St. Leonard's Riding School. It also has an interest for wintering birds and wildfowl.

Trent Meadows pLWS is adjacent to the Attenborough scheme area but lies within Derbyshire and impacts on it are discussed in *Appendix A.*

The location of the SINCs highlighted is shown on Figures BB3.1 and BB3.2.

B4.2.3 Habitats

National and Lowland Nottinghamshire Biodiversity Action Plan (BAP) habitats are listed in *Table 4.3* in *Section 4.3, Volume 1*.

The Phase 1 Habitat Survey data is shown on the General Arrangement Drawings for Attenborough, Erewash and Rylands in *Annex B3.* The results of the botanical survey within the SSSI are shown on the drawings in *Annex B1*. The National Vegetation Classification (NVC) communities found during the botanical surveys are listed in Table B4.1.

Table B4.1 NVC Communities and Sub-communities Recorded during Botanical Survey at Attenborough SSSI, 2006

NVC Code	Community [1]	Sub-community
Aquatic Communities		
A2	*Lemna minor* community	
Grasslands		
MG1	*Arrhenatherum elatius* grassland	
MG1b		*Urtica dioica*
MG4	*Alopecurus pratensis – Sanguisorba officinalis* grassland	
MG6b	*Lolium perenne – Cynosurus cristatus* grassland	*Anthoxanthum odoratum*
MG9	*Holcus lanatus – Deschampsia cespitosa* grassland	
Vegetation of Open Habitats		
OV24	*Urtica dioica – Galium aparine* community	
OV26	*Epilobium hirsutum* community	
OV26c		*Filipendula ulmaria – Angelica sylvestris*
Swamps		
S4	*Phragmites australis* swamp and reed-beds	
S5	*Glyceria maxima* swamp	
S5a		*Glyceria maxima*
S6	*Carex riparia* swamp	
S12	*Typha latifolia* swamp	
S12a		*Typha latifolia*
S14	*Sparganium erectum* swamp	
S14-S15 transition	*Sparganium erectum* swamp – *Acorus calamus* swamp	
S15	*Acorus calamus* swamp	
Woodlands and Scrub		
W2	*Salix cinerea – Betula pubescens – Phragmites australis* woodland	
W6	*Alnus glutinosa – Urtica dioica* woodland	
W6b		*Salix fragilis*
W21a	*Crataegus monogyna – Hedera helix* scrub	*Hedera helix – Urtica dioica*
W24	*Rubus fruticosus – Holcus lanatus* underscrub	

[1] - Refs: Rodwell 1991; Rodwell 1992; Rodwell 1995; Rodwell 2000

This page is intentionally blank

Designed	ES	Date: Jan 07
Checked	PS	Date: Jan 07
Drawn	NG	Date: Jan 07
Checked	ES	Date: Jan 07
Reviewed	PS	Date: Jan 07

Rev.	Nature of Revision	Drawn	Chkd.	Rvwd.	Appd.	Date
1	Defence Updates	NG	CJ	ES	ES	08/08

Meadow Lane
Cemex Works Site
Glebe Field
The Village Green
Attenborough Village
Barton Lane
River Erewash
The Strand
Visitors Centre
Railway Line
Attenborough Sailing Club
Old Fisherman's Car Park
Barton Lane
Bird Hide
Cottages

Key

- Attenborough Lakes
- Proposed Flood Defence
- River Trent
- Kingfisher Route + Tufted Duck Route (Waymarked Footpaths)
- Other Footpaths
- Barge Channel
- The Brook
- T — Tern Platform
- SSSI Boundary

Scale

0m 250m 500m

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Attenborough SSSI

Environment Agency

Contract no. 108806	Approved: ES	Date: Aug 08
BLACK & VEATCH	Scale : NTS	Drawing no. Figure B4.1

P:\108806 - Left Bank Detailed Design\60_Generated documents\62_Generated Drawings\MapInfo\Env Statement Updated\Attenborough_SSSI_V1.WOR Aug 08 NG ISSUED 26/08/08

This page is intentionally blank

Aquatic Communities

Small stands of floating macrophytes are present in a few of the flooded pits in Attenborough SSSI. The A2 *Lemna minor* community recorded is ubiquitous in lowland England, and is not of high botanical importance. No submergence communities (e.g. beds of *Potamogeton, Eolodea* or *charophytic* algae) were found. It is likely that the high numbers of grazing waterfowl present in the area would preferentially feed on such plants, were they present. The Brook also supports dense pure stands of the introduced least duckweed *Lemna minuta* in places. This community has no NVC code.

Grasslands

The field north of the River Erewash in Reach 3, adjacent to Nottingham Road, is species poor semi-improved grassland. All other grasslands affected outside of the SSSI are amenity grasslands or low diversity pasture.

Between the River Erewash and Barton Lane (Reach 5), the proposed working area supports species-poor MG1 neutral grassland and mosaics of poor grassland and tall herb vegetation. MG6 grassland is mainly present in horse-grazed areas, and is also of low diversity.

The species-rich grassland between Glebe Field and The Brook in Reach 8 (Map Ref. C43, Figure BB1.2, *Annex B1*) is good quality MG9, and although of limited extent, is of high intrinsic botanical value.

The grassland community at Glebe Field represents a fine example of MG4 meadow foxtail *Alopecurus pratensis – Sanguisorba officinalis* flood meadow. Rare plants found in Glebe Field are listed in Table B4.2. The MG4 grassland found in Glebe Field is a nationally rare grassland type, largely confined to lowland floodplain valleys in the south and east of England (Jefferson & Robertson, 1996). Lowland hay meadows have been recognised as priority habitat types in the UK Biodiversity Action Plan as a result of their scarcity and vulnerability to changes in land use practices. There is likely to be no more than 1543ha of this resource in Britain (Jefferson, 1997).

The Trent Valley and Rises Natural Area in the East Midlands forms a key focus for this community type in England (Jefferson 1997). It is likely that this resource was historically more extensive along the River Trent and many of the larger tributaries. The MG4 resource is now highly fragmented and it is estimated that there is only 123ha within this Natural Area.

In Nottinghamshire, unimproved lowland grassland is extremely rare. It is estimated that 99.7% of neutral grassland has been lost since 1938 due to agricultural improvement and all remaining fragments in the county are now small. Glebe Field provides 1.7 ha in total of unimproved grassland and represents 14% of the county resource. Unimproved grassland is included in the SSSI citation.

Vegetation of Open Habitats

Throughout the proposed working area through Attenborough SSSI there are a range of open habitat communities variously dominated by common nettle *Urtica dioica* (OV24) and great willowherb *Epilobium hirsutum* (OV26). Many of these

communities are species-poor and of low intrinsic botanical value. However, in the northeast of Glebe Field there are two small stands of OV26c close to The Brook (Map Ref. C46, Figure BB1.2). These are diverse, and of high botanical interest.

Some of the non-NVC tall herb communities are of moderate diversity, where tall, vigorous mesotrophic species such as wormwood *Artemisia absinthium*, mugwort *A. vulgaris* and hogweed *Heracleum sphondylium* are prominent (e.g. Map Ref. C23 in Reach 5, Figure BB1.1, *Annex B1*). The Old Fisherman's Car Park supports a stand of low-growing, semi-open early successional vegetation close to Attenborough village (Map Ref. C38, Figure BB1.2, *Annex B1*). This grassland is of low to moderate interest, although much of the interest is due to the presence of a number of neophytic species, e.g. Canadian fleabane *Conyza canadensis*, and large-flowered evening-primrose *Oenothera glazioviana*.

The Old Fisherman's Car Park was surveyed in September 2006 by a Botanical Society of the British Isles (BSBI) Vice County Recorder and members of the Nottinghamshire Botanical and Geological Records Centre. They recorded 88 species including twiggy mullein *Verbascum virgatum*, which is only the second Nottinghamshire vice-county recording. In addition common spotted-orchid *Dactylorhiza fuchsii* spikes have been recorded in last few years (Aitken 2006). It is also considered by NWT as a fundamental component of their environmental education programme for children and was used by over 5,500 children for learning between March 2005 and July 2006.

Overall the vegetation present is typical of many dry, nutrient-poor urban brownfield sites but within the SSSI the Old Fisherman's Car Park provides a valuable additional habitat, which has the potential to develop further with appropriate management in future years.

Swamps

Marginal and emergent (swamp) communities are well represented in the botanical survey area of Attenborough SSSI, and though small, some of these are very diverse. The neophyte, sweet-flag *Acorus calamus* appears to be locally frequent in the River Trent and in Attenborough SSSI. It has its own NVC community: S15 *Acorus calamus* swamp (Map Ref. C47, Figure BB1.2, *Annex B1*). Other swamps are more species poor and are defined by their dominant species: S5 (*Glyceria maxima*), S6 (*Carex riparia*), and S12 (*Typha latifolia*).

Swamp communities are also prominent near Attenborough village, where they are common along The Brook, and at the edges of the silt lagoon to Works Pond. Of particular note is a small area of herb-rich fen vegetation (Map Ref. C45, Figure BB1.2) lying between The Brook and Works Pond. It does not assign well to any particular NVC community, but for its size, is notably diverse. In Works Pond common reed *Phragmites australis* (S4) has rapidly colonised the silt, and forms extensive, species-poor and dense stands across much of the lagoon (Map Ref. C50, Figure BB1.2).

The Brook was surveyed in September 2006 by a BSBI Vice County Recorder and members of the Nottinghamshire Botanical and Geological Records Centre. They recorded 57 species (including tree and shrub species). Notable species within The Brook include tasteless water pepper *Persicaria laxiflora* (a Vascular Plant of Conservation Concern in the Nottinghamshire BAP), tubular water-dropwort

Oenanthe fistulosa, and fringed water-lily *Nymphoides peltata*. Rare plants found in or near The Brook are listed in Table B4.2.

Open waters with emergent vegetation are included in the citation for Attenborough SSSI.

Woodlands and Scrub

The main woodland type in the botanical survey area within the SSSI is W6b. This is willow carr, and is represented in the area by a number of different ages, the oldest and most diverse at the northern end of Attenborough SSSI (Reach 10); (Map Ref. C28, Figure BB1.4). It is mainly defined by the prominence of crack willow, with some canopy alder and other willows (including purple willow *S. purpurea*) forming an open understorey. The oldest stand is particularly interesting because the canopy species are unpollarded, and both crack willow and white willow form impressive standards 25m or more in height. In contrast, developing stands along the edges of some of the flooded pits are very species-poor, and often support only grey willow, crack willow, osier and alder.

At the north-east corner of Attenborough village, a stand of W2 wet woodland has developed close to a planted embankment (Reach 9); (Map Ref. C51, Figure BB1.2). This is also willow carr, but differs mainly in having little alder in the canopy and prominent common reed in the under storey. There is only one stand in the botanical survey area, suggesting it is a locally uncommon habitat type.

Scrub communities include those dominated by hawthorn *Crataegus monogyna* (W21) and bramble *Rubus fruticosus* agg. (W24). These are very species-poor and have little intrinsic botanical value. Near the Attenborough Visitor Centre, there are also a number of dense, mono-specific stands of broom *Cytisus scoparius*, of similarly low botanical value.

A number of mature trees within the gardens adjacent to the proposed defences in Erewash (Reach 4) and through Toton STW (Reach 2) are within the proposed working area.

Table B4.2 Rare Plants at Attenborough - The Brook and Glebe Field Meadow

Species	**Percentage of 10km grid squares recorded nationally** (Preston & Pearman *et al* 2002).	**Locality within SSSI**
Water-pepper *Persicaria hydropiper*	60%	Beside The Brook in Glebe Field.
Salad burnet *Sanguisorba minor*	33%	Only found in parts of Glebe Field. Indicator of old unimproved grassland.
Kidney vetch *Anthyllis vulneraria*	48%	Only found on approach to the Old Fisherman's Car Park bridge (no recent records). Scare plant in SW Nottinghamshire away from limestone.
Dogwood *Cornus sanguinea*	42%	The south side of the entrance to the Old Fisherman's Car Park only.
Pepper-saxifrage *Silaum silaus*	25%	The "L" Meadow and Glebe Field only. Indicator of old unimproved grassland.
Betony *Stachys officinalis*	47%	Only occurs in Glebe Field. Associated with undisturbed unimproved pastures and hedgebanks.
Yellow-rattle *Rhinanthus minor*	80%	Three sites including Old Fisherman's Car Park.
Devil's-bit scabious *Succisa pratensis*	84%	Only in Glebe Field.
Marsh ragwort *Senecio aquaticus*	64%	Regionally scarce in just four squares in Lincs, and two in Notts. Rare in the SSSI, with only one location beside The Brook in Glebe Field.
Reed sweet-grass *Glyceria maxima*	42%	Found all along The Brook. Elsewhere large dominant pure stands have declined, and are more fragmented than in the 1970s.
Common spotted-orchid *Dactylorhiza fuchsia*	67%	Every year on the Old Fisherman's Car Park.
Southern marsh-orchid *Dactylorhiza praetermissa*	29%	Only in Old Fisherman's Car Park, possibly mis-identified (Aitken 2006).
Bee orchid *Ophrys apifera*	28%	Two localities in the SSSI including the Old Fisherman's Car Park but no recent records.
Tasteless water-pepper *Persicaria laxiflora*	2%	By The Brook at the north end of Glebe Field, Only four 10km squares in Nottingham and only three small patches within Attenborough where plant is dominant. Listed in Nottinghamshire LBAP.
Dropwort *Filipendula vulgaris*	16%	Glebe Field.
Tubular water-dropwort *Oenanthe fistulosa*	15%	The Brook beside Glebe Field.
Fringed water-lily *Nymphoides peltata*	16%	Recorded only in 2m patch in The Brook by Glebe Field in 2005.
Slender marsh bedstraw *Galium constrictum*	0.5% with only one location outside its restricted area of New Forest/Dorset.	The Brook around Glebe Field and "L" Meadow. Nottingham record defined as alien in Preston & Pearman *et al* 2002.

Source: NWT, Aitken 2000

Note - All plants listed have a restricted distribution (<5 localities) or abundance (rare or scarce) within Attenborough SSSI (since 2003).

Hedgerows

Three separate hedgerows associated with the Attenborough Village Green, as shown in Figure B4.2, were surveyed in September 2006. No other hedgerows except garden boundaries will be affected by the scheme.

Table B4.3 summarises the results of the hedgerow survey. The results show that none of the hedgerows surveyed would satisfy the criteria of biological importance of the Hedgerow Regulations 1997 (*SI 1160*). The hedgerow (H1) along The Strand would meet the definition of an 'Ancient and/or species-rich Hedgerow' defined by the UK BAP, on the grounds that it supports an average of five woody species per 30m length. UK BAP priority habitats are of national geographic value but hedgerows with five or more woody species are fairly widespread across England; the BAP target is to halt the net loss.

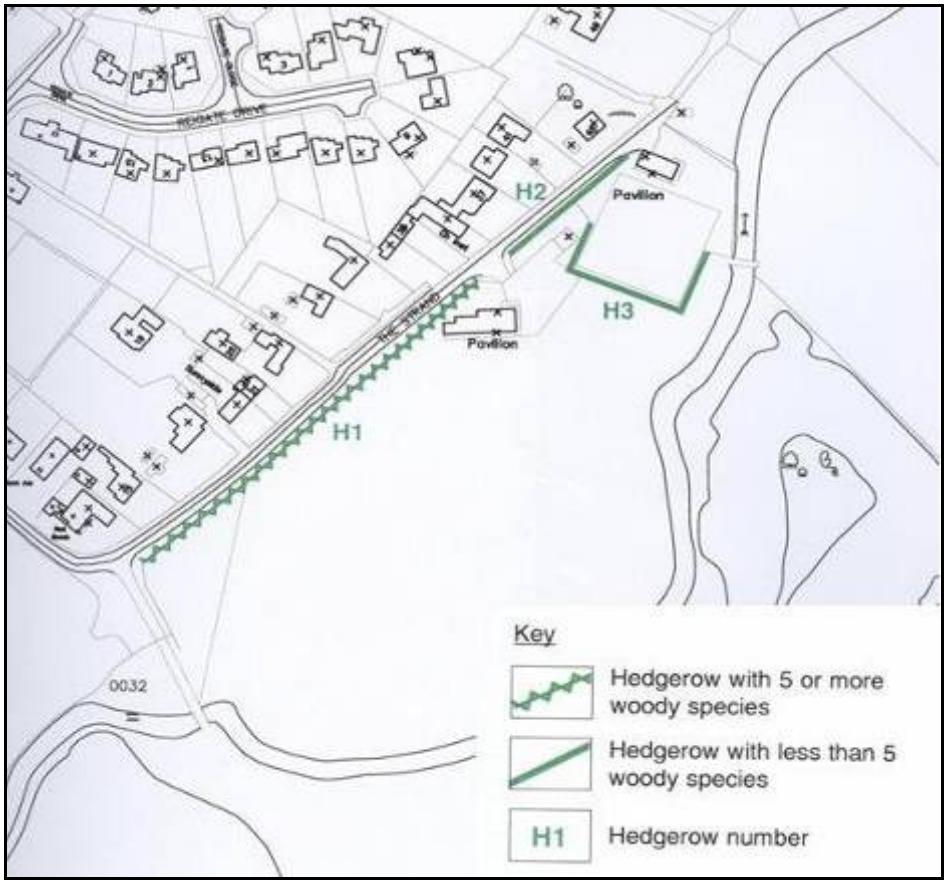


Figure B4.2 Locations of Hedgerows at Attenborough Village Green

Table B4.3 Status of the Hedgerows in Attenborough village

Hedgerow reference	Length (m)	Biologically important under the Hedgerow Regulations 1997	BAP priority habitat (Ancient/species-rich hedgerows)
H1	170	N	Y
H2	60	N	N
H3	80	N	N

All three hedgerows are relatively well-managed, and have the appearance of being trimmed regularly. H1 and H2 are dominated by hawthorn. Whilst there are few

gaps within either hedgerow, they are quite open at the base, and there is much growth of scramblers, especially bramble and hedge bindweed *Calystegia sepium*. Elder *Sambucus nigra* is more dominant at the southern end of H2. Only H1 supports any standard trees, an immature ash tree *Fraxinus excelsior* close to the cricket pavilion. There are also a few outgrown hawthorn bushes up to 5m tall in the same area.

H3 is immaculately trimmed, very dense, and probably much less than 30 years old. It was planted entirely with box-leaved honeysuckle *Lonicera pileata,* a common ornamental hedging species much used in gardens and parks.

All of the three hedgerows have a ground flora that is species-poor e.g. cleavers *Galium aparine*, hedge bindweed, common nettle *Urtica dioica*, ground-elder *Aegopodium podagraria* and ivy *Hedera helix*, along with much bare ground. Few features are associated with any of the hedgerows; banks, ditches, parallel hedgerows (other than garden hedges) and good connections with the Attenborough lakes, other ponds, woodlands and other hedgerows are all absent. The gappiness at the base of H1 and H2 is likely to reduce their attractiveness to amphibians and small mammals. Small birds, such as dunnock and house sparrow, use the hedgerows for nesting.

H1 is classified a national BAP habitat as it contains more than five woody species. However, this BAP habitat is not scarce, either nationally or regionally and is therefore assessed to be of district importance. None of the hedgerows that were surveyed supported any plants listed on Schedule 8 of the Wildlife & Countryside Act 1981 (as amended), plants of conservation concern (for example BAP Priority Species) or any nationally rare, nationally scarce or locally rare plants.

Watercourses

The River Erewash flows adjacent to Reaches 4 and 5. South of the railway the River Erewash braids and runs through the SSSI. The poor water quality of the River Erewash is affecting the water quality of the SSSI and it is considered to be one of the principal reasons much of the SSSI is in an unfavourable condition. In 2009 Cemex propose to improve the condition of the SSSI by channelling the River Erewash through the SSSI and into the River Trent.

The Nottingham and Beeston Canal runs through Reaches 13 and 14 but in this area it is heavily used for moorings and has a lower nature conservation interest.

There are a number of surface water drainage outfalls and open ditches that discharge to the Attenborough SSSI. Chilwell Brook (Reach 11) and Siemens Stream (Reach 12) convey the most flow, draining runoff from the urbanised areas of Chilwell and the Siemens site respectively. Attenborough village also has four main surface water outfalls discharging surface water from the village into the adjacent Attenborough lakes. Other minor surface water outfalls exist in Reaches 6 and 10.

The treated effluent from Toton STW discharges into the River Erewash in Reach 1, just upstream of the Attenborough Junction railway crossing.

B4.2.4 Protected Species

Legislation in relation to the protected species described below is detailed in *Annex 2, Volume 1*. National and Nottinghamshire BAP species relevant to the floodplain are listed in *Table 4.4, Volume 1*.

Breeding Birds

A breeding bird survey was undertaken between April and June 2006 along the proposed working areas within Attenborough SSSI. The survey area and methodology are detailed in *Annex 2, Volume 1.*

The waterbodies alongside the railway corridor support common waterbirds, with many nesting coots *Fulica atra* and moorhens *Gallinula chloropus* and small numbers of mute swan *Cygnus olor*, Canada goose *Branta canadensis*, mallard *Anas platyrhynches*, tufted duck *Aythya fuligula* and great crested grebe on the various pits. Common terns are also nesting on specially provided tern rafts within the gravel pits (refer to Figure B4.1). All of these species are generally common at gravel pits both locally and nationally although Attenborough does support the largest colony of common tern in the county.

The reedbeds/willow carr at Works Pond (Reach 9) support modest numbers of reed warblers *Acrocephalus scirpaceus*, which are species of conservation concern, having undergone a major decline in UK population, with one or two of these species in scattered smaller reedbeds. All of these species remain common in suitable habitat both locally and nationally.

Woodland at the Delta (Reach 10) supports a variety of species including the Royal Society for the Protection of Birds (RSPB)-listed stock dove *Columba oenas* and song thrush *Turdus merula* (and possibly lesser spotted woodpecker *Dendrocopos minor* and willow tit *Parus monatnus*). Although the greater part of this habitat is well removed from the proposed working corridor (and much of it separated from the railway by the open gravel processing plant area).

Rail-side hedgerows and scrub support small numbers of RSPB-listed dunnock, willow warbler *Phylloscopus trochilus* and bullfinch *Pyrrhula pyrrhula*. These species remain common and widespread in both a local and national context, along with the other species present in these areas. Of note, however, is a tree sparrow *Passer montanus* nest-box scheme in the southwest corner of Beeston Pond and an adjoining garden (Reach 10), which has proved successful for this seriously declined species.

Figure B4.3 shows the locations of RSPB-listed bird species within Attenborough SSSI recorded during the 2006 survey.

Bird records provided by NWT for the Old Fisherman's Car Park list 42 species (including nine breeding records) and the following RSPB-listed species (RSPB *et al*., 2002):

- Stock dove (Amber listed)
- Green woodpecker (feeding site; Amber listed)
- Song thrush (Red Listed/UK BAP)

- Willow warbler (summer visitor/breeds; Amber listed)
- Goldcrest (Amber listed)
- Willow tit (Red listed)
- Bullfinch (Red Listed/UK BAP)
- Reedbunting (Red Listed/UK BAP)

Outside the SSSI hedges, trees and scrub provide breeding habitat for a range of passerine birds. Large open fields at Erewash and Rylands may be used by ground nesting birds. Sand martins were seen nesting in cracks by the walls by Beeston Lock Gates during the 2008 ecology survey.

Wintering birds

Table B4.4 shows the percentage of the relevant qualifying level in the SSSI represented by the five-year mean peak count for species (e.g. 50% indicates that the five-year mean peak count is half that required for the site to qualify as nationally or internationally important as appropriate for the species in question). Note that these percentages are taken directly from Wetland Bird Survey (WeBS) data so, therefore, do not include the 2005/2006 wintering survey data for this scheme and that feral species are excluded.

Table B4.4 Percentage of National and International Qualifying Levels for Each Species in Attenborough (SSSI)

Species	% of national threshold	% of international threshold	Five-year mean peak	Present survey average total
Mute Swan	15	15	56	10
Shelduck	0	0	2	2
Wigeon	2	0	67	0
Gadwall	33	9	56	15
Teal	6	3	119*	40
Mallard	8	1	277*	156
Shoveler	20	8	30	48
Pochard	11	2	65	98
Tufted Duck	33	3	301	145
Goldeneye	6	0	14	14
Goosander	16	1	25	27
Little Grebe	12	0	9	8
Great Crested Grebe	69	2	110	100
Cormorant	53	10	122	100
Coot	12	1	211*	94

Source: WeBS * denotes peaks that occur earlier in the winter period

Table B4.4 shows that only four species reach numbers above 3% of the figure required for international importance (mute swan, gadwall, shoveler and cormorant); Attenborough SSSI is, therefore, not currently supporting waterfowl populations of international importance.

On a national scale, no species achieves the threshold of qualification. The most significant species is great crested grebe, which achieves 69% of the threshold.

The wintering bird survey was undertaken in 2006; refer to *Annex 2, Volume 1*. The results are described below for each lake:

Coneries East (no Reach adjacent) The survey results indicate that Coneries East is by far the most important lake at Attenborough in terms of wildfowl numbers. 10 out of the 18 most numerous species occur in peak numbers, most of these significantly in comparison with other lakes. Its significant species include four diving birds: tufted duck, pochard *Aythya farina*, ruddy duck *Oxyura jamaicensis* and great crested grebe. Teal *Anas crecca* occurs in its greatest numbers, but species missing from this lake include other shallow water feeders: shelduck *Tadorna tadorna*, gadwall *Anas Penelope* and shoveler, as there is better foraging for these species elsewhere.

Coneries West, Church, Tween, Main and Beeston Ponds (Reaches 5 to 7 and 10) All these lakes are similar in that they are mature, deep gravel pits with marginal areas and islands dominated by trees. Such habitat tends to support fewer birds than 'younger' gravel pits, presumably on account of more limited food. Nevertheless, modest numbers of a wide range of species occur, including the majority of goosander (on Main Pond), and a significant proportion (61.7%) of the reserve's coot population, especially on Church Pond (Reaches 6 and 7).

Works Pond (Reach 9) The silt bed provides optimal foraging for shallow feeders, and supported the best numbers of shoveler, regular shelduck and the only significant number of teal away from Coneries East. Furthermore, the exposed mud is attractive to visiting gulls and lapwing *Vanellus vanellus* (and probably other wader species during passage periods).

The Delta (Reach 10) is mainly woodland and has a rather limited area of water, together with a reasonable extent of reedbed. Hence, although it supports a good range of species, they generally occur in only small numbers. It is most notable for its wintering bitterns *Botaurus stellaris*.

Clifton Pond (no Reach adjacent) contains the greatest diversity of habitats including deep, open water, shallow areas, exposed islands and extensive reedbeds. Consequently, nearly all of the waterfowl species that were recorded in the reserve were regularly present, albeit generally in modest numbers. Gadwall was the only species for which this was the most important lake.

The lakes of greatest importance to each species are summarised in Table B4.5.

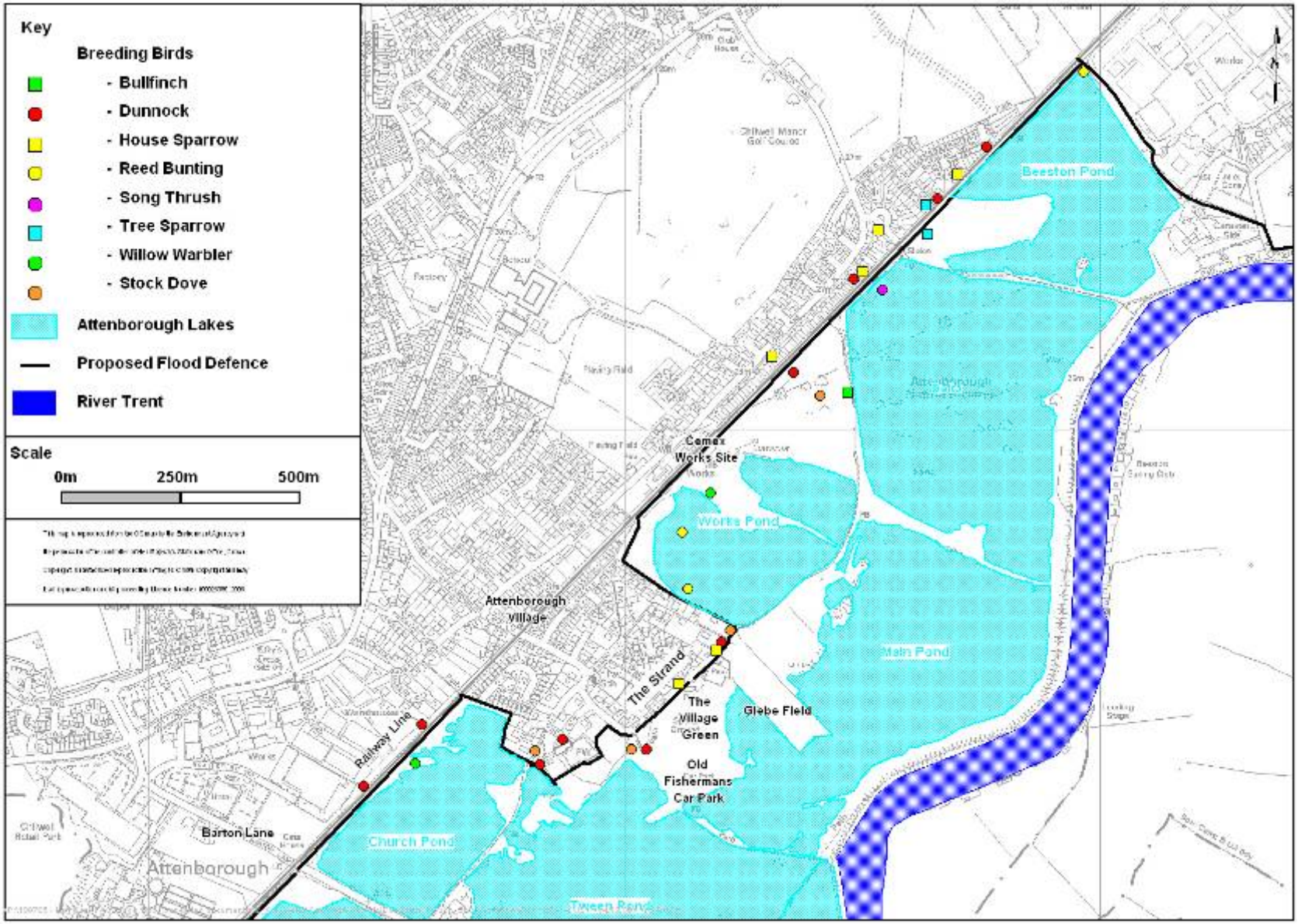


Figure B4.3 Location of Red and Amber Listed Breeding Bird Species in Attenborough SSSI (2006 Survey)

Table B4.5 Most Important Lakes within Attenborough SSSI for Waterfowl Species Occurring at >2% of the National Threshold (2006 Survey)

Species	Most important lakes (with percentage of reserve population in Jan-Mar 2006)	
	Rail side	River side
Great Crested Grebe		Coneries East (37%) Tween (38%)
Cormorant		Coneries East (c80%) Main (c20%)
Gadwall		Clifton (57%) (Delta)
Tufted Duck	Beeston (34%)#	Coneries East (42%)
Shoveler	Works (54%)	Delta (20%)
Goosander		Main (61%)
Mute Swan		Coneries East#, Tween#
Little Grebe	None	None
Coot	Church (38%)	Clifton (20%)
Pochard		Coneries East (43.5%)
Mallard		Coneries East (35%) Tween (47%)
Teal	Works (27%)	Coneries East (57%)
Goldeneye	Church (31%)	Main (31%) Clifton (27%)

 # indicates night-time usage

Bats

A bat survey was undertaken in the Attenborough, Erewash and Rylands scheme area in July and August 2006; refer to *Annex 2, Volume 1* for further details of methodology. Sections 4 to 7 of the survey covered the scheme area and the locations of the survey are shown in Figure B4.4. The desk study showed records of bats within Attenborough village; refer to Figure BB3.1. No potential bat roost habitat was identified in Rylands.

Emergence watches were carried out on trees considered to have potential as roosts and transect surveys carried out in most survey sections. Figures BB3.3 to BB3.10 show the tree reference numbers. No definite observations were made of bats emerging from any of the trees.

In April and June 2008 all trees surveyed in 2006 were re-surveyed. In addition any new trees, which now could be affected by the scheme due to changes in design, were assessed by the ecologist for their potential to be roost sites. No new potential roost sites were identified.

Bat Survey Section 4 The only tree identified for emergence watch was a mature white willow (within T87). No bats were seen to emerge from this tree during the watch in August 2006. Incidental records of commuting noctule *Nyctalus noctula* and a pipistrelle species *Pipistrellus sp.* were made. Noctule, common pipistrelle *P. pipistrellus* and Daubenton's bats *Myotis daubentoni* were recorded during a transect survey. In June 2008, a follow-up emergence survey was undertaken of T87 and no bats were seen to emerge from the tree.

Bat Survey Section 5 The only tree identified for emergence watches was a mature ash with woodpecker holes (T115). No bats were seen to emerge, although the presence of staining around the holes suggests that it is reasonably likely that it has been used by bats in the past. No transect survey was carried out. In 2008, no staining around the holes was seen, however the tree is still a potential bat roost owing to its size and deterioration.

Bat Survey Section 6 No bats were seen to emerge from any of the trees on this section but common and soprano pipistrelles *Pipistrellus pygmaeus* were recorded feeding regularly over the bowling green parallel with the tree line. One noctule and several Daubenton's were recorded feeding over the adjacent lakes. Natterer's bats *Myotis nattereri* were recorded foraging along one of the tracks around the lake.

Bat Survey Section 7 No trees or structures in this section were identified for emergence watches. Common pipistrelle, soprano pipistrelle and noctules were recorded during the transect survey.

Badger (Meles meles)

Records from the Nottinghamshire Biological Records Centre (NBRC) data show that the first record of a badger within Attenborough SSSI was reported from the Clifton Pond area in 2002, thought to be a wandering male. No badger setts or other field signs were recorded during the 2006 or 2008 field surveys.

Otter (Lutra lutra)

There are desk study records of otter within the SSSI (refer to Figure BB3.1) but no holts or resting places were found during the 2006 or 2008 surveys.

Water Vole (Arvicola terrestris)

Water voles were once common within Attenborough SSSI but data sheets for the reserve state that the species has declined rapidly over the past 20 years and very few, if any, have been recorded recently. No field signs were found along the working corridor during the 2006 or 2008 surveys. Anecdotal records were also provided of water voles in The Brook and so additional water vole surveys were undertaken in September 2006 and May 2008. The Brook contains areas where the vegetation and bank structure offer suitable opportunities for water voles however, no evidence of water voles was found. The reason for this is unknown but could potentially be due to any of the following:

- as the site is used heavily by the public water voles may not be able to tolerate the levels of disturbance;
- cattle disturbance may be a factor where they have poached and grazed the bank sides;
- brown rats may act as competitors;
- large areas of bank-side are heavily shaded resulting in habitat which is sub-optimal for water voles;
- American mink may be present (or may have been present in the past) eliminating previous populations of water vole from the stream.

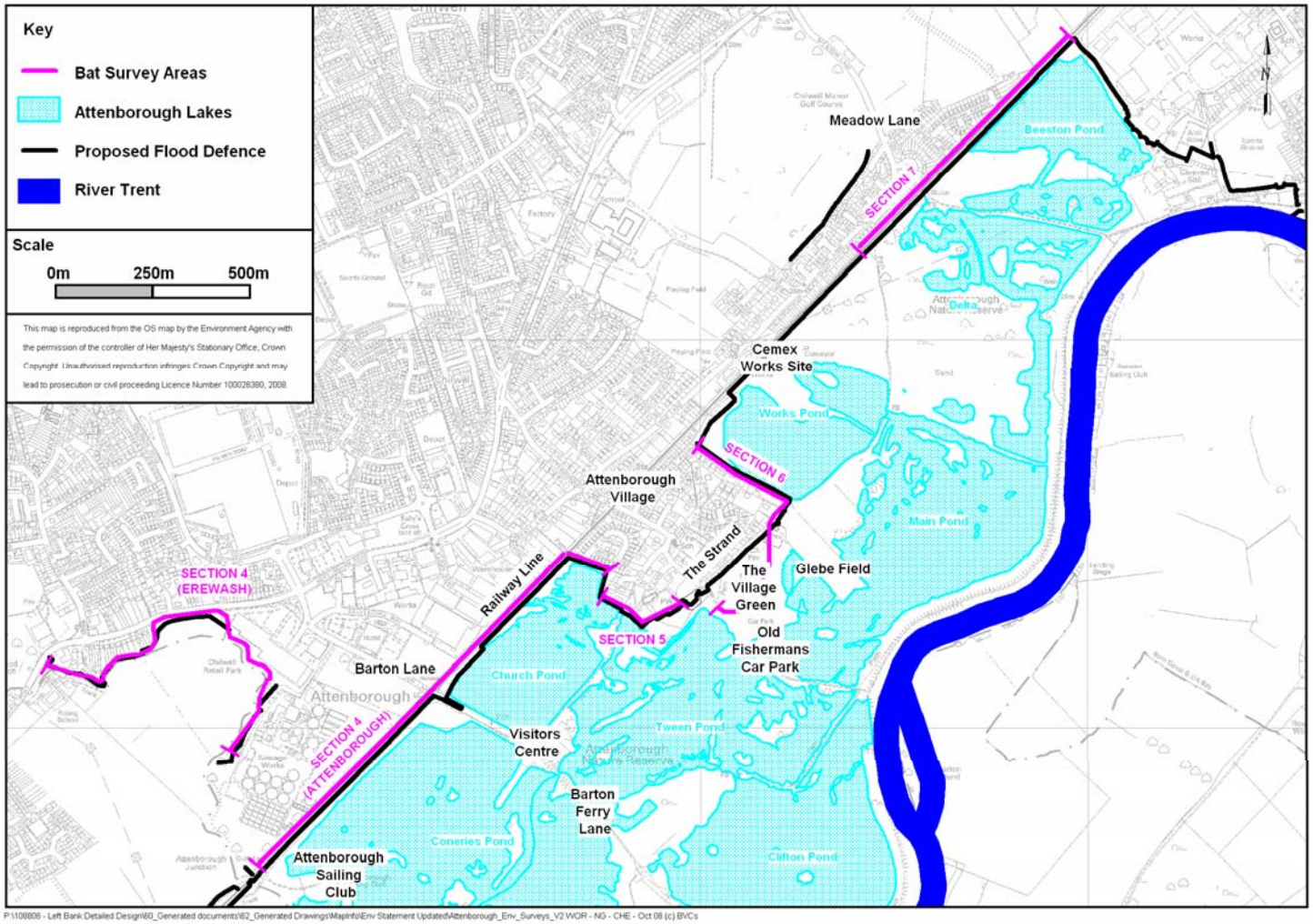


Figure B4.4 Location of Bat Surveys in Attenborough, Erewash and Rylands Scheme Area

Amphibians (including Great Crested Newts)

A pond was identified as being within 250m of the works in the Cemex Works Site at Attenborough (Plate B4.1). The pond is reported to have a good population of smooth newts *Triturus vulgaris.* The threshold number to indicate a significant population size for Nottinghamshire is 25 adults noted on a single visit ('Provisional Criteria for Herpetofauna SINCs in Nottinghamshire'). Access permission was refused within the 2006 survey season. The pond was examined in 2008 and appeared to have dried up at the time of survey. The area where the pond had been now contains sedges and no open water, although it may hold water at some points during the year. The pond was examined in May 2008, which is within the peak time of year for newt breeding. Consequently, it is unlikely that this pond was used as a newt breeding site in 2008.

There are no desk study records of great crested newts *Triturus cristatus* for the scheme area.

Plate B4.1 Pond in Cemex Works Site (Reach 10)

Reptiles

The proposed scheme area through Attenborough SSSI contains a range of habitats (short and long grassland, scrub and wetland) that provides good potential habitat for reptiles. A survey in May 2006, however, did not record any reptiles so it is considered unlikely that there is a significant population present. No good potential reptile habitat is present at Erewash or Rylands.

B4.2.5 Other Fauna

Invertebrates

Three areas of the Attenborough, Erewash and Rylands scheme area that were considered as being of greatest invertebrate potential were assessed in summer 2006

by an entomologist. These are shown in Figure B4.5. The areas surveyed were judged to be either of District or Local importance (Colin Plant Associates (2006) criteria); refer to Table B4.6. The only species found with a conservation designation was the ground beetle *Demetrias imperialis*, which has Nationally Scarce (B) status. This is the lowest category of formal national designation.

Table B4.6 Results of 2006 Invertebrate Survey, Attenborough SSSI

Site Name	Description	Importance	Justification
Attenborough Central (Reach 9 and near Reach 8)	Area of dry grassland with ruderal species developed over gravel and railway ballast. The southern edge of this area is formed by the edge of a gravel pit, with scrub and a very limited fringe of marginal vegetation. The open areas included the dry-habitat species of robberfly *Machimus atricapillus* and the spider *Zelotes latreillei*. The wetland fauna was relatively limited in size but this was the only site for the snail-killing fly *Pherbellia ventralis*.	Local	A limited fauna with low expectation that rare species will be encountered with further survey.
Near Cemex Works Site (Reach 10)	This area is located east of the Cemex working area and comprises ruderal vegetation and scrub developed over gravel. The fauna comprised a largely widespread array of species characteristics of open and vegetated habitats, with only a limited wetland influence. Open-habitat species included the spiders *Pardosa amentata* and *Xysticus cristatus*, with species of rough herbage including the spider *Araneus diadematus*.	Local	A limited fauna with low expectation that rare species will be encountered with further survey.
Near Footpath Junction (Reach 10)	This area comprises a glade within an area of wet woodland. Within this area the wetland flora was dominated by meadowsweet *Filipendula ulmaria* with terrestrial components such as nettle. The Nationally Scarce (B) species was encountered here: the ground beetle *Demetrias imperialis*. This beetle is at the northern margin of its range in Britain here and is characteristic of reed beds and flood litter. Overall the fauna was diverse with wetland and open habitat components. Wetland species included the snail-killing fly *Tetanocera ferruginea* and the ground beetle *Amara plebeja*. Species of open, drier habitats included the spider *Xysticus cristatus*.	District	A diverse mixed fauna was recorded including a Nationally Scarce (Notable) species.

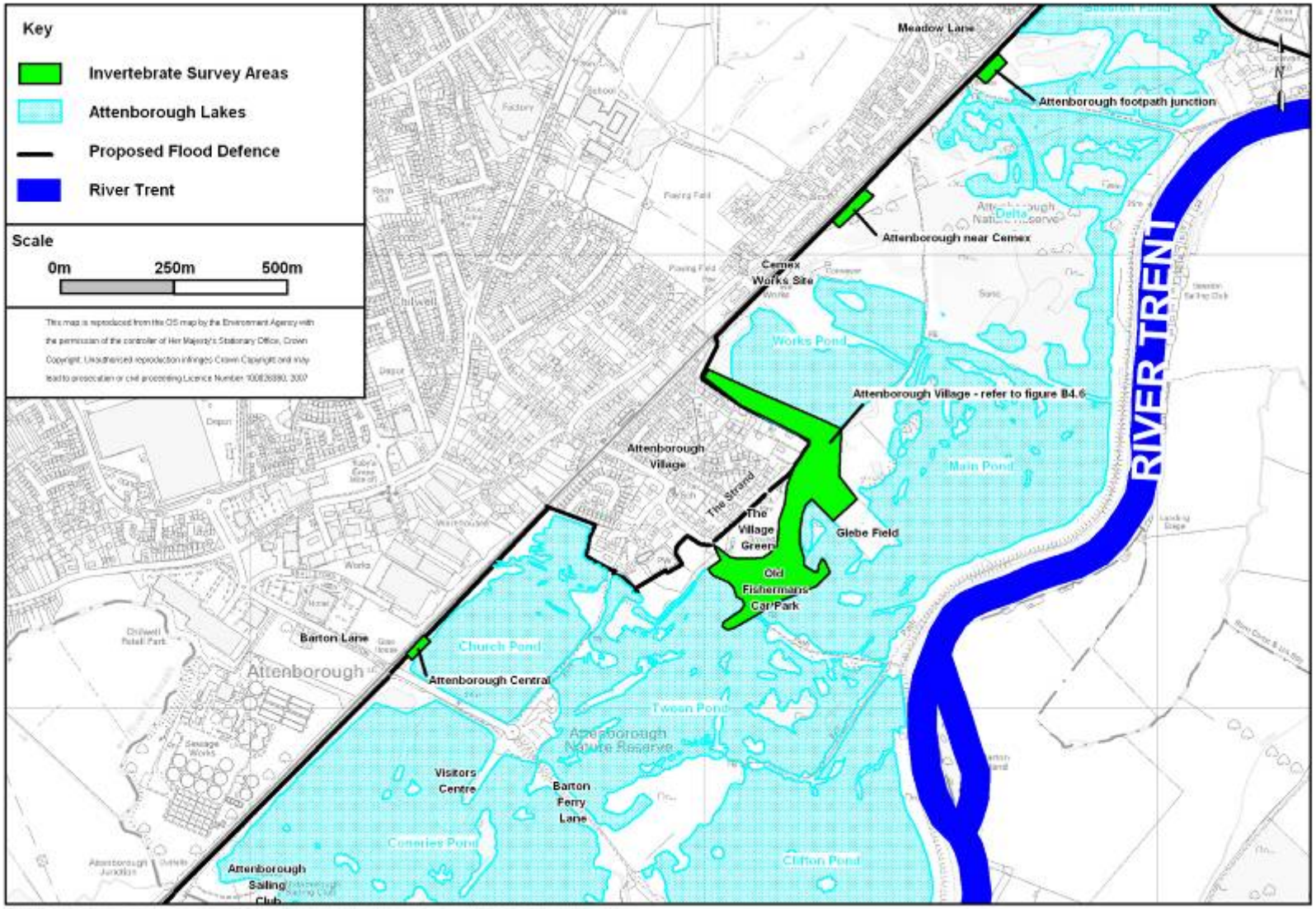


Figure B4.5 Location of Detailed Invertebrate Surveys in Attenborough SSSI

An additional invertebrate survey was carried out as part of the Attenborough village alignment assessment in September 2006. This survey was undertaken at a sub-optimal time of year when many rare and specialist species would not be recorded. However, based on a visual assessment of the habitats an attempt has been made to assess the likely significance of the faunas present using the Colin Plant Associates (2006) criteria. These are, however, based on visual assessment only and can only be considered to be preliminary assessments. The habitats surveyed are shown in detail on Figure B4.6 below. The main habitats of interest were associated with Glebe Field and habitats in and adjacent to The Brook; refer to Figure B4.6 and Table B4.7. Desk study data from NWT also records presence of two notable diving beetles:

- *Dytiscus semisulcatus:* found in The Brook. Only located at three other sites in Nottingham.
- *Dytiscus circumcinctus*: located at three sites in Nottingham including Attenborough SSSI.

The non-native spiny-cheek crayfish *Orconectes limosus* is found within Clifton Pond. In 2008 a survey was undertaken of Clifton Pond and adjacent waterbodies. 16 adult spiny-cheek crayfish were recorded within Clifton Pond. No crayfish were found outside of Clifton Pond. However, the pond has overtopped into Tween Pond twice during flood events in the last 12 months and it is likely that, although the surveys did not find crayfish, they may have invaded Tween Pond.

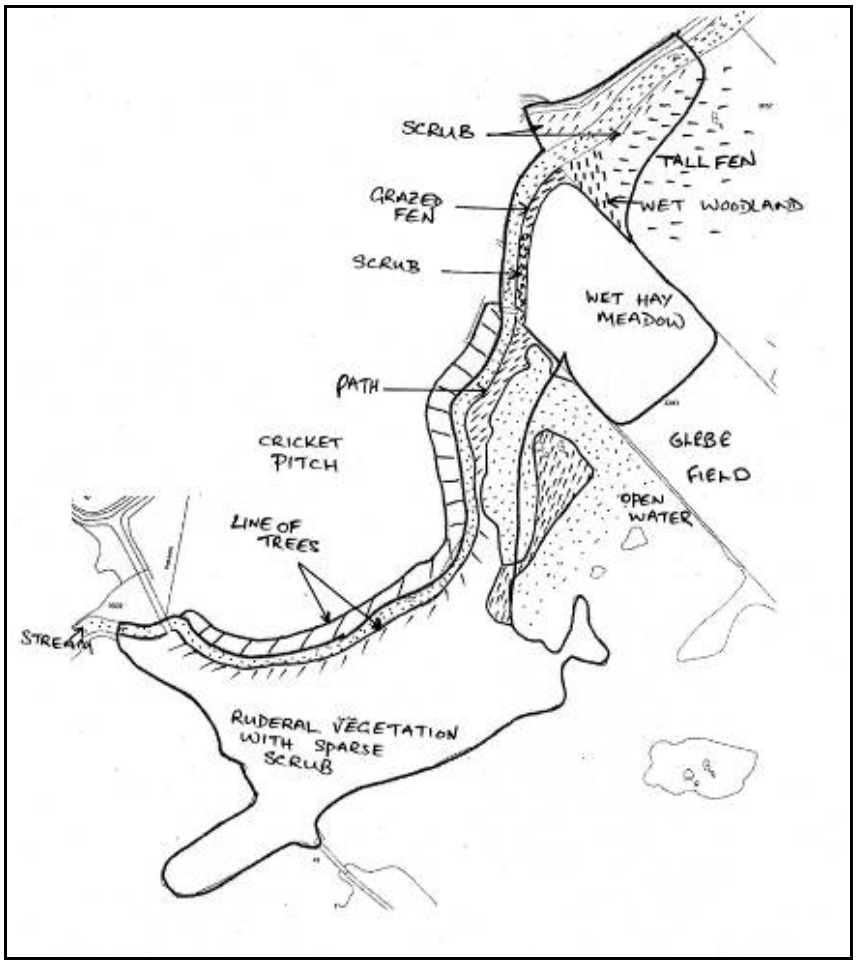


Figure B4.6 Habitat Types Identified for Invertebrate Interest at Attenborough village

Table B4.7 Summary of Potential of Invertebrate Habitats South of Attenborough Village Based on Visual Inspection (September 2006 survey)

Section	Visual assessment	Invertebrate assemblage recorded	Likely significance of fauna
Eastern boundary of Attenborough village (Works Pond)	Moderate	No direct survey due to safety concerns	Local
Perimeter of cricket pitch	Moderate	Sparse fauna of common wetland species	Local
Old Fisherman' s Car Park Area	Moderate	Sparse fauna of generalist species	Local
Line of trees	Moderate	Generalist and common wetland species	Local
Gravel path (open water margin)	Low	Common open water species	Local
Wet hay meadow/Glebe Field	High, or possibly excellent	Common wetland species	District - County
Scrub between the hay meadow and the brook	Moderate	Common wetland species	Local
Grazed fen	High, or possibly excellent	Common wetland species	District - County
Wet woodland	High	Common wetland species	District - County
Tall fen	High, or possibly excellent	Common wetland species	District - County
Scrub north and south of The Brook	Moderate	Not surveyed directly	Local

Desk study records of moths and butterflies for the Old Fisherman's Car Park have been provided by NWT. A total of 19 butterflies were recorded and 113 moth taxa (Table B4.8). Two of the moths were micro rather than macro-moth species, and two of the macro-moth taxa could not be identified to species with certainty.

All of the butterflies are considered to be common and widespread in southern Britain, although Nottinghamshire is close to the northern limit of the main core of the distribution for the Essex skipper and the brown argus. Of the moths, nine are considered Local but none were Nationally Scarce or rarer. The moths considered to be local are widespread and Nottinghamshire lies within the core of their distribution.

The entire moth and butterfly assemblages are also assessed as being of local importance only.

Table B4.8 Summary of the Moth and Butterfly Assemblages in the Old Fisherman's Car Park, Attenborough SSSI

Group	Number of species	Species considered common	Species considered local	Moths with Nationally Scarce or RDB status, or butterflies with Butterfly Conservation Priority status greater than Low
Butterflies	19	19	0	0
Moths	113	104 (with 1 immigrant)	9	0

Mammals

Other than the protected species above there are desk study records of small mammals in the Attenborough, Erewash and Rylands scheme area including common shrew *Sorex araneus*, pygmy shrew *Sorex minutus*, water shrew *Neomys fodiens*, hedgehog *Erinaceus europaeus*, brown hare *Cepus europaeus*, bank vole *Clethrionomys glareolus*, short-tailed vole *Microtus agrestis*, wood mouse *Apodermus sylvaticus*, harvest mouse *Micromys minutus*, fox *Vulpes vulpes*, stoat *Mustela erminea*, weasel *Mustela nivalis* and American mink. Most of these records are for the SSSI. Brown hare is a UK BAP species.

4.2.6 Invasive Species

There are stands of Japanese knotweed *Fallopia japonica* along the railway and within the boundary of the SSSI close to the Erewash. Himalayan balsam *Impatiens glandulifera* was only recorded along the River Trent. Japanese knotweed is also known at three other locations within Attenborough SSSI including the Old Fisherman's Car Park.

Water fern *Azolla filiculoides* and Australian swamp stonecrop *Crassula helmsii* are found at the eastern and southern edges of the Delta in Attenborough SSSI.

B4.3 Summary of Ecological Interest

The following ecological receptors are present in the Attenborough, Erewash and Rylands scheme area and are considered during the EcIA:

- Attenborough SSSI
- Attenborough Pastures SINC
- trees (wet woodland and standard trees)
- hedgerows
- birds
- bats
- otters
- water voles
- amphibians
- invertebrates

Invasive species are also discussed.

The value of each of these ecological resources, given as a geographical scale, is provided in Table B4.10. The definition of these levels of value is given in *Annex 2, Volume 1*. The evaluation method for invertebrates is also given in *Annex 2* in *Volume 1*.

B4.4 Impact Assessment

Table B4.11 summarises the impact, mitigation and significance for all the ecological receptors. The assessment of significance (in brackets) moderates the EcIA assessment to the standard determination of Impact Assessment; refer to *Table 6.1, Volume 1*.

B4.4.1 Construction Impacts

Statutory Designated Nature Conservation Sites
Holme Pitt SSSI - This site is on the opposite side of the River Trent and would not be subject to any direct or indirect disturbance.

The *impact* has been assessed *prior to mitigation* as being **not significant** at a **National** level.

Attenborough SSSI - The potential impacts on Attenborough SSSI (Reaches 5 to 7, 9 and 10) will be as follows:

Land Take
Land take will result from four different elements of the scheme. These are illustrated in Figure B4.7a and B4.7b and Table B4.10 and listed below.

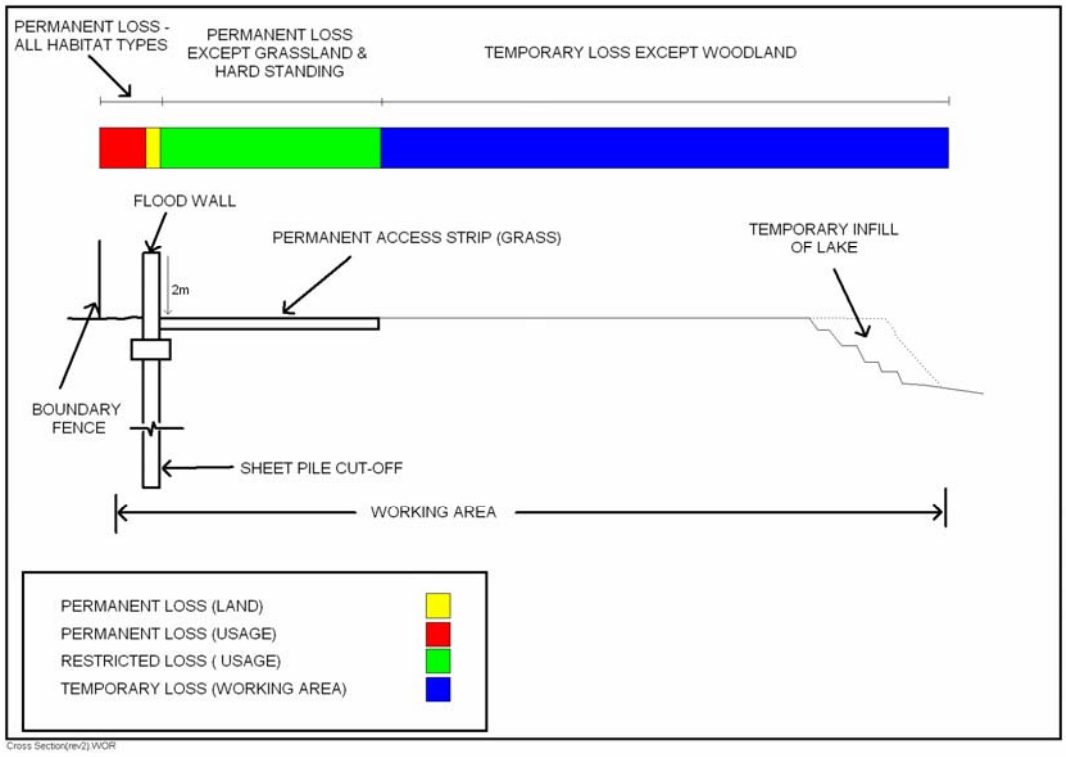


Figure B4.7a Working Areas and Landtake within Attenborough SSSI (walls with sheet pile cut-off)

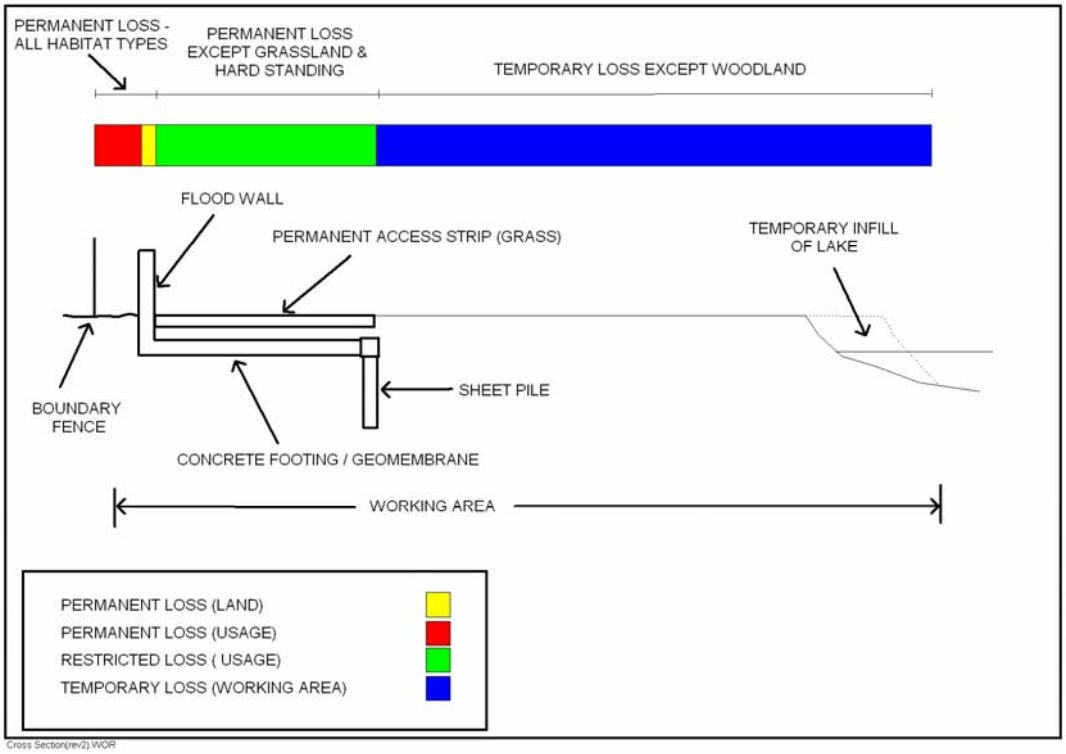


Figure B4.7b Working Areas and Landtake within Attenborough SSSI (walls with off-set sheet pile cut-off)

Permanent loss (land) – This is the footprint of the defence. The land is designated as being 'permanently lost' regardless of the existing habitat type.

Permanent loss (usage) – It is accepted that the defence will effectively form a new boundary for the affected SSSI. The permanent loss (usage) is the portion of land lost by the creation of this new boundary. The land is designated as being 'permanently lost' regardless of the existing habitat type.

Restricted loss (usage) – This is the portion of land adjacent to a wall where the Environment Agency restricts its future usage for one of the following reasons:

- access is required for inspection or maintenance;
- an easement is required to protect the buried engineering structure which, in places, includes a buried geomembrane or concrete footing.

Whether the restricted areas for access are designated as 'temporary' or 'permanent' loss is dependent on the existing habitat type. Grassland is assumed to be a 'temporary' loss where there is no geomembrane or concrete footing because this will be allowed to re-establish. All other habitat types are assumed to be a 'permanent' loss e.g. woodland/scrub; refer to Figure B4.7a.

Where the easement is required to protect the buried engineering structure (either a geomembrane or concrete footing) this is designated as permanent loss for all habitat types due to the need to protect the structure from root damage from trees/scrub and the uncertainty of the effect on establishment of any vegetation from the restricted soil profile; refer to Figure B4.7b.

Temporary working area - This is the additional portion of land required to construct the defence. The area is needed to provide access for construction activities and to store materials. All temporary working areas will be reinstated to their existing habitat type and, therefore, the impact is generally considered as temporary. The exception is woodland habitat. The woodland would be reinstated in situ, either by planting or natural re-colonisation, as advised by Natural England and NWT. No additional compensatory habitat is proposed; refer to Table B4.10. However, the impact is considered permanent in EIA terms as the woodland will not re-establish in less than 10 years; refer to *Table 6.2, Volume 1*.

A summary of land take for the SSSI, including open water habitat is provided in Table B4.9. The definitions of temporary and permanent land take are provided in Table B4.10.

Table B4.9 Land Take within Attenborough SSSI

Land Take (m^2)	
Temporary	**Permanent**
53,100	16,800

Wet woodland would be lost at the following locations:

- To the east of Attenborough Village, close to Meadow Lane; refer to Map Ref: C28, Figure BB1.4 in *Annex B1*.
- Within Beeston Pond.
- Within Works Pond, which includes part of the area of the locally uncommon W2 wet woodland.

There will also be disturbance to the high value swamp communities in Beeston Pond. Swamp communities in the Delta area and the NG9 grassland at Works Pond would be undisturbed.

In Attenborough SSSI none of the vegetation that will be lost through Coneries Pond and Church Pond, is considered to have a high botanical value (Reaches 5 and 6).

The alignment of the proposed defences along The Strand through Attenborough village will mean that the high value habitats associated with Glebe Field and The Brook will not be directly affected. Glebe Field will be separated from the works by the bowling green and some gardens, and will not be subject to any indirect impacts. At the closest point at the western end of The Strand, The Brook is 40m from the works so there is a risk of potential pollution incidents affecting the swamp communities. The Old Fisherman's Car Park will be used as a materials storage area. Only the hard standing area will be affected.

Disturbance to Fauna

Disturbance, particularly to birds, will occur during construction through physical movement of personnel and machinery, noise and vibration. There will also be some loss of habitat. Impacts on the different species are discussed under separate headings (see below).

Creation of a Physical Barrier

The defence will form a barrier to the landward movement of species, in particular terrestrial mammals. This is also a concern in a flood event for escaping animals. There will still be opportunity for movement into the reserve via the River Trent, the floodplain upstream and downstream and via the main access points (e.g. Barton Lane).

Pollution Risk

During construction there will be a risk of a pollution incident or sediment run-off to terrestrial habitat or the lakes.

Potential Impacts on Hydrology

The hydrological composition of Attenborough SSSI is dominated by a series of interconnecting lakes. In 'normal' conditions the average water level in the lakes is typically 25.50m OD.

Our studies have confirmed there is a risk to certain areas of Attenborough from seepage flooding through the underlying gravel strata. A cut off below ground level is proposed as part of the scheme to increase the seepage flow path during extreme conditions and reduce flood risk; refer to Figure B11.1. However, the cut-off will not be installed across the entirety of Attenborough. Groundwater flow will, therefore, be reduced, not stopped.

In December 2005 water level recorders were installed in Coneries and Main Ponds, the Rivers Erewash and Trent, as well as within boreholes throughout the Attenborough area to monitor groundwater levels. Assessment of data from the recorders and rainfall data has confirmed lake levels are influenced by surface water flows, in particular from the River Erewash. As the proposed defence works will have no effect on surface water flows, lake levels and the wider hydrological composition of Attenborough SSSI will similarly be unaffected; refer to *Section B8*.

In summary 3.16% of the total area of Attenborough SSSI would be directly affected by the flood defence scheme, either permanently or temporarily. However, there will be wider impacts on the fauna of the site, in particular birds, outside the construction area due to disturbance and vibration.

In addition, areas of the SSSI would also be subject to disturbance during the construction of the compensatory habitat. While this adverse impact will be significant during construction the residual impact will be beneficial.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **short-term** (indirect impacts/temporary working areas) **to permanent** (landtake and impacts on woodland) at a **National** level. **(Moderate)**

Table B4.10 Impact Classification for Land Take within SSSI

Habitat Type	Impact classification; refer to Figure B4.7	Change to site for habitat	Timescale of impact	Action
Woodland (broadleaved or wet)	Permanent loss (land) – land take for defence	Irreversible	Permanent	compensatory habitat will be created
	Permanent loss (land) – behind barrier	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– pile capping	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– easement	Irreversible	Permanent	compensatory habitat will be created
	Temporary loss (working area)	Reversible	Permanent	habitat will be reinstated following works
Grassland	Permanent loss (land) – land take for defence	Irreversible	Permanent	compensatory habitat will be created
	Permanent loss (land) – behind barrier	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– pile capping	Reversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– easement	Reversible	Temporary	habitat will be reinstated following works
	Temporary loss (working area)	Reversible	Temporary	habitat will be reinstated following works
Swamp	Permanent loss (land) – land take for defence	Irreversible	Permanent	compensatory habitat will be created
	Permanent loss (land) – behind barrier	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– pile capping	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– easement	Irreversible	Permanent	compensatory habitat will be created
	Temporary loss (working area)	Reversible	Temporary	habitat will be reinstated following works
Scrub	Permanent loss (land) – land take for defence	Irreversible	Permanent	compensatory habitat will be created
	Permanent loss (land) – behind barrier	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– pile capping	Irreversible	Permanent	compensatory habitat will be created
	Restricted loss (usage)– easement	Irreversible	Permanent	compensatory habitat will be created
	Temporary loss (working area)	Reversible	Temporary	habitat will be reinstated following works

Site of Interest for Nature Conservation (SINCs)

Attenborough Pastures SINC is separated from the construction works by the River Erewash but may be subject to impacts from construction related pollution (e.g. dust). The site will also be subject to visual/noise disturbance but as the area is designated for its botanical interest, this should not affect its designation.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **short-term** at a **County** level. **(Minor)**

Woodlands and Trees

Trees to be lost are shown on Figures BB3.2 to BB3.9. A total of 106 individual trees would be lost plus another 63 groups of trees will be removed or partially removed as they are located within the working area. This includes the wet woodland within Attenborough SSSI. Wet woodland within Nottinghamshire County is scarce.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **permanent** at a **County** level. **(Moderate)**

Hedgerows

Both hedgerows H1 (170m) and H2 (60m) through Attenborough village would be lost; refer to Figure B4.2. H1 is of highest value as it fulfils the species-richness criteria of the UK Biodiversity Action Plan for 'Ancient and/or Species-rich Hedgerows' (Plate B4.2). In total 230m of hedgerow would be lost.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **permanent** at a **Local** to **District** level. **(Moderate)**

Plate B4.2 Hedgerow H1 along The Strand in Attenborough Village

Birds

The flood defence working corridor is extremely narrow for much of its length, and hence breeding birds are relatively few in both number and species (in comparison with the rest of the SSSI). Construction would, however, cause disturbance to any birds nesting in the vicinity, in terms of both land take and noise disturbance.

Given the above, the impact on local breeding bird populations is likely to be minimal, with the species affected being largely abundant and widespread both locally and nationally.

The results of the wintering bird survey indicate that disturbance from the railway line is currently keeping birds away from the proposed working area. NE also does not regard the noise from construction activity likely to disturb wintering birds, many of whom use areas of the lakes away from the railway line (NE pers. comm.).

Permanent removal of hedgerows, trees and scrub will remove nesting habitat for birds.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **short-term to long-term** at a **Regional** level. **(Moderate)**

Bats

Bat Survey Section 4 Three trees and a railway bridge along this section were identified as having some features suitable for bats and so loss of any of these features may have an impact of minor to moderate significance on bats in the area. Even though no bats were seen to emerge from the mature willow in T87 during two emergence watches, bats are transient creatures and will move roosts regularly during the season. T87 will need to be cleared for the construction for Reach 6. The entire length of the section is used by feeding bats so there is also an impact from loss of a feeding corridor. However, this will be predominantly a temporary loss and thus of minor significance.

Bat Survey Section 5 The main bat feature of interest, T115, will be retained and there will be no significant impact on bats in this sector.

Bat Survey Section 6 Due to the alignment through Attenborough village there will be no significant impact on bats resulting from work as no suitable features for use by bats are present.

Bat Survey Section 7 No trees or other structures were identified on this section as having features suitable for roosting bats. Feeding bats were recorded along almost the entire length of the section and there is the potential impact of temporary loss of feeding habitat on bats in the area. The significance, if any, of this impact will depend on timing of works i.e. greatest in spring and summer when bats are active.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **medium-term to permanent** at a **Local** level. **(Minor)**

Otters

Otters are known to use Attenborough SSSI but no holts or resting places were found within or close to the proposed working area or highlighted by NWT. Whilst otters using the lakes and islands would be subject to disturbance during construction they are mobile enough to move away from the source and the loss of potential habitat would not be significant within their territory.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **short-term** at a **Regional** level. **(Minor)**

Water Voles

No water voles were recorded in the survey area during 2006 or 2008 and at present the lake banks within the working corridor through the SSSI are considered to be potential but not optimum habitat. During construction there would be a temporary loss or significant disturbance to the lake banks throughout the SSSI but as no water voles are thought to be present at the time of this report the impact is considered to be not significant and short-term at the County level. However, due to the likely time delay between the EIA and construction, further surveys would be carried out prior to site clearance. If water voles are found a mitigation strategy would be agreed with NE and this could increase the impact to moderate.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **short-term** at a **County** level. **(None)**

Other Mammals

All mammals are protected under the Wild Mammals (Protection) Act 1996, primarily to prevent cruelty. Impacts to semi-natural habitat are mainly restricted to the designated sites. However, due to the linear nature of the scheme, large areas will remain unaffected and populations of brown hare and other small mammals should not be significantly impacted.

The *impact* has been assessed *prior to mitigation* as being **not significant** at a **Local** level. **(None)**

Amphibians

One pond has been highlighted as potentially supporting a good population of smooth newts (Cemex Works Site in Reach 10). In May 2008, however, the pond was found to have dried out and is therefore unlikely to support breeding populations of newts. The site of the pond will not be directly affected during the works but if amphibians are present construction would disturb part of their terrestrial habitat, although significant areas would remain undisturbed.

The *impact* has been assessed *prior to mitigation* as being **not significant** at a **Local** to **County** level. **(None)**

Invertebrates

All habitats disturbed by construction activity will support some invertebrate assemblage. Most of the habitat of local interest supports common species. Given that a large amount of semi-natural habitat in the area will remain unaffected and most of the habitat in the working area will be re-instated, the impact is considered to be negligible. The most important area identified during the baseline survey was in Attenborough SSSI near the Footpath Junction (Reach 10). Approximately half of this glade will be disturbed during construction. The remaining area should provide a source of immigration for species lost during construction. However, it is possible that the population of the ground beetle *Demetrias imperialis*, a Nationally Scarce (B) species, could be lost.

The *impact* has been assessed *prior to mitigation* as being **significant adverse** and **medium-term** at a **District** level. **(Minor)**

Invasive Plant Species

There is Japanese knotweed within the working area in Reach 5 and also along the railway line. Without due care, there is the potential for this species to be spread to other areas of the SSSI. This would have a significant adverse impact. No other invasive species are currently located within the main construction area.

Water fern *Azolla filiculoides* and Australian swamp stonecrop *Crassula helmsii* are found at the eastern and southern edges of the Delta in Attenborough SSSI and should be unaffected.

B4.4.2 Operational Impacts

During a flood event the improved standard of defence will mean that areas within the existing floodplain will be subject to a very minor increase in water levels. This increase will be up to 0.07m during a flood event with a 1% probability of occurrence and will affect all areas in front of the defence and unprotected areas on the opposite bank (including Attenborough SSSI and Holme Pitt SSSI). It is not considered that this impact will have an adverse impact on the nature conservation interest of the area as all species and habitat are already subject to periodic flooding. Attenborough Pastures SINC will still be subject to flooding from the River Erewash.

21 other SINCs in the Attenborough, Erewash and Rylands scheme area will now be protected against a flood event with a 1% annual probability of occurrence upon completion of this scheme. Previously at these sites, flooding would commence during a flood event with a 4% annual probability of occurrence, and so their nature conservation interest is not dependent on regular flooding from the River Trent. Therefore a decrease in flooding from the River Trent will not have significant impacts.

There may be requirements for vegetation clearance such as regular grass cutting and removal of scrub vegetation in order to maintain the integrity of the flood defence structures and access. Land take impacts for access are included in construction impacts. Inspection visits have the potential to disturb the avian fauna of Attenborough SSSI. However, inspection visits are likely to be only once a year

and due to the location on the edge of the reserve are unlikely to cause significant additional disturbance. Reach 5 along Coneries Pond already has vehicle access used by Attenborough Sailing Club and Network Rail.

B4.4.3 Mitigation Measures and Monitoring

In this section mitigation measures are those measures that can be carried out within the working area to reduce the residual ecological impacts of the scheme. Compensatory habitat creation will be carried out elsewhere within the SSSI or within the wider Trent corridor when it is considered that it is not possible to entirely mitigate for the ecological impacts within the working area; refer to *Appendix F*.

B4.4.3 Mitigation Measures for Attenborough SSSI

General Measures for SSSI

All vegetation clearance will be undertaken outside of the breeding season (mid-March to September). In addition, in the most sensitive areas, i.e. downstream of Attenborough village through Works Pond, the Delta and Beeston Pond (Reaches 9 and 10) no construction works will be carried out during the main bird breeding season to avoid disturbance to breeding birds in the surrounding habitat.

All habitats in temporary construction areas will be re-instated. A detailed method statement for re-instatement (and habitat creation) will be prepared and agreed with NE prior to the start of construction but the design principles will be as follows:

- Provision of an ecological clerk of works to ensure the measures described below are implemented on site, anticipated issues are effectively addressed and any future enhancement opportunities identified.
- Where ground is too soft to run-over in temporary working areas, top and subsoil will be stripped and stored separately in accordance with best practice. Where the land falls away significantly (e.g. Reach 9) it will be built up with inert material.
- All reinstated land will be seeded. Scrub and woodland will be allowed to naturally regenerate.
- Seed will be harvested from local species rich grasslands, e.g. Wheatear Field, Glebe Field and Chilwell Meadow (all are NWT managed). As it is only practical to take limited seed per year, harvesting will be programmed over several years. Harvesting will be undertaken by an experienced contractor. It is proposed that only native seed/plugs of local provenance will be used for reinstatement. A nursery crop of marginal species (including reeds) will be sourced from the SSSI (if agreed by NE/NWT) or other local sites if available. All planting will be protected from geese grazing, where required.
- A 1m buffer zone will be maintained at the edge of the lakes to minimise the risk of bank erosion. A low level silt trap will also be used to control sediment run-off as required.
- Hydro-seeding may be used over banks where there is concern over erosion. Its use will be agreed in advance with NE.
- The fill material used to create the working areas required on the edge of the lakes will be used to create valuable marginal habitat (a BAP Priority habitat). The specification for the infill material is provided in *Appendix F* but will be

clean and have a suitable pH (i.e. not lime/concrete). The creation of shallows will be at a 1 in 15 gradient.

- Silt displacement is considered difficult to mitigate however, mitigation measures such as the targeted placement of geotextile or use of Phos-lock will be implemented to minimise this as required.
- Walls will be designed to have a rough surface and the use of overhanging copings limited to allow small mammals to escape floodwaters.
- Ground conditions will be replicated as far as practical in the wet woodland.
- No overfill material will be used to compensate for bulkage. The area comprises made ground but has settled and consolidated over time.
- Design of the defences will ensure no significant change in hydrological regime for the SSSI. The proposed cut-off will be designed to ensure groundwater flow is reduced, not stopped; refer to *Section B11*.
- Indirect effects on Attenborough SSSI and Attenborough Pastures SINC during construction will be minimised by good working practice (to control dust/noise) and pollution control measures. Details of construction practice are given in *Section 3.4, Volume 1*.
- Adverse impacts on the wet woodland could be minimised by coppicing / pollarding of willow species rather than total removal in order to allow a greater works area or access to an area. However, this technique is only likely to succeed if the trees and shrubs in question are young. Mature trees may not survive such treatment.

Specific Measures for Each Reach

Reach 5 – Coneries Pond

- Within the working width there is room to retain some of the mature trees. These will be clearly marked on site and protected.
- Create new margins along working areas in Coneries Pond.

Reaches 6 and 7 – Church Pond

- Reinstatement over geomembrane between sheet piles and defence will comprise mostly sand and topsoil.
- The topsoil will be seeded with a grassland mix. No woody vegetation with roots likely to penetrate the geomembrane will be allowed to re-establish.
- New margins along the working areas in Church Pond will be created.

Reach 8 – The Strand

- Replanting of the hedgerow lost along The Strand with native species. Hedgerow will be replaced with a hedgerow mix that will meet the definition of a ‘species-rich hedgerow’ under the UK BAP. This will meet the BAP target to halt the net loss of species-rich hedgerows although preservation in situ is always preferred.

Reaches 7 and 8 – Old Fisherman’s Car Park

- Confine materials storage area to existing hard standing area.
- Protect adjacent habitats.
- Agree re-instatement with landowner, NE and NWT.

Reach 9 – Through Works Pond and Cemex Works Site

- Much of the temporary infill used for construction of access through Works Pond will be removed and used elsewhere within the SSSI for enhancement works to improve habitats.

Reach 10 – The Delta and Beeston Pond

- Good stands of swamp vegetation will be removed, carefully stored and replaced.

Compensatory Habitat within the SSSI

The measures proposed within the working area cannot fully mitigate the impacts. Therefore, habitat creation and restoration will be undertaken in and around Attenborough SSSI as compensatory habitat for areas permanently lost (as defined by Table B4.10). We have discussed our proposals with NE and NWT and are committed to delivering a minimum of 9.8ha of habitat. This commitment is discussed in more detail in *Appendix F* and summarised below:

Marginal Habitat Creation Commencing in 2009 – Reedbeds

In early 2009, the Environment Agency will commence works on the creation of two areas of compensatory habitat as advance works, these are:

- 2.44 ha of new reedbed to the west of the River Erewash and immediately north of the River Trent; this is Area F on Figure F3.1 (*Appendix F*). The material will be excavated material from the adjacent bank. This new reedbed is located in a section of lake which is just outside the designated SSSI boundary but within the Attenborough West Gravel Pits LWS in Derbyshire.

- 2.75ha of reedbeds and marginal habitat along the edge of Coneries South Pond within the SSSI; this is Area G on Figure F3.1 (*Appendix F*). The material for the works is from banks within the SSSI.

The other measures proposed within Attenborough SSSI that make up the total of 9.8ha are described below.

Habitat to be Created During the Construction of the Nottingham Trent Left Bank FAS

<u>Wet Woodland</u>
Approximately 1.35 hectares of wet woodland will be formed along the edge of Beeston Pond, which is Area A on Figure F3.1 (*Appendix F*) This will be done using the material which was previously used to form the temporary working area. Any additional material will be transported through the temporary working corridor.

<u>Reedbeds</u>
Presently, the Attenborough SSSI has approximately 148 hectares (1.48km^2) of open water. All its lakes were formed from gravel extraction works and, consequently, they have steep sided banks and are of a relatively constant depth. New reedbeds and other marginal habitat will be created by infilling the margins of a number of the lakes.

- A new 0.35ha reedbed will be created to the west of Siemens on the edge of Beeston Pond, which is Area B, on Figure F3.1 (*Appendix F*).
- 1.32ha of reedbed and new SSSI habitat (emergent vegetation) will be formed within Church Pond, which is Area C on Figure F3.1 (*Appendix F*).
- 0.5ha of reedbed will be created in Tween Pond from material excavated from Wheatear Field to create a new wet meadow, which is Area D on Figure F3.1 (*Appendix F*).
- 0.2ha of reedbed will be created on the northern edge of Coneries North, which is Area E on Figure F3.1 (*Appendix F*).

These marginal habitats and reedbed will be created during the construction of the Nottingham FAS however, works on them may continue for an additional 12 months because of planting durations, sourcing of fill material and technical issues.

Wet Meadow

Wet meadow habitat will be created in Wheatear Field from the excavation of material for Tween Pond reedbed. A smaller area of wet meadow will also be created to the north west of Clifton Pond. The total area of wet meadow habitat created will be 0.9ha.

Controlling the Pond Levels and Improving their Water Quality

At present, the majority of the ponds are interlinked, resulting in a constant water level throughout the site. All the wetlands are currently in an unfavourable condition, mainly due to poor water quality. To improve water quality and the diversity of marginal habitat, four water control structures will be introduced; refer to *Figure F3.1, Appendix F.* These will only control levels during low flow periods and the flood risk to the surrounding area will not be affected.

Installation of Otter Holts

Otters have been recorded within the SSSI and holts will be installed on three small islands in Coneries Pond.

Re-profiling of Existing Lake Islands

Five small and two larger islands in Coneries Pond and Tween Pond respectively, will either be removed or re-profiled to vary the depths. The re-profiled islands will create potential little ringed plover habitat, as well as additional marginal habitat.

Additional Fencing

Stock fencing will be installed on the Delta, near Beeston Pond. The approximate area to be fenced is shown on *Figure F3.1, Appendix F.* This will allow future management of the vegetation.

Restoration of The Brook, Attenborough

The Brook adjacent to the Old Fisherman's Car Park in Attenborough, is to be restored through de-silting and tree pollarding on its southern side. The restoration should improve water quality and overall biodiversity, and provide potential habitat for water vole.

B4.4.4 General Mitigation Measures

Woodlands and Trees

Detailed design will ensure that as many trees as possible are retained. Retained trees will be protected in accordance with best practice, such as BS 5837: Trees in Relation to Construction; refer to *Volume 1* for details. Sufficient replanting of lost trees will be undertaken to ensure the ecological value of the site is retained and no net loss of trees. All species will be native and appropriate to the local area.

Hedgerows

Working widths will be limited, wherever practical, to minimise the impact on hedgerows. The hedgerows within Attenborough village (H1 and H2) will be replaced adjacent to the new flood defence using locally native species. The specification will be agreed with the County Ecologist but as this is classified as a BAP hedgerow there should be an equivalent or improved diversity of species.

Breeding Birds

Removal of potential nesting habitat will not be carried out during the breeding season, unless a nesting bird survey proves there are no nests present or that could be disturbed by the works. All wild birds are protected under the Wildlife and Countryside Act 1981 whilst actively nesting; refer also to Attenborough SSSI above.

The only species for which additional mitigation is proposed is for tree sparrow, a seriously declined species, which has maintained a significant resident population at Attenborough, both along the railway line (and in adjoining gardens) and along the River Trent. All existing nest-boxes will be relocated. As an enhancement, additional new boxes will be erected during the winter, into suitable areas that are removed from the works.

Bats

Two trees have been identified as potential bat roosts and one (T87) will be lost. T115 on the edge of the working area will be protected during construction. Use by bats was not confirmed in either trees and further surveys will be undertaken at least eight weeks prior to site clearance. If bats are found, a licence under the Habitats Regulations will be obtained, which will require detailed mitigation to be agreed with NE. Mitigation measures will include replacement planting and a bat box strategy.

Otter

A pre-construction survey will be carried out and if resting places or holts are found a licence will be obtained from NE.

Water Vole

If water voles are found during pre-construction surveys, a mitigation strategy will be agreed with NE. Mitigation will be based on recommendations in the Water Vole Handbook (Strachan, 2006).

Other Mammals

All habitats in the temporary working areas will be reinstated and compensatory habitat creation/restoration undertaken for all semi-natural habitats that are permanently lost. The wall in Reaches 5 to 10 will have a rough finish to help small mammals climb it to escape a flood event and the use of coping stones in these reaches will be limited.

Amphibians

The pond at Cemex will be re-examined prior to construction and, if necessary, pre-construction surveys will be carried out during the amphibian survey season. A mitigation strategy will be prepared based on the results but may include destructive searches in working areas or trapping and translocation.

Invertebrates

In general, for most invertebrates, there is little that can be done in terms of mitigation as species are always present as some life-stage on a work site. Undertaking work at a time when some species are adults and can fly is of limited value at a population level, as any suitable habitat nearby is likely to be occupied and such immigration may have density dependent impact. It is not thought that working at specific times of year would reduce the impact of the work.

The general mitigation/compensatory habitat measures proposed within the SSSI would be valuable for invertebrates. Creation of shallows will also benefit the invertebrate population. The following recommendations are made to mitigate the disturbance to invertebrate habitat after the completion of engineering works:

- The reinstated grassland should be as low-growing as possible or with a composition including tussock-forming grasses to give a varied structure. Some bare ground should be left un-seeded and a varied topography including undulations or even ruts to try and give a range of micro-habitats and humidity.
- Deadwood from any tree felling should be stacked in non-working areas (subject to Environment Agency Development Control approval). Where possible such stacks should be placed in a range of conditions including sun, shade and in dry and wet areas.

Invasive Species

It will not be possible to control Japanese knotweed within Network Rail's land due to the safety restrictions. However, any Japanese knotweed, or soils within 7m of a plant, within the easement should be treated in accordance with Environment Agency's best practice guidelines. Pre-construction checks will be carried out to identify the extent of invasive species within the working area.

Pre-construction checks will also be undertaken of any works in the SSSI or Chilwell Brook for the presence of water fern and Australian swamp stonecrop.

B4.5 Residual Impacts

The main residual impact of the defence alignment through Attenborough SSSI will be the permanent loss of 1.68ha of habitat as shown in Table B4.9. Compensatory habitat, however, will be provided in and around the SSSI which will include:

- creation of a minimum of 8.5ha of marginal habitat (approximately 5.15ha are being created in 2009);
- creation of 1.3ha of wet woodland;
- installation of water control structures;
- provision of fencing to allow grazing;
- restoration of The Brook;
- installation of otter holts;
- re-profiling of existing small islands.

In addition, 0.7ha of wet woodland within Attenborough SSSI lies within the temporary working area. This woodland, as all other habitats within the temporary working areas, will be re-instated but the woodland will take many years to fully re-establish. Overall, the mitigation proposed will reduce the significance of the impact on the SSSI to **minor to moderate adverse**.

There will also be the residual impact of the barrier effect of the wall to immigration and emigration (primarily of terrestrial faunal species). The design of the wall will help to minimise this impact.

Table B4.11 Summary of Impacts on Flora and Fauna

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Construction Impacts					
Attenborough Gravel Pits SSSI (National)	Site clearance and construction (see also 'birds')	Will cause approximately 1.68ha of permanent loss and an additional 5.31ha temporary loss; refer to Table B4.9. In total 3.16% of the SSSI will be directly affected.	Adverse effect on conservation status: probable. Therefore, significant adverse impact at the National level: probable **(Moderate adverse)**	Areas of temporary works to be reinstated. Compensatory habitat to be provided; refer to *Appendix F*. Detailed mitigation method statement to be agreed in advance of works with NE/NWT/Cemex.	Probable adverse effect at the National level in the medium term while vegetation re-establishes; significant. **(Moderate adverse)** With compensatory habitat probable adverse effect at the National level in the long-term; not significant. **(Minor to None adverse)**
	Construction of flood wall	Wall creates physical barrier to movement of species to the north, both generally and in a flood event.	Adverse effect on conservation status; extremely unlikely. Therefore, no significant adverse impact at the National level: probable. **(Minor adverse)**	Wall facing to be 'rough' to allow small mammals to climb to escape floods, limited overhanging coping. Access also possible along the floodplain and over level-crossings.	Certain adverse effect at the National level; not significant. **(None)**
	Site clearance and construction of compensatory habitat measures	Habitat creation will cause a high level of disturbance to existing habitats.	Adverse effect on conservation status: probable. Therefore, significant impact at the National level: probable. **(Moderate adverse)**	Detailed mitigation method statement to be agreed in advance with NE/NWT/Cemex but to include pollution control, protected species, surveys, appropriate timing of works, etc.	Probable adverse effect at the National level in the short-term; significant. (**Moderate adverse)** Probable adverse effect at the National level in the medium-term; not significant. **(None)** Probable beneficial effect at the National level in the long-term; significant. (**Moderate beneficial)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
	Silt disturbance	Reduced water quality of the lagoons (suspended solids/release of nutrients) Silts may contain contaminants. Area already subject to some disturbance by barges/Cemex.	Adverse effect on conservation status; unlikely. Therefore, significant adverse impact at the National level: unlikely. **(Minor adverse)**	Little cost-effective mitigation available but localised use of geotextile or Phos-lock to be discussed with NE.	Probable adverse effect at the National level in the short-term; not significant. **(Minor adverse)**
	Water pollution	Through Erewash or Attenborough.	Adverse effect on the conservation status: unlikely. Therefore, significant adverse impact at the National level: unlikely. **(Minor adverse)**	Pollution control/good working practice.	Certain adverse effect on the National level in the short-term; not significant. **(None)**
	Dust	It is estimated that dust during construction could affect up to 25% of the SSSI.	Adverse effect on the conservation status: unlikely. Therefore, significant adverse impact at the National level: unlikely. **(Minor adverse)**	Good working practice.	Certain adverse effect at the National level in the short-term; not significant. **(None)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
	Hydrology	Groundwater flow will be reduced but not stopped. Surface water flows, lake levels and wider hydrological composition of SSSI will be unaffected.	Adverse effect on the conservation status: unlikely. Therefore, significant impact at the National level: probable. **(Minor adverse)**	Long-term monitoring.	Probable adverse effect at the National level in the long-term; not significant. **(Minor adverse)**
	Overall Significance of Effect		Adverse effect at the National level: significant. **(Moderate adverse)**	Working area minimised. Detailed mitigation method statement to be agreed in advance with NWT and Cemex but will include stripping and reinstatement or harvesting and re-sowing temporary working areas and creation of compensatory habitat.	Adverse effect at the National level in the short term: significant. **(Minor to moderate adverse)** Adverse effect at the National level in the long-term; not significant. **(None)** Beneficial effect at the National level in the long-term; significant. (**Moderate beneficial**).
Attenborough Pastures SINC (County)	Construction	Risk of pollution during construction (dust, pollution incident) could affect up to an estimated 25% of the SINC.	Adverse effect on conservation status: unlikely. Significant adverse impact at County level: unlikely. **(Minor adverse)**	Pollution control/good working practice.	Adverse effect at the County level in the short-term: not significant. **(None)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Trees - woodland and standard trees (County)	Site clearance and construction	169 trees/groups within and outside of the SSSI will be lost.	Adverse effect on conservation status: likely. Therefore, significant adverse impact at the County level: likely. **(Moderate adverse)**	Detail design to retain as many trees as possible. Working width to be reduced where practical to retain trees. Retained trees to be fenced off. No works within tree canopy, where practical. BS5837 guidance to be followed. Replacement and supplementary planting.	Probable adverse effect at the County level in the long-term: significant. **(Minor adverse)** Certain no permanent significant adverse effect at the County level. **(None)**
Hedgerows (Local - District)	Site clearance and construction	Two hedgerows affected, with 230m of hedgerow permanently lost. Connectivity of local network not affected.	Adverse effect on conservation status: certain. Therefore, significant adverse impact at the Local to District level: certain. **(Moderate adverse)**	Hedges replanted next to defence where practical with mix of locally native species.	Certain adverse effect at the Local-District level in the long-term; not significant. **(None)**
Birds (Regional)	Site clearance and construction	Clearance of hedgerow/trees and disturbance to working area and wider zone will cause an overall loss of potential breeding bird habitat.	Adverse effect on conservation status; probable. Therefore, significant adverse impact at the Regional level: certain. **(Moderate adverse)**	Vegetation clearance to be undertaken outside of breeding bird season. Work within most sensitive lakes of SSSI carried out outside of breeding season. All vegetation in temporary working areas to be reinstated. Compensatory habitat measures within SSSI will create additional habitat in the medium to long-term.	Likely adverse impact at the Regional level in the short-term; not significant. **(Minor adverse)** With compensatory habitat measure certain adverse impact in the medium to long-term; not significant. **(None)** Probable that compensatory habitat measures will have a beneficial impact to the bird interest of the SSSI in the long-term. **(Minor beneficial)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Bats (Local)	Site clearance and construction	Loss of one likely tree roost plus loss of vegetation.	Adverse effect on conservation status; probable. Therefore, significant adverse impact at the Local level: probable. **(Minor adverse)**	Further survey prior to construction phase. If bats confirmed licence to be obtained and mitigation strategy agreed with Natural England. Compensatory habitat to include replacement planting and erection of bat boxes in local area.	Likely adverse impact at the Local level in the short-term; not significant. **(Minor adverse)** With compensatory habitat measures certain adverse impact in the medium to long-term; not significant. **(None)**
Otters (Regional)	Construction disturbance	River Trent is known to be used by otters. No holts or resting places within survey area. Construction disturbance possible to otters moving through area.	Adverse effect on conservation status; extremely unlikely. Therefore, significant adverse impact at Regional level: extremely unlikely. **(Minor adverse)**	Pre-construction surveys to ensure no holts or resting places have been established in the interim period which could be disturbed by the works.	Probable adverse effect at Regional level; not significant. **(None)**
Water Voles (County)	Site clearance and construction disturbance	While no water voles were recorded sections of potential bank habitat will be lost /disturbed during construction.	Adverse effect on conservation status: extremely unlikely. Therefore, significant adverse impact at the County level extremely unlikely. **(None)**	Pre-construction surveys. Design and re-instatement of banks to improve water vole habitats.	Probable adverse effect at County level in short-term; not significant. **(None)** Probable beneficial effect at County level in medium-term due to improved habitat; significant. **(Minor beneficial)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Amphibians (Local to County)	Site clearance and construction	GCN known in wider area but pond at Cemex has dried up. No other ponds.	Adverse effect on conservation status; unlikely. Significant adverse impact at Local to County level: extremely unlikely. **(None)**	Pre-construction survey required at Cemex pond if habitat has improved. Depending on findings mitigation to be agreed with County Ecologist. May involve trapping/translocation.	Certain adverse effect at Local/County level in short-term; not significant. **(None)**
Invertebrates (District)	Site clearance and construction	Disturbance to 50% of the Attenborough SSSI near the Footpath Junction survey area (Reach 10) highlighted as District importance.	Adverse effect on conservation status; probable. Therefore, significant adverse impact at the District level: probable. **(Minor adverse)**	Areas of temporary works to be reinstated. The general mitigation/compensatory habitat measures proposed within the SSSI would be valuable for invertebrates. Detailed mitigation method statement to be agreed in advance of works with NE/NWT/ landowner.	Certain adverse effect at the District level in the medium-term; significant. **(Minor adverse)** Probable adverse effect at the District level in the long-term; no significant. **(None)**
Operational Impacts					
Holme Pit and Attenborough SSSIs (National)	Flood protection to left bank	Very slight increase in the depth of flooding. As the SSSIs already in floodplain will not have adverse impact.	Adverse effect on conservation status; extremely unlikely. Therefore, no significant adverse impact at the National level: unlikely. **(None)**	None required.	Certain adverse effect at the National level; not significant. **(None)**

Ecological Receptor (Value)	Proposed Activity/Impact	Characterisation of Unmitigated Impact	Significance Without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
	Maintenance of an easement/access adjacent to defence.	Restriction on the growth of woody species on defence (may effect integrity) or easement (may restrict access).	Impacts are incorporated into construction impacts as above.	None required.	Certain adverse effect at the National level; not significant. **(None)**
	Overall Significance of Effect		Adverse effect at the National level: not significant. **(None)**	None required.	Certain adverse effect at the National level; not significant. **(None)**
SINCs (County)	Flood protection to left bank	Very slight increase in the depth of flooding. As sites already in floodplain will not have adverse impact.	Adverse effect on conservation status; extremely unlikely. Therefore, significant adverse impact at the county level: extremely unlikely. **(None)**	None required.	Certain adverse effect at the County level; not significant. **(None)**
		Protected from floods up to and including 1% annual probability of occurrence.	Impacts are incorporated into construction impacts as above.	None required.	Certain adverse effect at the County level; not significant. **(None)**
	Overall Significance of Effect		Adverse effect at the county level: not significant. **(None)**	None required.	Certain adverse effect at the County level; not significant. **(None)**

B5. NOISE AND VIBRATION

This section considers the noise and vibration impacts arising from construction, operation and associated traffic movements.

B5.1 Method of Assessment

The evaluation of the impacts considered the effects of noise and vibration from construction and operation activities on sensitive receptors. Using the principles set out in BS 5228 'Noise and Vibration Control on Construction and Open Sites', this assessment applies to the properties within 200m of the works, where the noise and vibration impact will be most significant. *Section 7.6.2, Volume 1* sets out the methodology in more detail.

B5.2 Baseline Conditions

Properties that are near to the A6005, Nottingham Road in Erewash and the railway line in Attenborough are subject to higher levels of background noise and vibration due to road traffic and trains respectively. However, most properties and recreation areas elsewhere are relatively undisturbed. The only other significant sources of noise are the Cemex Works Site to the north of Attenborough village and Beeston Weir in Rylands. The number of buildings within 200m of the flood defence route has been estimated as being 1,260; refer to Table B3.1.

Figure B5.1 shows the 'zones' in the Attenborough Erewash and Rylands scheme area that will be most sensitive to sheet piling noise and therefore experience the greatest impact.

In addition to human receptors, there are a number of protected species and other fauna that have been identified along the flood defence route. Details of impacts on protected species from noise can be found in *Section B4*.

B5.3 Impact assessment

B5.3.1 Construction Impacts

Impacts from Construction Site Noise (excluding piling)

The typical plant that will be used on site is likely to consist of dumper trucks, lorries, excavators, compactors and rolling plant.

Using the methodology outlined in *Section 7.6.2, Volume 1,* Table B3.1 shows that **326** buildings are within 50m of the works and are at risk of a high level of noise disturbance from construction site noise. There are a total of **1,260** buildings within 200m of the defence works. Buildings over 200m of the works are not considered to be at risk from significant noise impacts.

During the test piling noise and vibration levels were measured for a 'typical' site set-up; refer to Table B5.1 and Table B5.2. This shows that the LA_{eq} noise levels are 70.9 dB at 15-20m which is less than the 72 to 92 dbA given by BS 5228 as typical average sound levels. DoE Guidance (DoE, 1976) states that noise levels

on the outside façade of the nearest occupied room should not exceed 70 dbA. Properties within 50m of the works which will experience high levels of noise include:

- Manor Garage, Toton STW and 25 properties on Nottingham Road (Erewash)
- Cemex, Ireton House, Poseidon House, 3 and 5 Adenburgh Drive, 7 Ferndale Close, 18 properties on The Strand and a further 183 properties around Attenborough Village
- Siemens, the Lock Keeper's Cottage, 97 properties in the Rylands area, caravans in the Beeston Marina and Mobile Home Complex and the permanent moorings on the Nottingham and Beeston Canal.

These predictions do not take account of variables, such as the screening of fences and other buildings, and the presence of existing ambient noise influences. Also, the temporary and daytime nature of the works, coupled with advance notification and ongoing liaison on any noisy activities, will reduce the sensitivity of a receptor's subjective response.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate adverse** (properties within 50-200m of works) to **major adverse** (properties within 50m of works) and **short-term**.

Impacts from Sheet Piling

A sheet pile cut-off is required for the proposed new flood wall in Reaches 3 to 10. No sheet piling is proposed for the Rylands section of the works (Reaches 12-14). Test piling was undertaken in the Cemex Works Site in October 2006 to determine the best method of sheet pile installation for the ground conditions and to measure the likely noise and vibration levels generated. Measurements were taken 15 to 20m away from the piling. Five piles were driven during the testing. Table B5.1 details the types of piling tested.

Table B5.1 Types of Piling Tested

Pile	Type of Piling
1	Leader rig with high vibrating hammer
2	
3	
4	'Still Worker' hydraulic pile press
5	'Still Worker' hydraulic pile press with pre-augering

The noise and vibration generated from a typical site set-up was also measured (JCE, 2006). Table B5.2 shows the results of the noise monitoring. Only the highest reading per test has been taken.

The tests concluded that the best installation method for the anticipated ground conditions was to use a leader rig with vibrating hammer. This has anticipated noise levels around 80-85 dB at 15-20m.

Table B5.2 Test Piling Noise Monitoring Results

Type of Piling or Activity[1]	$LA_{eq, T}$ (dB) [2]	$LA_{90, T}$ (dB)	$LA_{50, T}$ (dB)	$LA_{10, T}$ (dB)	$1\text{-}A_{max, T}$ (dB)	$1\text{-}A_{min, T}$ (dB)
Pile 1	81.4	72	81.5	86.5	89.6	70.8
Pile 2	81.7	64.0	81.0	85.5	91.5	60.2
Pile 3	83.0	66.5	82.5	87.0	90.0	62.6
Pile 4	68.8	59.0	60.5	69.0	94.9	57.3
Pre-auger	72.7	62.5	73.0	75.0	94.6	56.6
Pile 5	61.6	58.5	60.5	63.5	75.3	57.2
Site set-up	70.9	54.0	65.0	70.5	94.0	43.7

[1] Refer to Table B5.1 for types of piling
[2] $LA_{eq, T}$ is the unit used for the assessment of residential development sites. The definition of units given in Table B5.2 is given in the Glossary in Volume 1.

Sound levels depreciate by approximately 6 dbA for every doubling of the distance from the source in an open field (Various, 1994); *refer to Section 7.6, Volume 1,* so beyond 50m the noise created from the piling operations will not exceed the DoE guidance. Noise monitoring within 50m of the piling operations will be monitored and where noise levels adjacent to buildings exceed 70 dbA working methods will be adapted where practical.

Figure B5.1 shows the zones of potential noise impact from sheet piling activities.

The amount of vibration (mm/s) recorded during the testing is shown in Table B5.3. Vibrations may affect buried underground services and properties nearby to the activity. Regular noise and vibration measurements will be taken as the works progress along Reach 6 where various mitigation measures can be tested before works commences in more noise sensitive areas. Continuous monitoring in sensitive areas will then dictate the contractors working method.

Table B5.3 Test Piling Vibration Monitoring Results

Type of Piling[1]/Activity	Max. Vibration Reading (mm/s)
Site set-up: Plant movements – Leader Rig, Crane, Lorry, Excavator, Dump truck and Tele-handler	1.825
Pile 1	6.475
Pile 2	6.325
Pile 3	2.65
Pile 4	0.55
Pile 5	0.625

[1] Refer to Table B5.1 for types of piling

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate adverse** (properties within 50-200m of piling) to **major adverse** (for properties within 50m of the works of piling) and **short-term**.

Impacts from Construction Traffic Noise

Construction of the defences requires the movement of labour, plant and materials that will generate extra traffic and increase the proportion of heavy vehicles on the public highways. This will result in an increase in traffic noise and is discussed in more detail in *Section B9*.

B5.3.2 Operational Impacts

No significant impacts have been identified.

B5.4 Mitigation Measures and Monitoring

An Environmental Clerk of Works will be appointed to supervise mitigation and ensure that the provisions of the agreed EAP are complied with.

Construction Site Noise

There are a range of generic measures that can be employed to limit the generation and control the emission of noise from the works; refer to *Section 7.6.5, Volume 1*. Their application will depend on local circumstances and the methods of working:

- Any temporary fixed plant, such as generators, are to be positioned as far as practically possible away from residential properties and screened to further reduce noise emissions.
- The contractor will use the smallest construction plant praticable, in particular alongside Reaches 3, 4, 7 to 9, 11, 12, 13 and 14.
- In addition to specific measures, adequate warning and written notice of construction works will be provided to all affected landowners. Health and Safety issues will be addressed through the Contractor's Health and Safety Plan.

Sheet Piling Noise and Vibration

Mitigation measures to limit the impact from sheet piling noise and vibration include:

- A structural inspection of all properties and boundary walls considered to be at risk within 200m of the piling works, including foul and storm water drainage systems. These surveys will be undertaken by a structural surveyor prior to any works commencing and will be made available to the residents of the properties as a record of the property's pre-works condition.
- The structural surveys will also be used to calculate and specify vibration limits from the piling works and to allow the construction team to select appropriate construction methods or additional control measures.
- These limits will be stringently adhered to and continuous monitoring undertaken. A copy of the results along with a post-construction structural

survey will also be provided to the residents to demonstrate that the works have been undertaken so as to not cause any unseen structural damage.

- The vibration of the hammer will be regulated by the operator to ensure that a careful balance between work output and noise/ vibration is reached.
- Piling plant will be well maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated.
- Training in the form of site inductions and tool box talks will reflect the need for consideration of noise issues such as switching off plant that is not in use, keeping engine covers closed, reporting defects and avoiding shouting and slamming of vehicle doors especially during out of hours working.

B5.5 Residual Impacts

Assuming the Contractor implements every reasonable precaution to minimise noise at all times, the majority of properties will continue to experience **minor adverse** noise impacts. However, due to the urban and residential nature of the scheme area, a number of properties within 50m of the works may experience **major adverse** impacts from piling noise and vibration. However, these impacts are **short-term** and there would be no noise impacts after construction.

Table B5.4 Summary of Impacts from Noise and Vibration

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Construction Site Noise	Moderate to major adverse and short-term	• Temporary fixed plant to be positioned as far as practically possible away from residential properties and screened to reduce noise emissions. • Liaison with residents and local businesses. • Other measures are detailed in *Section 7.4.5, Volume 1*.	Minor to moderate adverse and short-term
Sheet Piling Noise and Vibrations	Moderate to major adverse and short-term	• Liaison with residents and local businesses. • Pre-works condition survey of all properties that are within 20m of sheet piling plus other structures as required. • A structural engineer to assess what the maximum tolerance level of vibration is for these buildings. • Continuous vibration monitoring during sheet piling. • The vibration of the hammer will be regulated by the operator to ensure that a careful balance between work output and noise/ vibration is reached. • Piling plant will be well maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated. • Training in the form of site inductions and tool box talks will reflect the need for consideration of noise issues such as switching off plant that is not in use, keeping engine covers closed, reporting defects and avoiding shouting and slamming of vehicle doors especially during out of hours working.	Moderate to major adverse (for properties within 50m of sheet piling activities) and short-term
Construction Traffic Noise	See *Section B9*		
OPERATIONAL IMPACTS			
No significant impacts have been identified			

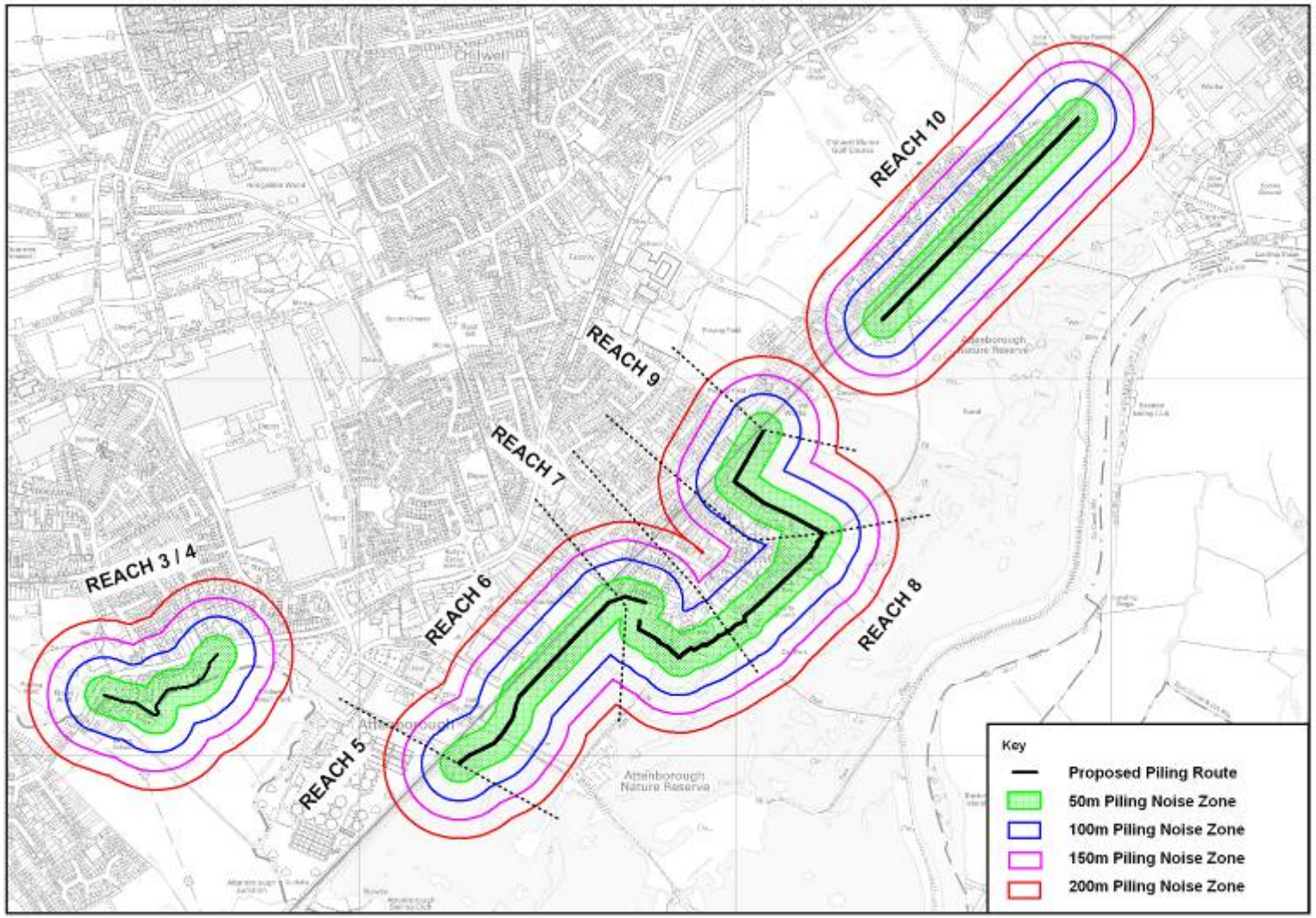


Figure B5.1 Zones of Potential Impact from Sheet Piling Activities

This page is intentionally blank

B6. AIR QUALITY

This section addresses the impact on the local air quality arising from construction activities and associated traffic movements.

B6.1 Method of Assessment

Identification of the ambient conditions was undertaken through a desk study of Broxtowe Borough Council's air quality website. No specialist investigations were considered necessary to support the assessment; given the nature of the works.

For the purposes of the assessment, it is assumed that all plant and equipment will comply with the relevant legislation and standards relating to air emissions. For example, the Road Vehicles (Construction and Use) Regulations 1986, as amended, set strict exhaust standards for the release of pollutants, such as carbon monoxide, hydrocarbons, nitrogen oxides, carbon dioxide and particulates.

The potential for the generation of dust is considered to be largely related to the hardness of the materials being handled. For example, soft friable materials, such as soil, break easily and produce a greater number of dust particles. Conversely, concrete and the other wall materials, such as bricks, are less likely to break and will generate less dust particles. It is assumed that once generated, dust will be dispersed predominantly by the wind and its deposition is determined to an extent by particle size. The potential for severe impacts is greatest within 100m of such activities (ODPM, 2000) and in most circumstances 70% of dust emissions deposit within 200m of the source (Various, 1994).

B6.2 Baseline Conditions

Generally, good air quality is to be expected in the typical semi-rural/suburban setting of the study area. The open nature of the site means that prevailing winds are likely to disperse any emissions and reduce the potential impact on air quality. On this basis, it is likely that the study area has a relatively good air quality.

There are no Air Quality Management Areas (AQMA) within the Attenborough, Erewash and Rylands scheme area.

B6.3 Impact Assessment

B6.3.1 Construction Impacts

Impact on the Local Environment from Dust Generating Activities

Dust emissions will arise from the day to day operation of machinery/vehicles over dry ground and from general construction activities. In addition, the following works are more likely to generate dust:

- removal of the existing visual screening bund in Reach 10;
- embankment raising works in Reaches 12 and 13;
- construction of new embankments in Reaches 1, 3, 7, 9 and 11;

- excavation of the wall foundations in Reaches 2, 4 to 10, 13 and 14.

The most dust will be produced through the movement of fill material for the embankments. The length of time works are programmed for raising and building new embankments will be between three and sevens months; however, movement of fill material will not occur during the whole of this period.

The *significance* of the *impact* been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

Impact on the Local Environment from Construction Plant and Vehicle Emissions

Construction plant and vehicles affect the quality of air, with petrol and diesel engines emitting a wide variety of pollutants, such as carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOCs) and particulates (PM_{10}).

The lorry movements on site will mainly be associated with the transport of material to and from the storage areas. Operatives will travel to and from the site each day in a number of vehicles. In addition, there will be a range of construction plant on the site, such as excavators, bulldozers and generators. The plant will emit exhaust gases but the open environment means that these emissions will mix and disperse.

The *significance* of the *impact* been assessed *prior to mitigation* as being **minor adverse** and **short-term**.

B6.3.2 Operational Impacts

Maintenance activities, such as grass mowing, would be undertaken on an annual basis. It is considered that in relation to the current background dust and other air pollutants, there would be **no significant** impacts on local residents and properties from the maintenance plant and vehicles.

B6.4 Mitigation Measures and Monitoring

Use will be made of alternative products, systems, or materials where practicable, such as mains electricity in preference to a diesel generator and pre-mixed materials rather than mixing on site. Where this is not possible, the principle will be to reduce the likelihood of the emission of dust and key pollutants and, where emissions arise, to contain or control them. With respect to dust, the latter involves the control of aspects, such as the surface area, moisture content, particle size and exposure of the material to meteorological conditions.

There are a range of generic measures that can be employed to limit the generation and control the emission of dust and key air pollutants from the works, as outlined in the CIRIA publication (2005) '*Environmental Good Practice on Site*'. These include:

- All vehicles used on the works will be kept in a well maintained and serviced state, and comply with the MOT emission standards at all times.
- Plant and equipment will be maintained and serviced in accordance with the manufacturers specifications.
- Dust suppression will be employed with regular applications of fine water spray, especially during dry or hot weather.
- Handling of materials will be minimised, where possible.

These measures are outlined in *Section 7.7.5, Volume 1* but their application will depend on local circumstances and the methods of working

An Environmental Clerk of Works will be appointed who will ensure compliance with the agreed EAP.

B6.5 Residual Impacts

A quantitative assessment of the effects of the mitigation measures and, therefore, identification of the residual impacts is not possible due to the variability of influencing factors, especially those relating to local conditions at the time of the works. However, given the likely nature of impacts an assessment does not appear warranted. Table B6.1 summarises the impacts of the FAS on air quality.

A qualitative assessment of the residual impacts suggests that with the application of good practice on site and effective public relations, the impact of dust generation from the construction works will be **minor adverse**. The impact of vehicle exhaust emissions will be of **no significance**.

Table B6.1 Summary of Impacts on Air Quality

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Impact on the local environment from dust generating activities	Moderate adverse and short-term	• An Environmental Clerk of Works will monitor the EAP and mitigation measures. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.7.5, Volume 1.* • Refer to *Section B9.*	Minor adverse and short term
Impact on the local environment from construction plant and vehicle emissions	Minor adverse and short-term	As above plus: • Use of alternative products, systems, or materials where practicable, such as mains electricity in preference to a diesel generator and pre-mixed materials rather than mixing on site.	None
OPERATIONAL IMPACTS			
No significant impacts identified			

This page is intentionally blank

B7. LANDSCAPE AND VISUAL AMENITY

This section addresses the impacts on the local landscape and visual amenity of the Erewash, Attenborough and Rylands scheme areas.

B7.1 Method of Assessment

The landscape and visual amenity impact assessment of the proposed works at Erewash, Attenborough and Rylands has been based on the second edition of the 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA) by the Landscape Institute and Institute of Environmental Management and Assessment (IEMA) published in March 2002.

Application of the guidelines in this assessment and the methodology is summarised in more detail in *Annex 3, Volume 1*. Impacts given in brackets moderate the assessment of significance to standard terminology used for other receptors for comparative purposes; refer to Table 6.1, *Volume 1*.

B7.2 Baseline Conditions

The River Trent and its floodplain are an important environmental corridor through the centre of Nottingham. The open areas provide an important ecological and recreational resource; refer to Section B3 and B4 for further details. The open areas of Attenborough are dominated by Attenborough SSSI (Plate B7.2), a wetland habitat of 221.2 ha which has developed as a result of aggregate mining. An extensive network of footpaths and cycle ways allows access through this important wildlife habitat.

The location of Plates B7.1 to B7.13, which show the existing landscape conditions, and 'photosketch' visualisations can be found in Figure B7.1.

To the north-west of the railway line and Attenborough SSSI is the River Erewash which acts as a boundary between the built up residential and retail districts to the north of Nottingham Road and the open fields to the south of Nottingham Road. The residential properties to the south of Nottingham Road currently have ready access to the River Erewash at the bottom of their gardens (Reach 4). These residential gardens have mature trees within them, and are generally well maintained by the residents; refer to Plate B7.1.

The SSSI, which lies adjacent to the main Nottingham railway line (refer to Plate B7.2), and the horse grazing field between Nottingham Road and the River Erewash (Reach 3) are designated as Green Belt.

The open spaces of the Attenborough SSSI surround Attenborough Village (Reaches 7 to 9). Attenborough Village is divided from the rest of the Attenborough residential area by the Nottingham to Derby railway line. The village is home to a number of attractive listed buildings, including St. Mary's Church, the spire of which acts as a focal point in the immediate area; refer to Plate B7.3. The Village Green, which is listed in the local plan as a 'private open space', and backdrop of well-appointed houses creates a visually attractive village setting; refer to Plate B7.4. The village together with the Old Fisherman's Car

Park, which is in the SSSI, have been designated as a Conservation Area; refer to Figure BB3.2, *Annex B3*. The key characteristics of this Conservation Area are its many older cottages, narrow lanes and the density and variety of mature vegetation.

To the north-east of Attenborough Village the Cemex Works Site (Reach 10), a working aggregate batching plant, forms a visually contrasting industrial feature to the edge of the SSSI; refer to Plate B7.5.

Chilwell Manor Golf Course is situated to the north of Attenborough Village (Reach 11) and forms a significant area of private recreational space in this area of Nottingham.

Within Rylands the local plan designates the Rylands allotment site (Reach 12) as a 'Safeguarded Site for Community and Education Facilities' and the recreation ground (Reach 12) is designated as 'Existing Private Open Space'; refer to Plate B7.6. The Weir Field Recreation Ground (Reach 13) is designated as 'Existing Public Open Space'. Refer to *Annex 1 Volume 1* for details of planning policies.

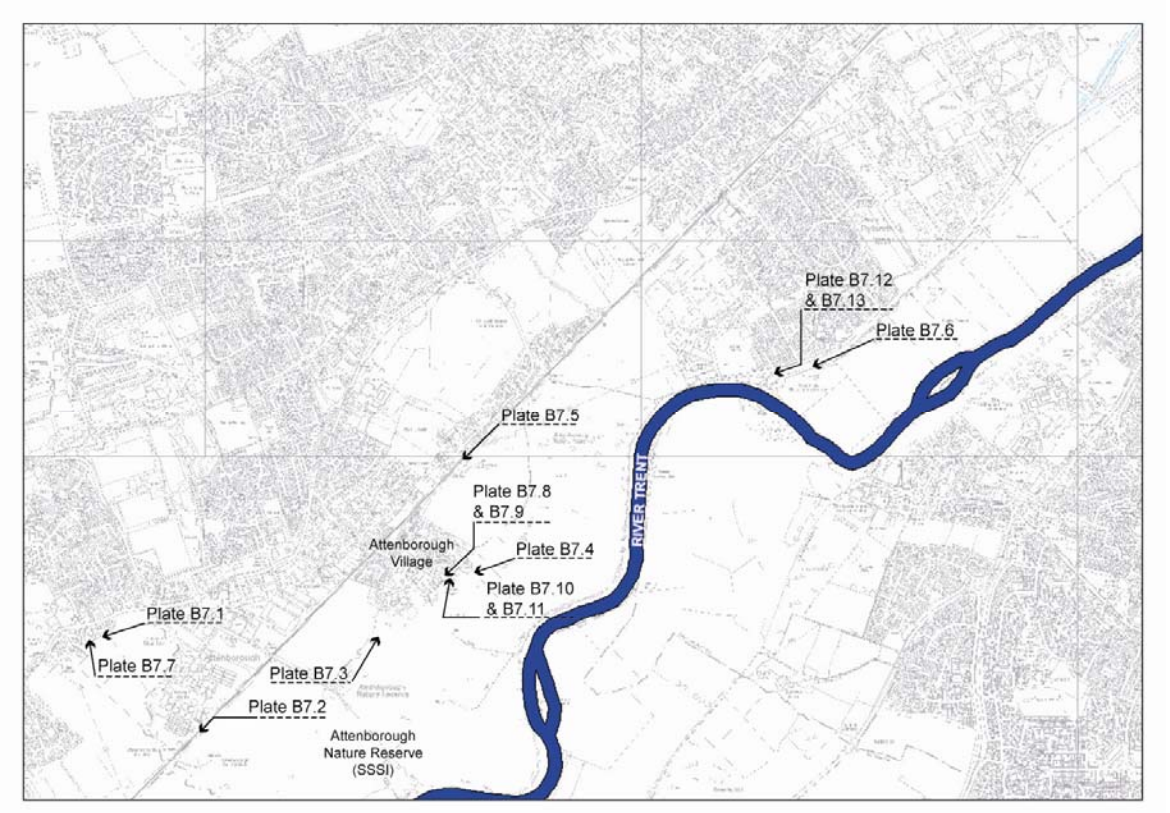


Figure B7.1 Location of Plates and Visualisations

Plate B7.1 Residential properties along the River Erewash Reach 4

Plate B7.2 Attenborough SSSI Reach 5

Plate B7.3 St Mary's Church, Attenborough Reach 7

Plate B7.4 Attenborough Village Green Reach 8

Plate B7.5 Aerial View of the Cemex Works site (Reach 10)

Plate B7.6 Aerial View of the Rylands stretch (Reaches 12 and 13)

B7.3 Impact Assessment

B7.3.1 Construction Impacts

Impacts of Construction Works on Local Landscape and Visual Amenity

During the construction period machinery, the storage of materials and site compounds will be intrusive new elements in the landscape and evident in existing views for local visual receptors. These visual impacts will be the greatest for the residents of Attenborough Village and the Nottingham Road residential properties in Reaches 4, 7, 8 and 9, and also for residents of the Beeston Marina & Mobile Home Complex, canal users and residents of Beeston Lock Cottage in Rylands; Reaches 12 - 14.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate adverse** to **significant adverse** and **short-term**.

Impact of New and Raised Defences on Local Landscape and Visual Amenity at Erewash (Reaches 1 to 4)

- The embankments through the Toton Sewage Treatment Works in Reaches 2 and 3, will have a **negligible** impact within the wider landscape context.
- The embankment in Reach 3 will have a **slight adverse** impact on existing views from Nottingham Road out over the floodplain.
- The construction of the brick clad wall in Reach 4 will have a **moderate adverse** impact on the landscape quality of individual gardens on Nottingham Road; refer to Plate B7.7. Currently these gardens enjoy ready access to the riverbank and the recreation opportunities it offers. The floodwall will have a **slight adverse** visual impact on views from the adjacent residential properties.

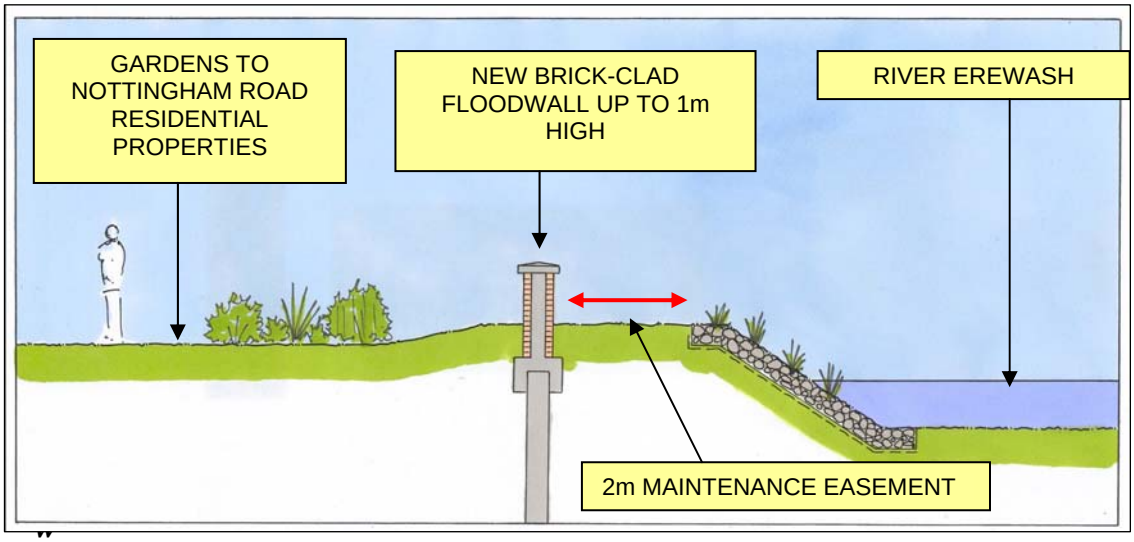


Plate B7.7 Section through New Floodwall through Nottingham Road Gardens, Erewash (Reach 4)

Impacts of New and Raised Defences on Local Landscapes and Visual Amenity at Attenborough SSSI (Reaches 5 – 11)

Reach 5 and 6

- The new timber clad wall along the railway and SSSI boundary will result in a **moderate adverse** visual impact for recreational users of the Attenborough SSSI. The wall will form a small-scale feature within the wider landscape and will be screened by the existing vegetation that is to be retained. There will also be full reinstatement of adjacent grassed areas, pond banks and marginal planting affected by the works.
- The new wall will have a **significant adverse** impact on the landscape, due to the permanent loss of 1.68ha of marginal lake habitat.
- The raised levels of the road ramp in Barton Lane (Reach 5) will have a **negligible** impact on the landscape character of the area. The road will be re-graded to ensure a smooth finish.
- The new wall in Reach 6 will have a **moderate adverse** visual impact for the residents of Gate House on Barton Lane. The installation of a flood gate alongside the property will ensure that existing access arrangements are maintained to an adjacent field that is currently used as horse pasture.

Reach 7

- A new 0.4m high wall will be built along the existing fence line between the SSSI and the footpath at the back of St. Mary's Close. A fence, similar to the existing, will be reinstated on top of the floodwall. This will result in a **moderate adverse** impact on the landscape and visual amenity.
- The new 0.75m high wall along the boundary of No. 3 Adenburgh Drive will replace an existing closed boarded fence and hedge of similar height. This will have a **moderate adverse** impact of the landscape character and a **significant adverse** impact on the visual amenity, these impacts reduce after mitigation to **not significant**.
- Along the boundary of No.5 Adenburgh Drive the 0.75 high wall will replace a post and single chain fence, and will form a new solid boundary between the garden and Church Pond (part of the SSSI) interrupting the existing open views across the pond. This will result in a **significant adverse** impact on the landscape character and visual amenity.
- The flood defence wall along the boundary of Poseidon House will replace an existing 1.8m high close boarded fence and will not therefore detract from any mid to long range views. The loss of vegetation along these boundaries and the formation of the floodwall will have a **significant adverse** impact on the landscape character of the immediate area and a **significant adverse** impact on visual amenity. However these impacts will reduce to **not significant** once reinstatement planting is successfully established. The flood gate in the wall at the end of Church Lane will allow continued pedestrian access to Attenborough SSSI. This flood gate will be perceived as part of the wall and will have a **slight adverse** impact on the landscape character of this area.
- The new flood wall along the boundary of Ireton House will replace an existing hedgerow. This will have a **significant adverse** visual impact from the public footpath in the SSSI and for the residents of Ireton House. Re-profiling of the edge of Church Pond as part of the reinstatement works

aims to mitigate this visual impact. There will be a **moderate adverse** impact of the landscape character around Ireton House. A 1.8m high flood gate will maintain the access from Ireton House to its lower garden. Proposed cladding and flood gate materials must be in keeping with the Conservation Area, liaison with the Conservation Officer at Broxtowe Borough Council is essential.

- The offset line of the proposed floodwall from the existing boundary of St. Mary's Church will ensure the retention of the existing mature trees and hedgerow to the edge of the churchyard. This vegetation will partially screen views to the proposed floodwall from the churchyard; however these views will be more apparent depending on the season. The wall will have a **moderate adverse** impact on views over the floodplain into the SSSI, and also on the landscape character of the curtilage around the Church. The creation of an embankment on the wall's wet side will reduce the wall's visual impact when viewed from the public footpath in the SSSI. The existing views of the Church spire will remain.
- Careful and sensitive liaison with the Church and Diocese will be necessary given the proximity to the church yard.
- The new embankment across the grazing field in Reach 7 will result in the loss of several mature trees near the interface with the new wall in Reach 8. This will have a **slight adverse** impact on the landscape. Once reinstatement grass seeding has established the proposed raising works will not result in a change to the overall character of the landscape.

Reach 8

- The replacement of the existing hedgerow on The Strand with a natural stone- clad reinforced concrete wall will result in a **significant adverse** change to the landscape character of the immediate area. The construction of the wall will introduce a strong physical barrier between The Strand and the Village Green; refer to Plates B7.8 and B7.9. The existing hedge does not act as a solid visual barrier; it allows some views across it. However, the new flood wall would become a visual barrier and remove these views to the Village Green.
- The new wall will form a significant new feature within foreground views from the adjacent residential properties and for people travelling along The Strand, and will result in a **significant adverse** visual impact. To mitigate this visual impact the road will be re-profiled to reduce the visual height of the wall to 1.5m when viewed from the dry side. Reinstatement of a hedgerow, tree planting and the grass verge will further mitigate the visual impact of the wall and change to the landscape character of the street.
- Pedestrian and vehicular access between The Strand and the Village Green, cricket pavilion, bowling club, Attenborough SSSI and individual residential gardens will be maintained through the use of flood gates. These flood gates will result in a **slight adverse** visual impact.
- The new wall will result in a **significant adverse** change to existing views from the Village Green. The new wall will be viewed by recreational users of the Village Green with the existing residential properties as a backdrop; refer to Plates B7.10 and B7.11.

- Seating has been integrated into the wall's design on the Village Green side to create a viewing area. Raised planting beds have been introduced to soften the visual impact of the wall.
- The new wall along the boundary of the public footpath and the lower garden of 49 The Strand and the setting back of the boundary wall on the other side of the footpath along with the necessary clearance of several trees will result in a **moderate adverse** impact on the landscape character of the property's garden. The garden will be fully reinstated in consultation with the property owner.

Reaches 9 and 10

- 51 The Strand and 7 Ferndale Close will experience a **moderate adverse** impact on the landscape character of their gardens. However this will be offset against the **benefit** of the enlarged level garden area associated with the in-filled bank to the landward side of the floodwall and any mitigation planting.
- The raised levels of the existing embankment in Reach 9 adjacent to Allendale Avenue will have a **slight adverse** visual impact on views from the residential properties out towards the Attenborough SSSI. The background views of existing tree planting will be retained. There will be reinstatement of marginal planting within Works Pond where affected by the works, and where possible maintenance access will be required.
- The proposed wall in Reach 10 will have a **moderate adverse** visual impact. The railway embankment will obscure views to the floodwall from users and residents of Long Lane and visitors to Attenborough SSSI will view the proposed floodwall in Reach 10 as a small-scale feature within the wider landscape of the SSSI and with the railway embankment as a backdrop. For the workers at Siemens there will be a **negligible** impact on the visual amenity or landscape character of their working environment.
- Where there is a permanent loss of vegetation in the SSSI, offset tree and reed planting is proposed for elsewhere in the SSSI, where suitable.

Reach 11

- There will be a **slight adverse** impact on the landscape character of the golf course with the loss of scrub vegetation cleared for the construction of a 300mm high earth bund. The earth bund itself will not be a visually intrusive element in the landscape, and will have a **negligible** visual impact.
- The earth bund will have a **negligible** landscape and visual impact on the residents of the adjacent properties.

Impacts of New and Raised Defences on Local Landscape and Visual Amenity at Rylands (Reaches 12 – 14)

Reach 12

- The new flood wall between the railway and Siemens Stream is sited along a grass verge between an access road and the edge of Beeston Pond in Attenborough SSSI. The wall will have a **slight adverse** visual impact once the works are complete as the wall will divide this open area.
- The reconstruction of a control structure on Siemens Stream in place of the existing structure will have a **slight adverse** visual impact. Visual

receptors at Siemens, the caravan park and the allotments will view the structure against a backdrop of existing palisade fencing.

- The raising of the existing embankment between the caravan park and the allotments will have a **slight adverse** effect on residents of the caravans and users of the allotments. The extended embankment foot print will reduce the size of the adjacent allotment plots and will require the relocation of several temporary structures (sheds and stores). However there will be a **negligible** impact on the existing landscape character.
- A new 2.3m high flood wall will run along the boundary between the field with the electricity pylon and the allotments access track. Although land use will remain there will be a **moderate adverse** visual impact for the users of this area. The landscape character will remain unchanged.
- The section of Riverside Road between the allotments and the recreation ground will be raised but this will have a **negligible** visual impact.
- The works to the embankment around the perimeter of the recreation ground will raise levels by around 0.6m and extend the footprint; however this will have a **negligible** impact on the landscape character. Likewise, the section of Riverside Road between the recreation ground pavilion and the Caravan Park, where the wall is to be, will have a **negligible** visual impact.
- The flood wall through the Beeston Marina & Mobile Home Complex will have a **significant adverse** impact on residents during construction, but once completed it will have replaced an existing boundary fence between caravans and it will have a **moderate adverse** visual and landscape impact.

Reach 13

- The canal towpath will be raised along its current alignment and will tie into the levels of the Lock. The potential loss of hedge along the canal tow path adjacent to the caravans due to the required increase in tow path levels, will have a **slight adverse** impact on the surrounding landscape and lines of vision. This impact will be temporary as the hedge will be reinstated.
- The 1.1m increase in height of the flood gates across Beeston Lock and the associated gate structure, as shown in Plate B7.12 and B7.13, will have a **moderate adverse** visual impact for users of the canal and the residents of Beeston Lock Cottage and surrounding caravans. For other visual receptors the impact will be **slight adverse**.
- The increase in height to the boundary wall of Beeston Lock cottage will have a **moderate adverse** impact for the residents of the cottage upon reinstatement of the garden.
- The raising and reprofiling of the existing flood embankment adjacent to the canal between Beeston Lock and Turnover Bridge will have **negligible** impact. The landscape character will not be affected and lines of vision will not significantly change. The re-profiling work will create a 2m wide easement between the canal and the flood embankment which will allow clearer views along the canal, thereby producing a **slight beneficial** visual and landscape impact. There will be a **slight adverse** visual impact on views from Weir Field Recreation Ground.

Reach 14

- The slight increase in height to the existing flood wall will have a **negligible** landscape and visual impact.

Summary of Significance of Landscape and Visual Impacts

Between Reaches 1 and 4 (Erewash) the *significance* of the visual and landscape *impacts* have been assessed *prior to mitigation* as being **negligible** to **moderate adverse** (wall in gardens at Nottingham Road) and **permanent**.

Between Reaches 5 and 11 (Attenborough) the *significance* of the visual and landscape *impacts* have been assessed *prior to mitigation* as being **negligible** (raising of Barton Lane) to **significant** (**major) adverse** (The Strand) and **permanent**.

For Reaches 12 to 14 (Rylands) the *significance* of the landscape and visual *impacts* has been assessed *prior to mitigation* as being **moderate adverse** and **permanent**.

B7.4 Mitigation Measures and Monitoring

The mitigation measures in Table B7.1 are to be incorporated into the design of the scheme to reduce or avoid visual intrusion caused by the construction works and to aid integration of the raised and new defences into their surroundings. In sensitive landscape areas, such as the Attenborough Village Conservation Area, the flood walls will be appropriately clad in accordance with the requirements of the Broxtowe Borough Council Conservation Officer. Appropriate cladding of flood walls is adopted as good practice and part of the baseline design.

Similarly re-seeding of embankments is considered as part of the engineering design and will be completed as standard for all areas.

The mitigation measures and reinstatement proposals have developed through liaison between Nottinghamshire County Council and the Environment Agency, as well as the local community. Consultation will continue throughout the detailed design stage with statutory consultees and the local community.

Table B7.1 Mitigation Measures and Wall Treatments

Impacts Proposed Works	Mitigation Measures and Wall Treatments
Visual appearance of new floodwalls	• Cladding in materials that are characteristic and appropriate to the area. • Reach 4 – Flood walls within gardens of Nottingham Road residential properties to be clad in brick matching the properties. • Reach 5, 6 & 10 – Walls to be clad in timber in the SSSI areas. • Reach 8 – Flood wall along The Strand within Attenborough Village to be clad in natural stone, with reinstatement hedge and tree planting on dry side of wall. • Reach 8 – road re-profiling of The Strand, to reduce the visual height of the wall to 1.5m, as viewed from The Strand. Integral seating and raised flower beds on the Village Green side. • Reach 13 – Beeston Lock to use materials to match existing natural stone and brick. At the Beeston Lock Cottage, reclaimed bricks will be used for the wall. • Reach 14 – bricks and coping to match existing wall.
Foreshortening of views	• Raising of road to reduce the visual impact of the wall for users of The Strand.
Impacts on existing mature trees	• Where proposed works are in close proximity to trees of high landscape value ensure the construction process minimises any potential damage to root systems. Where it does not compromise operational requirements, trees removed due to construction should be replaced.
Raised road levels	• Grade road ramps so that a smooth road surface is achieved.
Visual impact of raised embankments	• Ensure the grass covered embankments blend into their landscape setting through landform design. Where it does not compromise operational requirements, appropriate planting set off the embankments may be utilised to reduce the visual impact.
Temporary adverse visual impact of construction activities and site compounds.	• Where possible locate site compounds and material storage areas away from sensitive residential receptors and adjacent to suitable vehicle access points. • Reinstate all areas affected by the works to their former land use and to at least the same condition.
Impact on residential properties	• All affected areas of residential properties (predominantly gardens and occasional sheds/outbuildings) to be reinstated to the same quality in agreement with the individual property owners.

The proposed flood defences and the mitigation and enhancements are shown on the Overview Plans; refer to *Figures V4.1 to V4.12, Volume 1.*

B7.5 Residual Impacts

Residual impacts are those impacts which remain after all practical mitigation and reinstatement proposals have successfully established. For many of the landscape and visual impacts the mitigation and reinstatement proposals will not significantly reduce the impact. This is due to the very nature of the proposed works; for example if an existing view of the SSSI from a private residence is interrupted, reinstatement planting will not bring back this view.

Summary Tables B7.2 and B7.3 outline the residual impacts.

Erewash (Reaches 1 – 4)
The works in Reaches 1 – 3 are all low level and once reinstated vegetation has established the residual impact will be **negligible (not significant)**.

The proposed floodwall through residential gardens in Reach 4 will form a physical barrier between the riverbank and the rest of the residential gardens. This will be mitigated by sympathetic reinstatement proposals to include access arrangements over the floodwall so the residents can continue to enjoy the benefits of the river at the end of their gardens. Once reinstatement planting has established, and fence boundaries and existing garden features have been reinstated in agreement with property owners, the proposed works will not result in any changes to the existing landscape character. The residual impact will be **negligible (not significant).**

Within Attenborough SSSI (Reaches 5, 6 and 10)
The proposed floodwalls that run parallel to the existing Nottingham to Derby Railway Embankment through the SSSI will have a **moderate adverse (not significant)** residual visual impact. These floodwalls will form small-scale elements within the wider landscape of the SSSI and will be viewed with the existing railway embankment as a backdrop. They will be timber clad to be in-keeping with the natural setting of the SSSI, where brick, stone or concrete are considered inappropriate. There will be a permanent loss of 1.68ha of marginal lake habitat within the SSSI, which will have a **significant** landscape effect within the immediate area.

Within Attenborough Village Residential Properties (Reaches 7 and 9)
Works are required within residential gardens in Reaches 7 and 9 (Attenborough Village). For the residential owners and occupiers there will be a **moderate adverse (not significant)** residual impact on the landscape character of the gardens.

Along the boundaries of No.3 Adenburgh Drive and Poseidon House there will be a **moderate adverse (not significant)** residual impact on the landscape character and visual amenity of the gardens, once reinstatement planting has successfully established.

Along the boundary of No.5 Adenburgh Drive there will be a **moderate/substantial adverse (significant)** residual impact, as the wall will permanently restrict views towards Church Pond from the garden.

Along the boundary of Ireton House there will be a **moderate/substantial adverse (significant)** residual impact on the landscape character. The pond edge will be re-profiled to reduce the visual impact of the wall and full reinstatement of marginal planting and tree planting will be carried out where possible. Any proposed cladding materials must be in keeping with the Conservation Area, and liaison with the Conservation Officer at Broxtowe Borough Council is required.

The new flood wall offset from the boundary of St Mary's Church will have a residual **moderate/substantial adverse (significant)** impact on the landscape character and visual amenity. These views will be experienced by Church visitors and users on the nearby footpath in the SSSI. The visibility of the wall will vary according to the season.

There will be a **slight adverse (not significant)** residual impact on visual amenity and landscape character for users of the public footpaths in the SSSI. The establishment of reinstatement planting will screen views towards the wall reducing the impacts from moderate adverse prior to mitigation to the stated **slight adverse (not significant)** level.

The residential properties whose gardens back onto the Works Pond (Reach 9) will experience a **moderate/substantial adverse (significant)** impact in the landscape character of their gardens and of the views into the SSSI with the loss of marginal pond vegetation. However this significance is reduced to a **moderate adverse (not significant)** residual impact, with the benefits of an enlarged level area of garden and mitigation planting.

The residents of Ferndale Close will experience **moderate/substantial adverse (significant)** impacts on their views out towards Works Pond. This will be mitigated by reinstatement of marginal planting, where possible. The residual impact on the landscape character and visual amenity will be **moderate adverse (not significant)** when reinstatement planting has established.

Along The Strand (Reach 8)

The proposed wall and the re-alignment of the existing hedgerow along The Strand will have a **moderate/substantial adverse (significant)** residual impact on the local landscape. The visual impact of the floodwall will be mitigated by sensitive cladding design, reprofiling the road, and reinstatement hedgerow and tree planting to reinstate the existing 'rural' village character; refer Plates B7.8 and B7.9.

Existing pedestrian, cycle and vehicular access routes will be retained through the use of flood gates through the floodwall. These gates will be clad to leave a **slight adverse (not significant)** residual impact on the visual amenity of The Strand. The backs of flood gates which will be viewed most frequently will be clad in timber to make them appear less incongruous in the local landscape scene.

The garden at No. 49 The Strand will experience the loss of a 1.0m wide strip of land along the boundary of The Strand. Although this represents a **moderate/substantial adverse (significant)** impact, in the long term there will be a **moderate adverse (not significant)** residual impact on the landscape character due to the size of the garden and proposed full reinstatement of the

areas affected by the works. The views from this garden will not be affected, as there is an existing 1.8m high boundary wall.

The proposed wall will have a **substantial adverse (significant)** residual impact on the views back towards The Strand for the users of the Village Green and also on the landscape character. Integrated seating and raised flower beds are proposed to soften the impact of the wall. Refer to Plates B7.10 and B7.11.

Rylands (Reaches 12 – 14)

The extended footprint of the raised flood embankment by Siemens stream will reduce the size of the adjacent allotments which will have a **slight adverse (not significant)** impact on the landscape character, which will be replaced where possible. The 2.3m high wall along the boundary of the allotments and adjacent field will have a **moderate adverse** impact on foreground views for the allotment holders and a residual **moderate/substantial adverse** (**significant)** visual and landscape character impact for the residents of neighbouring caravans.

The increase in height of the Beeston Lock flood gates will have a **moderate adverse (not significant)** residual visual impact for the residents of Beeston Lock Cottage, adjacent caravan owners and users of Beeston Lock.

Overall the impacts in landscape character in the Rylands area are considered to be **not significant**; however for the residents of the Beeston Marina & Mobile Home Complex there will be a **significant** visual and landscape impact.

B7.6 Summary

There are five areas for which the scheme will have a **significant adverse impact** on the landscape character and visual amenity. These areas are as follows:

- The proposed wall off-set from the boundary of St. Mary's Church will have a significant adverse landscape and visual impact for users of the Church and the footpath in the SSSI.
- The proposed wall along the property boundaries of No. 5 Adenburgh Drive and Ireton House will have a significant adverse landscape and visual impact for the residents of these properties.
- The proposed wall along The Strand will have a significant adverse impact for users of The Strand, users of the Village Green and residents along The Strand.
- The proposed wall between Ferndale Close and Works Pond will have a significant adverse visual impact for the residents of Ferndale Close.
- For the proposed wall and embankment adjacent to Beeston Marina and Mobile Home Complex and allotments in Rylands there will be a significant adverse visual impact for the local residents and allotment users.

The mitigation and reinstatement measures proposed attempt to reduce the residual impacts of the flood protection measures. However, due to the sensitivity of these areas the residual impact remains significant.

For the other areas affected within Erewash, Attenborough and Rylands the residual impact varies from negligible to moderate adverse and in accordance with the adopted methodology these impacts are considered **not significant**.

Plate B7.8 View along The Strand, Attenborough Village, Reach 8 (refer to Plate B7.9)

Plate B7.9 'Photosketch' Visualisation of New Floodwall along The Strand, with reinstatement hedgerow and tree planting (refer to Plate B7.8)

Plate B7.10 Existing view from the Village Green, Attenborough, Reach 8 (refer to Plate B7.11)

Plate B7.11 'Photosketch' Visualisation of new flood wall along The Strand, Attenborough viewed from Village Green (refer to Plate B7.10)

Plate B7.12 Existing View of Beeston Locks (refer to Plate B7.13)

Plate B7.13 'Photosketch' Visualisation showing Beeston Locks Re-Grading (refer to Plate B7.12)

Table B7.2 Summary of Landscape Impacts [3]

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
EREWASH							
Reach 1 Toton Sewage Works South Construct new embankment	Low	Low	Slight (minor) / Not Significant	• Retention of existing trees to the riverbank	Negligible	Negligible / Not Significant	No change to landscape character once working area is reinstated.
Reach 2 Toton Sewage Works North Construct new wall and embankment	Low	Low	Slight (minor) / Not Significant	• Appropriate concrete finish to floodwalls • Retention of existing trees to the riverbank	Negligible	Negligible / Not Significant	
Reach 3 Field south of Nottingham Road Construct new embankment	Low	Low	Slight (minor) / Not Significant	• Vehicular access ramp over embankment to maintain existing access	Negligible	Negligible / Not Significant	
Reach 4 Nottingham Road properties and Manor Garage Construct new wall	Medium	Medium	Moderate / Not Significant	• Reinstate access over the floodwall to for each individual garden. Where possible retain existing garden trees. • Full reinstatement of gardens agreed with individual property owners.	Negligible	Slight (minor)/ negligible / Not Significant	

[3] Unless otherwise stated the residual impacts are adverse. The duration of effects unless otherwise stated is permanent

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
ATTENBOROUGH							
Reach 5 **River Erewash to Barton Lane** Construct new wall	High	Low	Moderate / Not Significant	• Full reinstatement: grassed areas, pond banks and marginal planting.	Low	Moderate / Not Significant	2-3 years for establishment of planting.
Raise road levels	High	Low	Moderate / Not Significant	• Full re-grading works to ensure smooth road surface	Negligible	Slight (minor) / Not Significant	
Reach 6 **Barton Lane to St. Mary's Close** Construct new wall between Barton Lane and St. Mary's Close.	High	Medium	Moderate/ Substantial (major) / Significant	• Flood gate to maintain access to adjacent field.	Medium	Moderate/ Substantial (major) / Significant	Loss of 1.68ha of SSSI.
Reach 7 **St. Mary's Close to the Strand** Construct new wall along boundary of SSSI.	High	Low	Moderate / Not Significant	• Reinstatement of fencing on top of flood wall.	Low	Moderate / Not Significant	There will be some vegetation loss to construct the wall. Liaise with Nottinghamshire Wildlife Trust.
Construct new wall along garden boundary of No.3 Adenburgh Drive	High	Low	Moderate / Not Significant	• Full reinstatement of individual residential garden.	Negligible	Slight (minor) / Not Significant	3-5 years for establishment of ornamental planting, 10+ years for trees.

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
Construct new wall along garden boundary of No.5 Adenburgh Drive	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of individual residential garden in consultation with property owner.	Medium	Moderate/ Substantial (major) / Significant	View towards Church Pond will be restricted. Liaison with property owner required.
Construct new wall along boundary of Poseidon House	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of individual residential garden.	Low	Moderate / Not Significant	3-5 years for establishment of ornamental planting, 10+ years for trees.
Construct flood gates at end of Church Lane	High	Low	Moderate / Not Significant	• Proposed materials for flood gates to be agreed with Conservation Officer.	Negligible	Slight (minor) / Not Significant	
Construct new wall along boundary of Ireton House	High	Medium	Moderate/ Substantial (major) / Significant	• Pond edge re-profiled. • Reinstatement: marginal planting, pond edge and tree planting. • Maintain access to lower garden with 1.8m high flood gate.	Medium	Moderate/ Substantial (major) / Significant	Agree cladding materials with Conservation officer. 10+ years for planting establishment
Construct new flood wall, offset from St. Mary's Church boundary	High	Medium	Moderate/ Substantial (major) / Significant	• Reprofiling on wet side.	Medium	Moderate/ Substantial (major) / Significant	Sensitive liaison with Church required.

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
New embankment	High	Low	Moderate / Not Significant	• No mitigation possible.	Low	Moderate / Not Significant	
Construct new wall	High	Low	Slight (minor)/ negligible / Not Significant	• Ensure appropriate concrete finish where concrete on wall exposed. • Full reinstatement of grassed areas.	Low	Slight (minor)/ negligible / Not Significant	There will be some vegetation loss to construct the wall. Liaise with Nottinghamshire Wildlife Trust. 12-18 months for re-seeding establishment.
Reach 8 **The Strand** Construct new wall	High	High	Substantial (major) / Significant	• Road re-profiling. • Revised road layout. • Integrated seating on Village Green side. • Reinstatement of grass verge on landward side. • Reinstatement of a hedgerow and trees on landward side. • Installation of flood gates to maintain access.	Medium	Moderate/ Substantial (major) / Significant	'Instant hedging' for immediate screening of the wall. Tree establishment will still take 10+ years.

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
Reach 9 **The Strand to Cemex Works Site** Construct new wall adjacent to residential properties	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of gardens where affected by works. • In-filling of the existing sloping bank to the landward side. • Reinstatement of marginal planting within Works Pond. • Replacement planting of trees and shrubs where appropriate to offset the loss of vegetation along the alignment.	Low	Moderate / Not Significant	10+ years for establishment of planting.
Reach 10 New wall through Cemex works on perimeter of SSSI to boundary of Siemens	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of adjacent grassed areas and pond banks. • Loss of permanent vegetation to be offset by suitable planting elsewhere in the SSSI, where possible. • New marginal habitat proposed within Beeston Pond.	Low	Moderate / Not Significant	The floodwall will form a small-scale element within the wider landscape once reinstatement planting has established. Reinstatement to be agreed with NE. 2-3 years for establishment of grassed areas and pond banks.
Reach 11 Golf Course	High	Negligible	Slight (minor) / Not Significant	• No mitigation possible	N/A	Slight (minor) / Not Significant	

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
RYLANDS							
Reach 12 Siemens Wall	Low	Negligible	Slight (minor) / Not Significant	• Upgrade tree planting along wall with native species. • Suitable coping stones on wall for workers to sit on.	Negligible	Slight (minor) / Not Significant	Flood wall will remove open access to Beeston Pond. 10+ years for establishment of planting.
Siemens control structure	Low	Low	Slight (minor) / Not Significant	• No mitigation possible.	N/A	Slight (minor) / Not Significant	
Raise existing embankment by allotments	Medium	Low	Slight (minor)/ Moderate / Not Significant	• Upgrade planting along embankment.	Negligible	Slight (minor)/ Negligible / Not Significant	Reduced size of some allotments & relocation of some shed and caravan.
New wall adjacent to allotments	Medium	Medium	Moderate / Not Significant	• New planting & native trees to screen wall	Low	Slight (minor)/ Moderate / Not Significant	New flood wall follows field boundary enabling continued use of land post completion of work. 10+ years for establishment of tree planting.
Road raising to Riverside Road	Low	Negligible	Slight (minor) / Not Significant	• Full re-grading works to ensure a smooth road surface is reinstated.	Negligible	Negligible / Not Significant	

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
Recreation Ground embankment	Low	Negligible	Negligible / Not Significant	• No mitigation possible.	Negligible	Negligible / Not Significant	
Beeston Marina and Mobile Home Complex flood wall	Medium	Medium	Moderate / Not Significant	• Planting to screen concrete flood wall.	Medium	Moderate / Not Significant	Consultation required with residents of nearby caravans to reduce construction and residual impacts. 3-5 years for establishment of ornamental planting.
Reach 13 Beeston Lock	High	Low	Moderate / Not Significant	• Use of natural materials where appropriate • Implementation of new planting scheme, replace hedge with native hedge mix.	Low	Moderate / Not Significant	Appropriate materials required to retain canal character. 7-9 years for establishment planting.
Wall around Beeston Lock Cottage	Medium	Medium	Moderate / Not Significant	• Use reclaimed brick and lime mortar to match existing • Reinstate garden in consultation with British Waterways and resident.	Low	Slight/ Moderate / Not Significant	3-5 years for establishment of planting; 10+ for tree planting.

SUMMARY OF LANDSCAPE IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Landscape Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Landscape Impact / Residual Significance**	**Comments**
Weir Field Recreation Ground Embankment	Medium	Low	Slight (minor) / Not Significant	• Replace any lost trees or hedgerows.	Negligible	Slight/ Negligible / Not Significant	Surrounding views will remain unchanged.
Reach 14 Rylands Wall raising	Low	Negligible	Slight (minor) / Not Significant	• Brick type to match existing wall	Negligible	Slight (minor) / Not Significant	

Table B7.3 Summary of Visual Impacts [4]

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
EREWASH							
Reaches 1 and 2 Toton Sewage Works	Low	Medium	Slight (minor)/ moderate / Not Significant	• Ensure an appropriate concrete finishto floodwalls. • Retention of existing trees to the riverbank.	Low	Slight (minor) / Not Significant	
Reach 3 Chilwell Retail Park	Medium	Negligible	Slight (minor)/ negligible / Not Significant	• Retention of existing trees to field boundary with the retail park.	Negligible	Slight (minor)/ negligible / Not Significant	Existing views from the retail park are heavily screened by tree and scrub planting that is to be retained.
Road users of Nottingham Road	Low	Low	Slight (minor) / Not Significant	• Retention of existing hedgerow boundary between Nottingham Road and the field.	Negligible	Slight (minor) / Not Significant	The existing hedgerow currently screens views from Nottingham Road to the field.

[4] Unless otherwise stated the residual impacts are adverse. The durations unless otherwise stated is permanent.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Reach 4 Residents	High	Low	Moderate / Not Significant	• Reinstate access over the floodwall for each garden. • Where possible retain existing garden trees.	Low	Moderate / Not Significant	The loss of existing trees and shrubs within gardens will be mitigated by reinstatement planting. 10+ years for establishment of planting.
Manor Garage	Low	Medium	Slight (minor)/ moderate / Not Significant	• No mitigation possible.	Medium	Slight (minor)/ moderate / Not Significant	
Visitors to the St. Leonard's Riding School	Medium	Negligible	Slight (minor)/ negligible / Not Significant	• Retention of existing vegetation along river bank which screen views.	Negligible	Slight (minor)/ negligible / Not Significant	
ATTENBOROUGH							
Reaches 5, 6 and 10 Residents of Attenborough, north of the Nottingham to Derby Railway Embankment	High	Low	Moderate / Not Significant	• Ensure appropriate concrete finish where exposed. • Full reinstatement: grassed areas pond banks and marginal planting.	Negligible	Slight (minor) / Not Significant	Views to the proposed scheme will be screened by the existing railway embankment. 2-3 years for establishment of planting.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Reaches 5 and 6 Residents of Gate House at Barton Lane.	High	Low	Moderate / Not Significant	• Ensure appropriate concrete finish to the floodwall. • Installation of flood gate to maintain access between Barton Lane and the adjacent grazing field.	Low	Moderate / Not Significant	Flood walls alongside railway embankment will be viewed as a small-scale feature within the wider landscape.
Recreational Visitors to the Attenborough Nature Reserve	High	Low	Moderate / Not Significant	• Full reinstatement: grassed areas pond banks and marginal planting. • Lake bank re-profiled	Low	Moderate / Not Significant	2-3 years for establishment of planting.
Reaches 6 & 7 Residents of St. Mary's Close and Church Lane	High	Medium	Moderate/ Substantial (major) / Significant	• Reinstatement of property boundaries. • Full reinstatement of gardens, to be agreed with property owners.	Low	Moderate / Not Significant	Reinstatement planting to mitigate loss of trees and shrubs. 3-5 years for establishment of ornamental planting; 10+ years for trees.
Reach 7 Residents of No.3 Adenburgh Drive	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of garden to be agreed with property owners.	Low	Moderate / Not significant	3-5 years for establishment of ornamental planting; 7-9 years for establishment of hedge planting; 10+ years for trees.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Residents of No. 5 Adenburgh Drive	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of garden to be agreed with property owners.	Medium	Moderate/ Substantial (major) / Significant	Existing open views into Church Pond will be restricted by the new wall. 3-5 years for establishment or ornamental planting.
Residents of Poseidon House	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of garden to be agreed with property owners.	Low	Moderate / Not Significant	10+ years for establishment of the planting. 3-5 years for the establishment of ornamental planting.
Residents of Ireton House	High	Medium	Moderate/ Substantial (major) / Significant	• Full reinstatement of gardens, to be agreed with property owners	Medium	Moderate/ Substantial (major) / Significant	Significant new structure within middle-ground views. 3-5 years for establishment of ornamental planting; 10+ years for trees.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Visitors to St Mary's Church	High	Medium	Moderate/ Substantial (major) / Significant	• The retention of existing mature trees and hedgerow to the boundary of St Mary's Church.	Medium	Moderate/ Substantial (major) / Significant	Visual impact of wall will vary according to the season.
Reach 8 Users of The Strand	High	Medium	Moderate / Significant	• Reinstatement of a grass verge on landward side. • Reinstatement of hedgerows and trees.	Medium	Moderate / Significant	'Instant hedging' will provide immediate screening of the wall but there will be no views through the hedge to the village green. 10+ years for establishment of tree planting.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Residents of The Strand	High	High	Substantial (major) / Significant	• Re-profile road. • Revise road layout. • Reinstatement of grass verge.	High	Substantial (major) / Significant	'Instant hedging' will provide immediate screening of the wall but there will be no views through the hedge Wall and hedge will be a visual barrier to the Village Green from front gardens and ground storey of buildings. 10+ years for establishment of planting.
Users of the Village Green	High	High	Substantial (major) / Significant	• Integrated seating and raised flower beds.	High	Substantial (major) / Significant	Wall will form a visual barrier to views of The Strand. Instant establishment of raised flower beds.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Reach 9 Residents of Ferndale Close	High	Medium	Moderate/ Substantial (major) Significant	• In-filling sloping bank to the landward side. • Reinstatement of marginal planting.	Medium	Moderate/ Substantial (major) Significant	For individual properties the floodwall will significantly alter existing views over Works Pond.
Residents of Allendale Avenue	High	Low	Moderate Not Significant	• No mitigation possible.	N/A	Moderate Not Significant	
Reach 10 Residents of Long Lane on north side of railway line	High	Low	Moderate Not Significant	• Retention of existing trees near the boundary with the adjacent residential properties. • Tree planting and fencing in place of existing visual screening bund.	Negligible	Slight (minor) Not Significant	10+ years for establishment of planting.
Workers at Siemens	Low	Negligible	Negligible Not Significant	• Retention of existing trees near the boundary with the adjacent residential properties. • Tree planting and fencing in place of existing visual screening bund.	Negligible	Negligible Not Significant	10+ years for establishment of planting.
Reach 11 Residents of Long Lane adjacent to the Chilwell Manor Golf Course	High	Negligible	Slight (minor) Not Significant	• Reinstatement grass seeding.	Negligible	Slight (minor) Not Significant	12-18 months for establishment of grass seeding.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Users of the Chilwell Manor Golf Course	High	Negligible	Slight (minor) / Not Significant	• Retention of existing trees near the boundary with the adjacent residential properties. • Grass seeding of all slopes.	Negligible	Slight (minor) / Not Significant	
RYLANDS							
Reach 12 Site users at Siemens	Medium	Medium	Moderate / Not Significant	• Retention of existing trees on boundary of adjacent residential properties. • Grass seeding of all slopes.	Low	Slight (minor)/ Moderate / Not Significant	Reinstated grass will help merge wall into setting. 12-18 months establishment period.
Allotment holders at Rylands	Medium	Medium	Moderate / Not Significant	• Planting at base of the embankment. • Additional planting to screen 2.3m high wall.	Medium	Moderate / Not Significant	10+ years for establishment of planting.
Users of the Rylands Recreation Ground	Medium	Negligible	Slight (minor)/ Negligible / Not Significant	• No mitigation required.	N/A	Slight (minor)/ Negligible / Not Significant	
Residents of Trent Vale Road and South Road, Rylands	High	Negligible	Slight (minor) / Not Significant	• No mitigation required.	N/A	Slight (minor) / Not Significant	Increased traffic during construction.

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Users of Riverside Road	Medium	Low	Slight (minor)/ Moderate / Not Significant	• No mitigation required	N/A	Slight (minor)/ Moderate / Not Significant	The increase in road and embankment levels will not have a high visual significance to the users of Riverside Road.
Residents of Beeston Marina and Mobile Home Complex	High	Medium	Moderate/ Substantial (major) / Significant	• Improve planting along the line of flood wall.	Medium	Moderate/ Substantial (major) / Significant	Ensure consultation with residents of caravans to minimise construction impacts.
Reach 13 Users of the Beeston Canal	High	Medium	Moderate/ Substantial (major) / Significant	• All new materials to reflect existing	Low	Moderate / Not Significant	Line of vision improved by 2m easement along toe of embankment along canal.
Residents of Beeston Lock Cottage	High	Medium	Moderate/ Substantial (major) / Significant	• Suitable wall cladding such as reclaimed brick	Medium	Moderate/ Substantial (major) / Significant	Once garden has re-established residual significance will reduce.
Users of Weir Field Recreation Ground	Medium	Negligible	Slight (minor)/ Negligible / Not Significant	• No mitigation required.	N/A	Slight (minor)/ Negligible / Not Significant	

SUMMARY OF VISUAL IMPACTS							
Prior to Mitigation Works				**Post Mitigation Works**			
Identified Area of Works	**Sensitivity**	**Magnitude of Change prior to mitigation**	**Level of Potential Visual Effect / Potential Significance**	**Mitigation and Reinstatement Measures**	**Magnitude of Change with Mitigation**	**Level of Residual Visual Impact / Residual Significance**	**Comments**
Residents of Canal-side	Low	Low	Slight (minor) / Not Significant	• Introduction of native tree species to replace those removed during construction.	Negligible	Negligible / Not Significant	Once embankment has been reseeded views from Canalside will not be affected.
Reach 14 Users of Beeston Canal	Low	Low	Slight (minor) / Not Significant	• No mitigation possible	N/A	Slight (minor) / Not Significant	10+ years for establishment of planting.
Users of Weir field recreation ground	Low	Low	Slight (minor) / Not Significant	• Grouped replacement tree planting	Negligible	Negligible / Not Significant	

B8. WATER

This section addresses the impacts on local surface waters and water quality. Impact on flooding regime is also considered. The impacts on groundwater in the form of aquifers are assessed in *Section B11*.

B8.1 Method of Assessment

An assessment of the potential impacts on waterbodies is based on the methodology outlined in *Section 7.9, Volume 1*. The sensitivity of waterbodies is based on factors such as the size and importance of the feature; water quality; use for abstraction, navigation or recreational purposes; and proximity to the proposed works. The magnitude of the impact is based on the length of time the construction activity will be present and the type of pollution that might occur.

B8.2 Baseline Conditions

B8.2.1 Surface Waterbodies

The two main rivers in the study area are the River Trent which flows from west to east and its tributary the River Erewash, which is at the western extent of the study area and flows from north to south.

Table B8.1 shows where the works are next to (within 15m) of main rivers or other watercourses and waterbodies. Most of these waterbodies and watercourses are of high sensitivity due to their recreational or nature conservation value or their water quality; refer to *Section B8.2.2*.

Table B8.1 Works next to Waterbodies and Watercourses

Reach	Main River	Other waterbody	Other watercourse
1 – 4	River Erewash		
5		Coneries Pond	
6		Church Pond	
7		Tween Pond and Church Pond	The Brook (Attenborough Village)
8			
9		Works Pond	
10		Beeston Pond	Chilwell Brook
11			
12		Beeston Pond	Siemens Stream
13	River Trent		Nottingham and Beeston Canal
14			Nottingham and Beeston Canal

B8.2.2 Water quality

The Environment Agency measures the chemical and biological quality of rivers using the General Quality Assessment (GQA) system, which is described in *Section 7.9.3, Volume 1*.

There are three GQA sampling points in the Attenborough, Erewash and Rylands scheme area; at the A6005 Nottingham Road bridge on the River Erewash, the confluence of the River Erewash and the River Trent, and on the Nottingham and Beeston Canal upstream of Beeston Lock; refer to Table B8.2.

Table B8.2 Water Quality Grades

Watercourse Stretch	GQA Chemistry Grade	GQA Biology Grade
A6005 road bridge	B 2006	C 2006
Confluence of Rivers Erewash and Trent	C 2006	B 2006
Nottingham and Beeston Canal	B 2006	*not sampled*

B8.3 Impact Assessment

B8.3.1 Construction Impacts

Impact on Watercourses and Waterbodies due to Pollution from Construction Activities

Construction activities have the potential to cause pollution in the local watercourses and waterbodies listed in Table B8.1. This may arise from the movement of construction plant and material or run-off from the site. In Attenborough Lakes this includes the creation of working platforms into the lakes.

In all Reaches there is the risk of spillages from poor handling, transportation or storage of construction materials.

During the replacement of the lock gates at Beeston Lock in Reach 13, there is the potential to disturb silt deposits in the canal during the pumping of water from the temporary cofferdam.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate** to **major adverse** (depending on the magnitude of the pollution incident) and **short-term**.

Impact on Potable Water and Foul Drainage due to Construction Activities

The road raising works along The Strand (Reach 8) will require diversions of foul and potable water pipes which will result in temporary disruption to these services. Interruption to an individual supply is likely to be around one day.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

B8.3.2 Operational Impacts

Impact on the River Trent and its Floodplain

The impact on the River Trent and its floodplain is a maximum increase in flood depth of up to 0.07m throughout Nottingham during a flood event which has a 1% annual probability of occurrence.

The *operational impact* has been assessed as being **not significant**. No mitigation required.

Impact from Maintenance of New and Raised Flood Defences and Structures

Maintenance activities are unlikely to result in any adverse impacts on water quality.

The *significance* of the *operational impact* has been assessed as being **not significant.**

Impacts on Local Surface Water Drainage

A number of open drainage ditches and minor watercourses discharge into the River Trent; these drain highly urban catchments. They become "locked" by flap valves at their downstream end during periods of high flow in the River Trent to avoid water backing up. When the flap valves are closed, water is unable to drain from the ditches and minor watercourses. However, due to the urban nature of the catchment, the peak flows in them are likely to occur before the corresponding peak in the River Trent. Consequently, the flood defence works are unlikely to significantly increase the flood risk from such watercourses.

The construction of floodwalls, in some areas, cut across surface water drainage paths. In these locations the design includes new drainage systems to prevent localised flooding on the protected side of the flood wall. An example of this is at The Strand in Attenborough Village where a new highways drainage system will be required along with a new pumping station to pump surface water over the floodwall.

The *significance* of the *operational impact* has been assessed as being **minor adverse** and **permanent**.

Impact on the River Erewash

The River Erewash discharges into the River Trent at the upstream end of the Attenborough, Erewash and Rylands scheme area and historic records show that flooding can occur simultaneously along these two rivers. Therefore, flood defences are proposed along the left bank of the River Erewash to protect the urban areas behind the railway line from flooding from the River Trent; refer to *Section B1.4.1*

The *significance* of the *operational impact* has been assessed as being **not significant**. No mitigation required.

Impact on Villages Outside the Scheme Area

The impact of increased flood risk to villages outside the scheme area is discussed in *Section 8, Volume 1*.

The *significance* of the *operational impact* has been assessed as being **moderate adverse** and **permanent.** No mitigation is required.

B8.4 Mitigation Measures and Monitoring

Considerable guidance is available on how to minimise the risk of water pollution from construction activities. For example, the Environment Agency has produced Pollution Prevention Guidelines (PPG) and these and other mitigation measures are set out in more detail in *Section 7.9.5, Volume 1*.

Appropriate method statements will be prepared for works to ensure water quality is not affected. During construction, care will be taken to ensure that equipment and fuel storage facilities are protected by secure fences and locked where possible. Spill kits and trained personnel will be available. An Environmental Clerk of Works will audit the construction works to ensure that the measures regarding pollution control are adhered to. Unnecessary transportation of fuels and potentially polluting chemicals will be minimised and all vehicles, including fuel bowsers, will carry emergency spill kits. Refuelling within 30m of any watercourse will be avoided, wherever possible, and refuelling will not take place within 10m of a watercourse. To deal with the runoff from exposed ground and stockpiles, silt fences, 'dip and lip' earth banks or sandbags, may be used to divert it away from watercourses. Site roads will be kept free from dust and mud.

B8.5 Residual Impacts

During construction, there is the potential that construction activities may pollute the watercourses and waterbodies near the works. However, through the adoption of appropriate mitigation measures, the **adverse** residual impacts will be of **no significance**.

The creation of reedbeds and marginal habitat for Reaches 6 and 10 (refer to *Section B4* and *Appendix F*) will act as a filter for sediment and pollution from surface water discharging into Church and Beeston Pond. This will help improve the water quality or the lakes.

The new and raised flood defences are likely to have a residual flood risk impact on the surrounding villages. This is discussed in more detail in *Section 8, Volume 1*.

Table B8.3 Summary of Impacts on Water

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Pollution risk from construction activities in and near to watercourses and waterbodies	Moderate to major adverse and short-term	Adhere to Environment Agency's PPGs. Method statements.	None
Disruption to potable and foul water pipelines from construction activities	Moderate adverse and short-term	Advance notice to water customers of disruption to supply. Good planning to minimise period of disruption.	Minor adverse and short-term
OPERATIONAL IMPACTS			
Maintenance of new and raised flood defences and structures	No significant impact	None required.	None
Impacts on local surface water drainage	Minor adverse and permanent	Construction of a pumping station at the western end of The Strand.	None
Impact on the River Erewash	No significant impact	None required.	None
Impact on villages outside the scheme area	Moderate adverse and permanent	Refer to *Section 8, Volume 1.*	

This page is intentionally blank

B9. TRAFFIC AND TRANSPORT

This section addresses the impact on local traffic and transport within the study area.

B9.1 Method of Assessment

The assessment of the potential impacts on local traffic and transportation uses the methodology outlined in *Section 7.10.2, Volume 1*. The impacts on navigation in the Nottingham and Beeston Canal are discussed in *Section B3*.

B9.2 Baseline Conditions

The River Trent has influenced the development of the road network in Attenborough, Erewash and Rylands and throughout Nottingham.

The A6005 Nottingham Road and Queens Road West are two of the main arterial routes into Nottingham and run along the north western side of the scheme area. Other important local roads in the scheme area include Barton Lane which is the main access road into Attenborough SSSI, Attenborough Lane which is the main road into Attenborough village and Meadow Road into Rylands.

There are no road river crossings in this scheme area, the nearest one being the A52/A453 Clifton Bridge, which crosses the River Trent further downstream.

The main railway line runs parallel to the proposed alignment of flood defences along the entire length of the scheme area. There is a railway station at Attenborough, and Beeston station is to the north of Rylands.

B9.3 Impact Assessment

B9.3.1 Construction Impacts

Impact on Local Roads due to Construction Traffic

There will be an increase in heavy vehicle movements in residential areas adjacent to works, specifically the A6005 Nottingham Road, Barton Lane, Attenborough Lane, The Strand, Ferndale Close, Allendale Avenue, Church Lane, Long Lane, Meadow Road, St Mary's Close, Ladybridge Close, Trent Vale Road, Canal Side, South Road and Riverside Road.

The location of proposed access points are shown on Figures BB3.3 to BB3.10. Apart from these access points, material will be transported along the haul routes shown adjacent to the defences. Estimated lorry movements are shown in Table B9.1. These may be subject to change as the detailed design develops.

The *significance* of the *impact* been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

Table B9.1 Estimated Lorry Movements

Reach	Volume of Earthworks (m^3)	Volume of temporary fill (m^3)	Volume of Concrete (m^3)	Other Materials and exportation of waste (m^3) (1)	Total Number of lorry movements (2)
Erewash					
1	100	0	0	15	30
2	700	0	40	110	220
3 and 4	2,800	0	180	445	870
Attenborough					
5	0	0	1,480	220	550
6	13,950	3,100	970	2,240	5,150
7	13,350	4,450	345	2,055	5,080
8	250	0	545	120	270
9	8,300	8,000	290	1,290	4,490
10	66,950	10,000	1,480	10,265	22,300
11	450	0	0	70	130
Rylands					
12 and 13	6,800	0	620	1,115	2,190
14	0	0	25	5	10
Totals	**113,650**	**25,550**	**5,975**	**17,950**	**41,290**

(1) Other building materials include sheet piles, stone and timber cladding among other construction materials. The volume of these materials and the volume of waste produced are hard to assume at outline design stage so it has been calculated that other building materials are 15% of the total volume of permanent earthworks and concrete required for the scheme.

(2) Calculation of number of lorry movements is based on the assumption that a lorry will carry an average load of 8 m^3 of earthworks (or other building materials/waste) or 6 m^3 of concrete on each trip. Calculations are shown for delivering the fill/concrete and returning.

Impact due to Local Road Raising Operations and Construction Activities Requiring Road Closures

- Restriction and/or temporary road closure of The Strand (Reach 8); refer to *Section B2.2.2.*
- A partial road closure will be required on Barton Lane (Reach 5) for up to four weeks, which may cause delays to visitor traffic entering and leaving the SSSI and to the residents of the cottages.
- Full closure will also be required for Riverside Road (Reach 12) for up to four weeks. Diversions will be set up along South Road and Trent Vale Road. Pedestrian access will be maintained.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **major adverse** and **short-term**.

Impact on Operation of Railway Network due to Construction Works Adjacent to Railway Line

In Reaches 1, 5, 6, 9 and 10 the construction of the new wall is within 10m of the main railway line.

Railway possessions will be needed specifically for Reaches 1 and 5, where the flood defence ties into the parapet of the railway bridge crossing of the River

Erewash (referred to as Attenborough Junction). The necessary approvals and consents will be agreed in advance with Network Rail to achieve these railway possessions.

As well as the above possessions, all works within 5m of Network Rail property will require their approval and supervision of works on site. This is applicable for works in Reaches 5, 6 and 10.

The *significance* of the *impact* been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

B9.3.2 Operational Impacts

Impact of New and Raised Defences on Local Transport Infrastructure

Reduced risk of flooding of the A6005 Nottingham Road, the local road network and the main railway line behind the new flood defences.

The *significance* of the *operational impact* been assessed as being **moderate beneficial** and **permanent**. No mitigation required.

B9.4 Mitigation Measures and Monitoring

The traffic and transport impacts will be controlled/minimised by implementation of a Traffic Management Plan (TMP); refer to *Section 7.10.5, Volume 1*. This will be agreed with the Local Highway Authority and the Highways Agency, where appropriate, prior to the works.

Specific considerations are to:

- Avoid increasing traffic flows on main roads at peak hours. Time deliveries of materials to the main site compounds between 9am and 4:30pm.
- Minimise disturbance to sensitive residential area. Alternative arrangements have been proposed for The Strand, including temporary access tracks and works timed outside the main school run; refer to *Section B2.2.2*.
- Minimise heavy vehicle movements through Attenborough village. Use of the Old Fisherman's Car Park as a materials storage area.

B9.5 Residual Impacts

With the proposed mitigation measures, it is considered that there will remain a **minor adverse** and **short-term** impact on traffic and transport during the construction period (Table B9.2). This results from the need to transport equipment, workers and material to and from the site and the restrictions on access to The Strand during construction in Reach 8.

Table B9.2 Summary of Impacts on Traffic and Transport

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Impact on local roads due to construction traffic	Moderate adverse and short-term	• Develop a TMP refer to *Section 7.10.5, Volume 1*. • To avoid increasing traffic flows on main roads at peak hours - time deliveries of materials to the main site compounds between 9am and 4.30pm. • To minimise disturbance to sensitive residential areas agree alternative arrangements to The Strand; refer to *Section B2.2.2*. • Use of the Old Fisherman's Car Park as a materials storage area to minimise heavy vehicle movements through Attenborough village.	Minor adverse and short-term
Impact due to local road raising and construction activities requiring road closures	Major adverse and short-term	• Develop a TMP refer to *Section 7.10.5, Volume 1*.	Minor adverse and short-term
Impact on operation of railway network due to construction works adjacent to railway line	Moderate adverse and short-term	All approvals obtained from Network Rail. Possessions appropriately timed to minimise impact on rail network.	Minor adverse and short-term
OPERATIONAL IMPACTS			
Impact of new and raised defences on local transport infrastructure	Moderate beneficial and permanent	*No mitigation required.*	Moderate beneficial and permanent

B10. CULTURAL HERITAGE AND ARCHAEOLOGY

This section addresses the impact on the local historic and archaeological environment.

B10.1 Method of Assessment

The archaeological value of the area was assessed through desk studies and field evaluation, as described in *Section 7.11, Volume 1*.

B10.2 Baseline Conditions

B10.2.1 Archaeology

Desk Study

From the desk study, a number of sites of archaeological and palaeo-environmental interest potentially affected by the scheme were identified. The features are discussed below and their locations are marked by the letters J - R; refer to Figure B10.1

Cropmarks and palaeochannels near the River Erewash confluence (J). Near the River Erewash confluence, cropmarks are located just to the south of the proposed defence. This may indicate the location of archaeological remains. Two palaeochannels also lie to the south of the proposed defence.

Cropmarks and palaeochannel along the River Erewash (K). Some cropmarks have been observed on aerial photographs within the area north of the River Erewash confluence. Within this area, a broad palaeochannel runs east to west and the proposed defences would cross this.

Attenborough medieval village (L). The Attenborough area around the medieval St Mary's Church (Reach 7) is of high archaeological value. Archaeological trial trenches have shown evidence for prehistoric, Saxon, Medieval and Post-Medieval settlement. There are a number of earthworks to the east of the church, which appear to relate to abandoned parts of the village. Further Medieval artefactual material and structures may survive in the area and there is a suggestion of a moated site to the south and west of the church. There are also medieval 'ridge and furrow' earthworks just to the north of the railway line.

Fishponds Scheduled Monument (M). Six medieval and possibly post-medieval fishponds are located south east of the church and are designated as a Scheduled Monument. The proposed new wall for Reach 7 will go through the northern part of this site, but will avoid the fishponds themselves. The group value of the fishponds and the Medieval village remains makes Attenborough a potential area of regional archaeological significance.

Post-medieval Gate House (N). The post-medieval Gate House dates from 1886 (or earlier) and lies adjacent to the line of the proposed defence.

Cropmarks (O). Undated cropmarks lie close to the proposed flood defences at Reach 5 and the area has the potential for archaeological remains.

Listed buildings in Attenborough (P). Two Listed Buildings, Rose Cottage (Grade II) and Ireton House (Grade II*), lie close to the proposed new defences in Reach 7.

Nottingham and Beeston Canal and Lock (Q). The eighteenth century canal is adjacent to the proposed works in Reaches 13 and 14. Works will be carried out on Beeston Lock (Reach 13).

Palaeochannel (R). Several palaeochannels have been identified by desk study in the east of the SSSI but may no longer exist.

Results from Ground Investigations

In Reach 3 in Erewash, two 30x1.6m evaluation trenches (E1 and E2) were excavated immediately north of the River Erewash within the field adjacent to Nottingham Road. A third proposed trench was cancelled as access to the site could not be obtained; refer to Figure B10.1.

Seven evaluation trenches were excavated in Attenborough. Six of these trenches (A2 - A7) were located within paddocks immediately south of the St. Mary's Church (Reach 7), whilst the seventh trench (A1) was positioned immediately west of the Barton Lane entrance to Attenborough SSSI (Reach 5). Three other proposed trenches (A8 – A10) were cancelled prior to the evaluation.

Two 30x1.6m evaluation trenches were proposed for the Rylands scheme area (R1 and R2), located south of the canal side in Beeston but could not be excavated as access could not be obtained.

The results are summarised in Table B10.1.

Table B10.1 Results of Archaeological Ground Investigations

Trench	Results
E2	*No archaeological remains were identified.*
E3	*A* single prehistoric worked flint, a core fragment of late-Neolithic or Bronze Age date was recovered from one of the upper alluvial deposits.
A1	*No archaeological remains were identified.*
A2 and A3	Trenches A2 and A3 were excavated under the terms of Scheduled Monument Consent. Trench A2 revealed a number of undated deposits and features including a series of stoney silt dump deposits which may represent upcast from the excavation of the nearby fishponds, although post-medieval artefacts recovered from two of these deposits apparently contradict this interpretation. A test-pit excavated in this trench demonstrated that these deposits overlay alluvial strata sealing gravel. Trench A3, positioned to establish whether the church cemetery originally continued to the south, revealed dump deposits and features, which are undated although fragments of late medieval tile were recovered from one of them. Test-pits excavated within this trench demonstrated that these deposits overlay alluvial strata sealing natural gravel. No evidence of burials or any other graveyard features were identified within A3.
A4	*No archaeological remains were identified.*
A5	Medieval features identified within Trench A5 included a substantial cut feature (A5009), extending beyond the limits of the trench and containing fragments of twelfth century pottery within its fills. Interpreted as a possible medieval fishpond, a note of caution has to be sounded, as the pottery was clearly re-deposited. Three other features, truncated pit cuts, are also dated to the Medieval period on the basis of pottery recovered from their fills. The features were sealed by a series of dumped deposits, forming an earthwork clearly visible on the surface, from which fragments of re-deposited twelfth century pottery were recovered. A recent ditch was recorded at the southern end of the trench.
A6	Evidence of Anglo-Saxon or Medieval activity was also identified in Trench A6 where a shard of tenth to twelfth century pot and thirteen shards of undiagnostic pottery of Anglo Saxon or Iron Age date were recovered. Also recovered at further intrusions were a post-medieval brick and an ashlar fragment, possibly of a similar date. In addition, 14 undated features, a sequence of post-medieval dump deposits and a recent pit were also present in the trench.
A7	Trench A7 was excavated to a depth of 0.30m. At this level features of post-medieval date were apparent. The trench also contained re-deposited medieval finds as well as post-medieval artefacts. These deposits overlay alluvial strata which in turn sealed natural gravel.

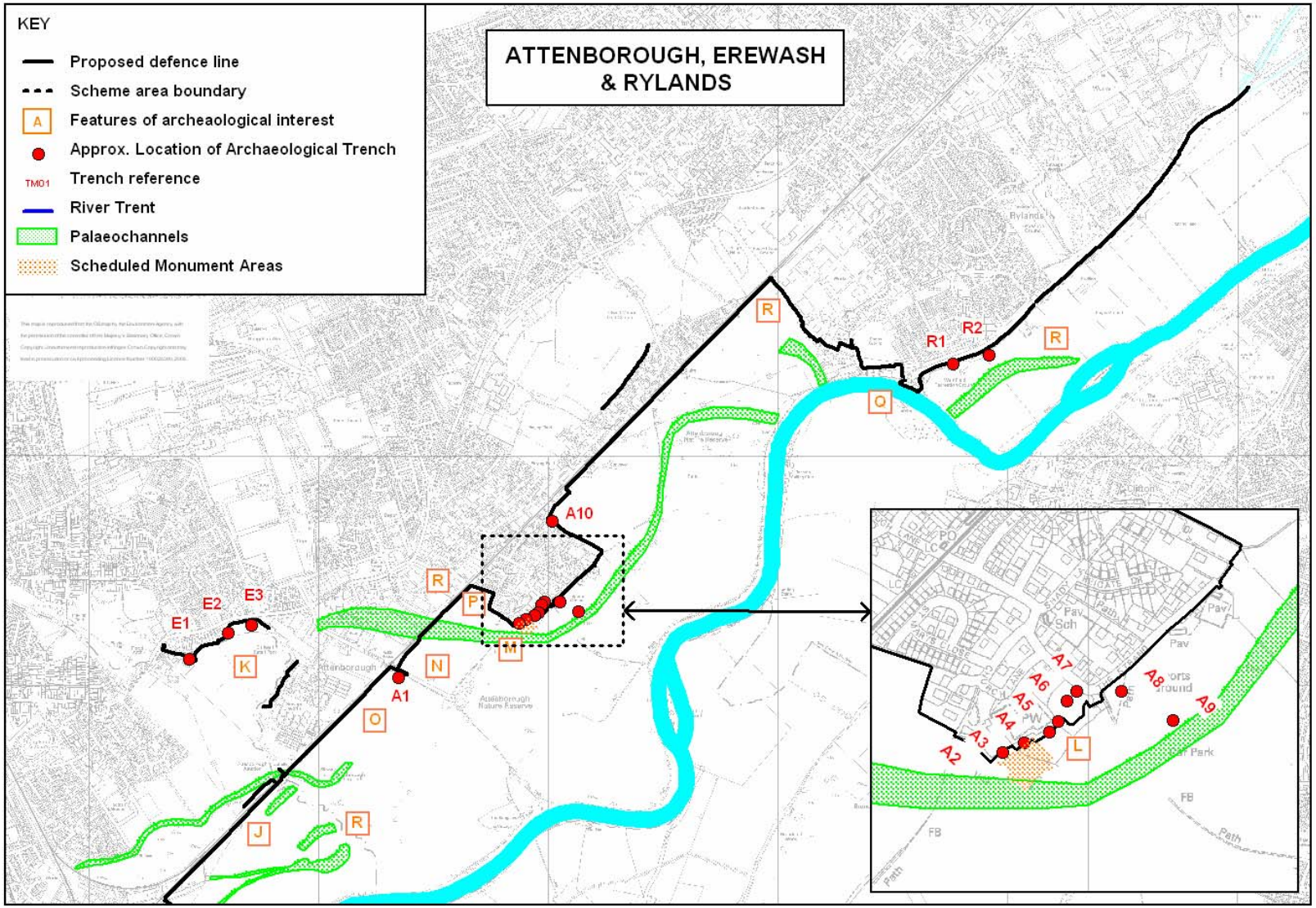


Figure B10.1 Map showing Archaeological Features of Interest and Locations of Ground Investigation Trenches

B10.2.2 Listed Structures

There are three Listed Buildings in Attenborough village that are close to the proposed flood defence works – see description of sites P and L above.

Beeston Lock is not designated as a Listed Building but is an important built component of the local historic environment.

There are no Listed Buildings or structures close to the works in Erewash.

B10.2.3 Conservation Areas

There are two Conservation Areas in Attenborough. The Attenborough Village Conservation Area is centred around St Mary's Church and includes most of the village; refer to *Section B7.2*. The Barge Lane Conservation Area lies north of the railway line and includes sections of Long Lane and Attenborough Lane.

B10.3 Impact Assessment

B10.3.1 Construction Impacts

There are archaeological impacts associated with the construction of new defences or the raising of existing defences. Construction activities that could damage archaeological remains include sheet piling, fencing off the works areas, stripping topsoil and subsoil from the compound areas and temporary haul roads, and excavations.

Sheet piling cut-off to control groundwater is required for Reaches 3 to 10. The insertion of sheet piles can damage buried archaeological deposits. The extent of this impact is, however, limited to the loss of buried remains in the footprint of the pile (approximately 20mm wide strip) and some deformation of remains around the immediate area of the pile (approximately 20cm either side of the pile). It has been demonstrated that buried waterlogged archaeological deposits are unlikely to be adversely affected by the insertion of sheet piles.

The vibration caused by some forms of piling can affect built structures of any age. *Section B5* outlines the piling methods that will be used.

In some circumstances, pile locations can require some limited excavation in advance of or during the piling operation. This can increase the impact upon the historic environment.

Table B10.2 summarises the level of impact on the known archaeological features due to these activities.

Table B10.2 Level of Archaeological Impact from Construction Works

Archaeological Site	Construction Activity					
	Fencing of Working Area	**Compound Stripping**	**Access Track Stripping**	**General Plant Movement**	**Topsoil and Subsoil Stripping and Excavation**	**Piling**
Cropmarks and palaeochannels near the River Erewash confluence (J)	Minor	None	Minor	None	Minor	Minor
Cropmarks and palaeochannel along the River Erewash (K)	Minor	None	Minor	None	Minor	Minor
Attenborough medieval village (L)	Minor	Minor	Moderate	None	Moderate	Minor
Fishponds, Scheduled Monument (M)	Minor	None	Moderate	None	Moderate	Minor
Post-medieval Gate House (N)	None	None	None	None	None	Minor
Cropmarks (O)	Minor	Minor	Minor	None	Minor	Minor
Further Listed Buildings in Attenborough (P)	None	None	None	None	None	Minor
Nottingham and Beeston Canal and lock (Q)	None	None	None	None	None	None
Palaeochannel (R)	Minor	None	Minor	None	Minor	Minor

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor** to **moderate adverse** and **permanent**.

B10.3.2 Operational Impacts

During a flood event there will be a greater number of Listed Structures protected from flooding by the proposed scheme.

The *significance* of the *operational impact* been assessed as being **minor beneficial** and **permanent**. No mitigation required.

B10.4 Mitigation Measures and Monitoring

There are a range of generic mitigation measures to reduce the general disturbances and risks relating to construction activities on archaeological sites. For example, the CIRIA (2005) publication 'Environmental Good Practice on Site'. These are described in more detail in *Section 7.11.5, Volume 1*.

A detailed mitigation strategy will be prepared in agreement with the County Archaeologists and English Heritage. Specific mitigation measures for the known archaeological sites include:

- Reach 6 - The avoidance of ground works in the vicinity of the Gate House (N).
- Reach 7 – Scheduled Monument Consent will be obtained for works in Reach 7. Ensure compliance with any additional conditions of the Scheduled Monument Consent for the works (M).
- Reaches 7 and 8 - The archaeological excavation of all areas of topsoil stripping on the site of medieval Attenborough (L and M). The monitoring of piling operations, particularly in the vicinity of the Listed Buildings (P).
- Reaches 1, 3, 5, 6, 12, 13 and 14 - The archaeological observation of ground breaking activities in areas of demonstrably significant archaeological potential, followed by the recording of any deposits identified (J, K, O and Q).
- Reaches 1, 3, 5, and 12 - A programme of geo-archaeological assessment of known palaeochannel deposits, disturbed during construction (J, K and R). Place the results of this archaeological work in the public domain in a format agreed by the archaeological officer and English Heritage.
- All Reaches - Regular archaeological monitoring of ground breaking operations in areas of archaeological potential to identify any previously unknown archaeological sites
- All Reaches - Any finds will be reported to the County Archaeologist, and work in that area will be stopped whilst the find is investigated by an archaeologist. Any fossils, antiquities, structures, remains and other objects of geological or archaeological interest or value will be reported to the coroner in accordance with the Treasure Act 1996.

B10.5 Residual Impacts

With proposed mitigation in place, residual impacts are limited to the visual impact of the defences on the historic environment, including Scheduled Monuments and Listed Structures; refer to *Section B7*.

The **adverse** residual impacts after mitigation are of **no significance**. The **beneficial** residual impact of an increased number of historic sites being protected from flooding will be **minor** and **permanent** (Table B10.3).

Table B10.3 Summary of Impacts on Archaeology and the Historic Environment

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Impact on archaeology due to construction activities	Minor to moderate adverse and permanent	• A detailed mitigation strategy agreed with archaeological officer and English Heritage. • Adhere to CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.11.5, Volume 1*.	None
OPERATIONAL IMPACTS			
Impact on the historic environment as a result of the reduction in flood risk	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent

B11. SOIL, GEOLOGY AND HYDRO-GEOLOGY

This section addresses the impact on the soils, geology and hydrogeology of the study area.

B11.1 Method of Assessment

Desk study, walkover surveys and intrusive ground investigations were carried out to determine the ground conditions at the site. Ground investigations were undertaken in November 2004 and September 2005. These included cable percussion boreholes, window sampling, trial pits, groundwater monitoring and associated laboratory work.

B11.2 Baseline Conditions

B11.2.1 Geology

The ground investigation has generally confirmed the underlying geology of variable deposits of made ground overlying a shallow depth of alluvium which is underlain by mudstone bedrock.

The solid geology of the area comprises rocks of the Mercia Mudstone and Sherwood Sandstone Groups of Triassic Age. These include the Nottingham Castle Sandstone Formation with mudstones of the Sneinton and Gunthorpe Formation. The Triassic rocks are underlain by Coal Measures strata of Carboniferous Age.

The rocks are traversed by a number of faults, the majority with an east-southeast to west-northwest strike although some, such as the Dunkirk Fault near Clifton Bridge, have a stronger north south alignment. The general bedding dip is towards the east.

Overlying the rocks are superficial deposits of Pleistocene and Recent Age. These include glacial till on the flanks of the Trent valley. The deposits of the valley itself are mainly alluvium, with terrace gravels giving way to head deposits on some of the side slopes. The alluvium of the broad floodplain of the River Trent is mainly clays, silts and sands with some organic clay. With the extensive urban and commercial development on the left bank of the River Trent, deposits of man-made filled ground are widespread.

B11.2.2 Soils

The nature of the made ground varies according to location. Through Attenborough the made ground typically exists as a mixed soil of clay, silt, sand and ash fill to gravel pits. At Rylands the made ground is present as either cohesive or granular fill.

The alluvium consists of cohesive deposits of clays and silts overlying granular deposits of sand and gravel. The bedrock is a weathered mudstone recovered in boreholes as sandy clay. The sandstone was not encountered in the boreholes.

B11.2.3 Hydrogeology

The granular alluvium has a high permeability and is classed as a minor aquifer. This layer has a hydraulic connection with the Rivers Trent and Erewash and the lakes in Attenborough SSSI. Analysis undertaken so far has found that a cut off is required for the flood defences through the Attenborough section of the scheme area to prevent seepage flows passing under the proposed flood defences through to the granular alluvium and flooding the area behind (refer to *Section B2.5.3*). An investigation was undertaken to determine what the effect of installing a cut off would have on the water levels of the lakes within Attenborough SSSI (B&V 2006). It found that the lake water levels are influenced by surface water run off and in particular flows from the River Erewash; refer to *Section B11*.

In normal conditions groundwater (and surface water) flows are towards the River Trent. Only when the River Trent is in flood (i.e. the river comes out of bank) do flows pass from the River Trent into the lakes. It was also found that the magnitude and velocity of the surface water inflow is greater than that of the groundwater inflow and therefore lake water levels are controlled by surface water inflows. Monitoring of the River Trent, Attenborough SSSI lakes and ground water levels is continuing and together with additional ground investigation will be used to verify these findings.

The Mercia Mudstone has a very low permeability and is classed as a non-aquifer. The Sherwood Sandstone is a recognised aquifer. It is overlain by the Mercia Mudstone which acts as a barrier restricting the interaction of water in the Trent and the granular alluvium with that in the sandstone.

B11.2.4 Contaminated Land

The chemical contamination of the ground has been assessed by performing a suite of tests on borehole samples. Comparing test results to available industry guidelines, such as Soil Guideline Values (SGVs), the values are low.

Little information is currently available on the made ground at Attenborough and Erewash. Further investigations during detailed design will be done to determine the presence of contaminated land.

B11.3 Impact Assessment

B11.3.1 Construction Impacts

Impact of Soil Compaction in Working Areas

Compaction by heavy machinery can damage the macrostructure of soil. The waterlogged nature of some areas makes them particularly prone to compaction and structural damage, as slippage of machinery on the wet ground has a very damaging effect on the soil structure.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** and **medium-term**.

Impact of Contamination of Soil and Groundwater by Fuels and other Hazardous Materials

The anticipated excavation depths through much of the scheme area will not be more than 1m below ground level and therefore the impacts to the immediate surrounding environment should be minimal. However, deeper excavation is required through Reaches 6, 8 and 10, where the sheet piling is offset from the flood wall and where new surface water drainage and a pumping station is planned (Reach 8).

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** and **short-term**.

B11.3.2 Operational Impacts

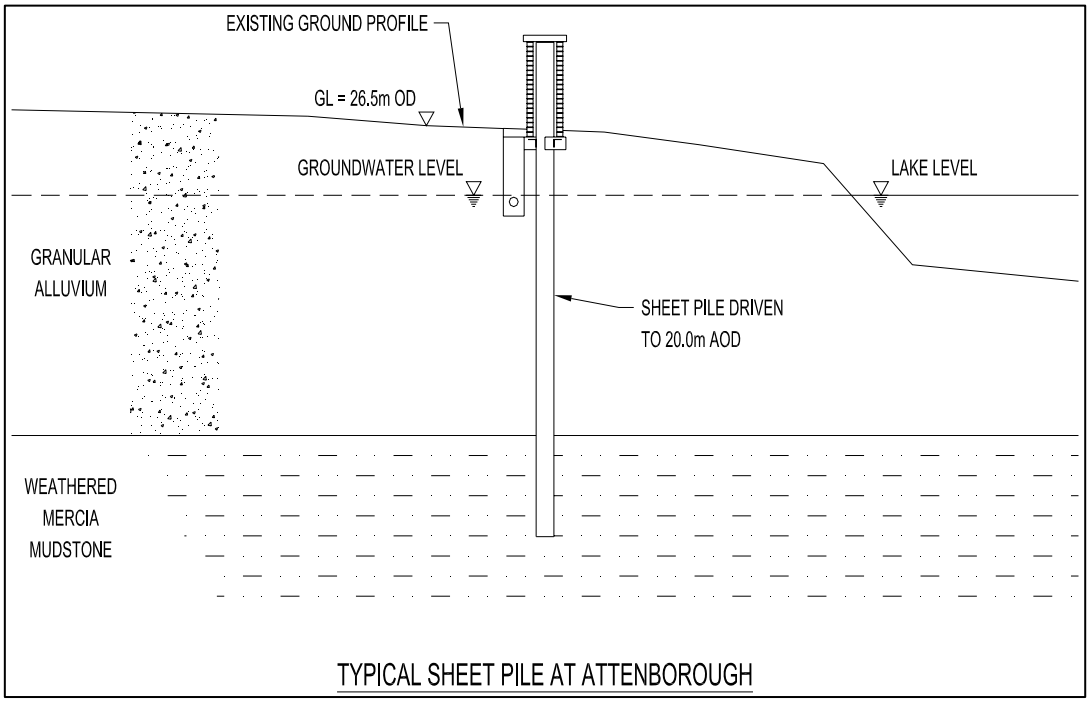
Impact of the Sheet Pile Cut-off on Groundwater Flows

The proposed sheet pile cut-off will not be installed over the full scheme length. In areas where the cut-off is installed the rate of groundwater movement across the sheet piling would be reduced but groundwater flow would not be stopped; refer to Figure B11.1.

The impact on normal and flood conditions of installing a groundwater sheet pile cut-off has been assessed (B&V 2006) and is outlined below:

Normal Conditions - In normal conditions groundwater flow is towards the River Trent. Surface water inflows from the catchment control the water levels in the Attenborough SSSI lakes. As the proposed works will have no significant effect on surface water flows and a nominal effect on groundwater flows, lake water levels will not be affected by the installation of a cut off.

Flood Conditions - In flood conditions where the River Trent comes out of bank (typically a flood event with a 20% annual probability of occurrence) groundwater flow is reversed and flows from the River Trent to the lakes and into the defended area.



Note: In some locations the sheet pile has had to be offset from the wall to accommodate site restrictions (e.g. electrical cables and railway line).

Figure B11.1 Typical Sheet Pile at Attenborough

The *significance* of the *operational impact* has been assessed *prior to mitigation* as being **minor adverse** and **permanent**.

Impact of Increased Surface Water Flows

The road raising works along The Strand (Reach 8) would lead to increased surface water flows. A pumping station has been included as part of the scheme which will pump this water away.

The *significance* of the *operational impact* has been assessed *prior to mitigation* as being **none**.

B11.4 Mitigation Measures and Monitoring

The general mitigation measures outlined for the protection of surface waters will inherently protect groundwater; refer to *Section 7.12.5, Volume 1*. However, the work will be undertaken in accordance with the Environment Agency's 'Policy and Practice for the Protection of Groundwater'. Mitigation measures would include:

- good site practice where working next to watercourses;
- restoration of the ground surface following completion of the works;
- reseeding/replanting to protect soils from erosion following completion of the works;
- monitoring of river, lake and groundwater levels will continue and information will be collated during detailed design to verify the current findings.

Mitigation measures to minimise the risk of contamination of soils and groundwater are as follows:

- contractor will be adopting industry standard working methods, including a controlled working area, stock piling of excavated materials, the use of drip trays for machinery, the control of invasive weeds etc.;
- provision of an Environmental Clerk of Works who will ensure compliance with the agreed SWMP and EAP.

Other measures for soils are detailed in *Section 7.12.5, Volume 1*.

B11.5 Residual Impacts

The majority of the impacts will occur at the construction and reinstatement stage rather than long-term post construction; refer to Table B11.2. However, the possibility exists that in the long-term, the groundwater level in Attenborough village could be raised locally against the defended side of the cut off by a small amount. This is not considered a significant issue as:

- several surface water outfalls will pass through the proposed sheet pile cut-off in the village and these outfalls would drain off any groundwater seepage back through the cut off;
- the groundwater cut-off is sheet steel piling, which would not wholly prevent seepage as some leakage will occur through the pile clutches;
- groundwater levels typically peak in the winter period and monitoring so far has shown that during this period the groundwater at Attenborough village is, on average, 900mm below ground level. This provides a sufficient safety margin for a small rise in groundwater levels not to appear at the surface through the village.

Table B11.2 Summary of Impacts on Soil, Geology and Hydrogeology

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Compaction of soil structure due to construction activities	Minor adverse and medium-term	• Restoration of ground conditions following completion of works e.g. stripping the topsoil in advance of the works, careful storage during the works and reinstatement on completion. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.12.5, Volume 1*.	None
Contamination of soil and groundwater due to construction	Minor adverse and short-term	• Follow Environment Agency's 'Policy and Practice for the Protection of Groundwater. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.12.5, Volume 1*.	None
OPERATIONAL IMPACTS			
Impact of the sheet pile cut-off on groundwater flows	Minor adverse and permanent	• Ongoing monitoring of groundwater levels.	None
Impact of increase surface water flow	None	No mitigation required	None

B12. LAND USE

This section addresses the impact on local land uses in the study area.

B12.1 Method of Assessment

Land use was identified through walkover surveys. Agricultural land classification grades were sourced from the Defra provisional classifications on the Multi-Agency Geographic and Information for the Countryside (MAGIC) website.

B12.2 Baseline Conditions

Nearly all the land in the Attenborough, Erewash and Rylands scheme area is either private residential property (including caravan plots), used for recreational purposes or managed for nature conservation; refer to *Section B3* and *Section B4* respectively.

Exceptions are the small field used by St. Leonard's Riding School as grazing pasture in Reach 3. The fields to the south of Ireton House and the west of St Mary's Church area also pasture (Reach 7). The fields to the south of the existing embankment and wall in Reaches 13 and 14 are arable. Other exceptions are the Rylands Allotment site adjacent to Reach 12, the industrial areas of Siemens (Reach 11) and Toton STW.

B12.3 Impact Assessment

B12.3.1 Construction Impacts

In addition to any direct temporary loss of land and associated productivity, construction work may also generate dust that could impact on allotments that are beyond the physical boundaries of the construction site; this issue is dealt with separately in *Section B6*. Impacts on access rights are outlined in *Section B3*. Impacts on habitats and species from land take in Attenborough SSSI are assessed in *Section B4*.

Impacts on recreational land use and industry are discussed in *Section B3*. This section focuses on the impact to productive land.

Impact of Loss of Land and Associated Productivity
The impacts to the allotments and horse grazing and agricultural land will be temporary, lasting only for the duration of construction (approximately three months). The potential impacts are as follows:

- temporary sterilisation of productive land within the working area;
- restricted access to the land across the construction area;
- damage to the soils disturbed during the construction process.

The footprint of existing flood defences and the increase in land take due to the proposed flood defences are shown in Table B12.1. Figure B4.7 illustrates the different types of land take.

Table B12.1 Existing and Increased Footprints of New and Raised Defences

Reach	Existing Footprint (m^2)	Increased/New Footprint (m^2)	
	Permanent [1]	**Temporary**[2]	**Permanent** [1]
Erewash			
1	*No existing flood defences in these reaches*	714	204
2		5,366	1,410
3		8,060	3,047
4		6,222	150
Attenborough			
5	*No existing flood defences in these reaches*	21,850	453
6		13,080	324
7		8,267	2,517
8		8,666	182
9		8,022	25,550
10		30,000	755
11		1,330	975
Rylands			
12	3,735	19,360	6,485
13	109	16,810	8,504
14	418	29,220	0

[1] Flood defence footprint
[2] Maintenance easement

The impacts to the allotments, agricultural land and horse grazing following reinstatement are as follows:

- it will take one full growing season for grassland to re-establish. Topsoil will take time to recover after reinstatement, with possible implications for crop productivity;
- a permanent easement of generally 1-5m will be created, along which the Environment Agency will have the right to carry out flood defence maintenance and monitoring. Land use along the easement will be restricted to protect the flood defence from damage, but this should not affect normal grazing practices;
- if compaction were to occur, long-term soil damage resulting from compaction could affect the fertility of the land.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** and **short-term** to **permanent** (for land take).

B12.3.2 Operational Impacts

Impact of Decrease in Available Floodplain

The proposed works will reduce the natural floodplain during an extreme event. The consequence of this is an increase in peak river levels in the surrounding areas. *Section 8, Volume 1*, describes the predicted impacts on downstream villages from the scheme.

B12.4 Mitigation Measures and Monitoring

The majority of the impacts will occur at the construction stage. All impacts will be minimised by careful planning, detailed consultation with the landowners/occupiers and close attention to detail during flood defence construction and reinstatement of the land.

The construction methodology which includes a number of mitigation measures is described in *Section B2*. As well as these general mitigation methods, other specific methods relating to land use impacts are summarised in *Section 7.13.5, Volume 1*. The key points relating to agriculture and grazing impacts are given in Table B12.2.

B12.5 Residual Impacts

The majority of the potential land use impacts will occur at the construction and reinstatement stage. The **adverse** impacts after mitigation are **short-term** and of **no significance**. Due to the linear nature of the scheme permanent land take for the defences should not affect viability of the remaining land.

Table B12.2 Summary of Impacts on Land Use

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Loss of land and associated productivity	Minor adverse and short-term to permanent	• A detailed record of the field drains will be made. Details for the post construction drainage schemes will be agreed with the landowners/occupiers. • The Environment Agency land agents will be used to discuss losses of grazing land with St. Leonard's Riding School. • Disturbed structures such as fences, hedges, ditches and water-troughs, will be reinstated as soon as possible after construction. • Full re-instatement of allotments.	None
OPERATIONAL IMPACTS			
Decrease in available floodplain	*Refer to Section 8, Volume 1.*		

B13. USE OF NATURAL RESOURCES AND WASTE GENERATION

B13.1 Main Materials Used and Sources

B13.1.1 Fill material for embankments

During construction, the clay on the side slopes of an existing embankment will be excavated and stepped to receive the fill material. The fill would be built up in layers using suitable material.

Potential local sources of secondary fill have been identified for the embankment raising works. 113,650 m^3 of fill material will be required for the embankments. Discussions are ongoing to determine the volumes and availability of the material.

B13.1.2 Fill material for working areas next to the lakes in SSSI

25,550 m^3 of fill material is required for the temporary working areas on the edge of Church Pond, Tween Pond, Works Pond and Beeston Pond (Reaches 6, 7, 9 and 10). It will be sourced locally from a suitable secondary source upon agreement with NE and NWT to ensure no adverse impacts on water quality and nature conservation.

B13.1.3 Ready mixed concrete

Approximately 5,975 m^3 of concrete is required for the construction of the new flood walls and foundations in Reaches 2, 4, 5 to 10, 13 and 14.

It is difficult to source ready mixed concrete containing recycled aggregates within the Trent Valley. This is largely due to the abundance of cheap natural aggregates. Cement replacement materials and a degree of recycled material can be incorporated into the specified design mixes. The mixes will be specified to optimise the recycled content but few suppliers are willing to offer full recycled and accredited mixes. It may be possible to source some fully recycled non structural concrete mixes and all efforts will be made to incorporate these.

B13.1.4 Steel sheet piles

Approximately 355 m^3 of steel will be required for the 2750m of sheet pile cut off in Attenborough. The contractor currently sources most of their steel reinforcement from suppliers who produce their steel from entirely recycled materials using Electric Arc Furnaces.

B13.1.5 Other materials

Primary sources of materials will be avoided wherever possible, and all efforts will be made that any imported materials will be from recycled or secondary sources following the Environment Agency Sustainable and Ethical Procurement Objectives. The timber used will be Forest Stewardship Council certified. Temporary haul road, site access and site compound materials will be reused in subsequent phases of the works to ensure that haulage journeys are reduced.

B13.1.6 Waste generation and management

There is very little waste anticipated from the proposed works and the principal waste items are listed below:

- wood, brash and root from the vegetation clearance;
- general construction waste including packaging and concreting formwork;
- general waste from site offices/compounds.

All site waste is to be segregated into separate assigned skips. Where possible, it will be recycled or reused on site. For example, the broken up sections of existing walls will be used in construction of the new walls. Where this is not possible, the material will be transported off to the nearest waste transfer site.

The Environment Agency sets specific waste targets for construction works; this is discussed in more detail in *Section 3.6, Volume 1*.

All topsoil and subsoil will be stripped prior to the works and stockpiled on site. At the end of construction, it will be replaced and, thus, none will be removed from the site.

B13.1.7 Site Waste Management Plans (SWMP)

A SWMP was completed during the outline design of the works. Waste issues will continue to be considered during the detailed design phase and fed into the specifications for implementation by the contractor. Through this, effort will continue to be made to:

- minimise the materials used;
- reduce the waste in construction;
- re-use surplus materials;
- re-cycle waste.

B14. IMPACTS IN-COMBINATION WITH OTHER KNOWN PLANS OR PROJECTS

The Attenborough, Erewash and Rylands scheme area forms part of the wider Nottingham Trent Left Bank FAS. The cumulative impacts of the entire scheme are described in *Section 8, Volume 1,* and include the impacts of increased peak flood river levels on outlying villages.

The following projects may impact on the Attenborough, Erewash and Rylands scheme area:

Works to River Erewash

The River Erewash currently discharges into the lakes at Attenborough SSSI. Research undertaken by Cemex has shown that pollution from the River Erewash is the primary cause of poor water quality in the lakes. Cemex have commenced a scheme to improve the lake's water quality by diverting the majority of the flow from the River Erewash directly into the River Trent. This will be achieved by the formation of a low embankment through the lakes, which will include a gap of 6m to maintain the barge navigation route through the lakes that Cemex requires for its gravel works.

Construction work is due to commence on the channelling of the River Erewash in early 2009 and although the works are some distance from the main flood defence works, it is in close proximity to the proposed habitat creation for the scheme within South Coneries pond which will also start in early 2009. The two schemes are being co-ordinated and there are no significant cumulative impacts predicted from the FAS and works to the River Erewash.

Severn Trent Pipeline

Works by Severn Trent Water to install a 12km length of water mains pipeline began in August 2006. The route of the pipeline commences at Church Wilne Water Treatment Works on the west side of the M1 and runs to the south of the proposed flood defences following the left bank of the River Trent where it crosses the river downstream of Thrumpton. It then continues along the right bank until it connects to the existing trunk main north east of Clifton.

The construction works for the pipeline will have been completed by the time works are due to commence at Attenborough, Erewash and Rylands. Therefore a significant cumulative impact from construction activities for the two projects is unlikely. However the alignment of the pipeline and the depth to which it is installed have implications for several sites considered for habitat enhancements; refer to *Appendix F* for more details.

Widening works to A453 road

The Highways Agency is proposing widening works to the A453. A 10km section from Junction 24 of the M1 to the Crusader Roundabout in Clifton is being upgraded from single to dual carriageway by construction of a second carriageway along the south of the existing road. The construction phase of the

project is scheduled to commence in 2010 and be completed in winter of 2012 and 2013. There is, therefore, the possibility of a timing overlap during the construction phase with this project. A mandatory EIA will also be produced.

The A453 is the main route into south Nottingham from the M1 and there are likely to be traffic management systems in place. This may increase the number of vehicles taking an alternative route into Nottingham to avoid possible delays by going via the A6005 Nottingham Road. There is, therefore, likely to be a **minor adverse** *cumulative impact* on local traffic and transport as a result of this widening project and the construction works at Attenborough, Erewash and Rylands.

Barton in Fabis Flood Alleviation Scheme

The existing flood defence embankment surrounding the village of Barton in Fabis on the right bank of the River Trent does not currently protect against flooding with a 1% annual probability of occurrence. The Barton in Fabis FAS is proposing to raise the level of the existing embankment and construct a short extension to the south of the village.

The first phase of works commenced in spring 2008 and an Environmental Report was produced. The second phase of works is due to commence in March 2009. As Barton in Fabis is on the right bank of the River Trent there will be no cumulative impacts as a result of this project and the construction works at Attenborough, Erewash and Rylands.

B15. ENVIRONMENTAL ENHANCEMENTS

One of the primary objectives of the Nottingham Trent Left Bank FAS is to protect and enhance the local environment wherever possible. The following environmental enhancement opportunities will be progressed in the Attenborough, Erewash and Rylands scheme area:

Enhancements at Attenborough, Erewash and Rylands

- Upgrade existing footpaths along the defence;
- improved access and health & safety works, such as signage and fencing, within the Rylands working area;
- potential to introduce amenity improvements to Attenborough Village;
- installation of bird and bat boxes in Attenborough SSSI.

Other Enhancements

As well as the above enhancements planned within the scheme area, there are proposals for additional biodiversity and recreational improvements off-site within the River Trent floodplain. Enhancements are discussed in more detail in *Appendix F*.

This page is intentionally blank

B16. SUMMARY AND CONCLUSIONS

The Nottingham Trent Left Bank FAS will raise existing defences and, where required, construct new defences to protect approximately 16,000 homes and businesses against a flood with a 1% annual chance of probability of occurrence.

Broxtowe Borough Council have confirmed that several sections of works within the Attenborough, Erewash and Rylands scheme area will require planning permission. The remainder of the works constitute 'permitted development' and do not require planning permission.

A large number of external parties have been consulted about the scheme through the Fluvial Trent Strategy, the Masterplan and Constraints Plan and the Scoping Report in 2005; the Scheme Alignment Leaflet in 2006; and the original ES in April 2007. We have also held various public and private meetings with affected parties.

The main area of public concern relates to the alignment of the defence along The Strand in Attenborough. We have considered the options for this location and consider that the alternatives will be contrary to PPS9 and PPS25. There will an impact on the Conservation Area of the village and we are proposing to mitigate this impact by replanting and re-profiling The Strand.

We plan to commence construction in the Attenborough, Erewash and Rylands scheme area in autumn 2009 and it is likely that the works will be completed in 2012. However, this programme is indicative only and may change during the detailed planning of the scheme.

The overriding human impact of the scheme is the permanent beneficial reduction in flood risk to over 16,000 properties and some critical infrastructure. This will have a positive impact on people's health in the event of a flood. However, properties in surrounding villages could experience a maximum increase in flood levels of 0.07m during a flood event with a 1% annual probability of occurrence. There will also be 69 extra properties that will now have a 1% annual probability of flooding. Separate studies have been undertaken in the locations affected by increased flood risk and works have started to reduce flood risk in Barton in Fabis and Burton Joyce. These schemes will provide protection from a flood event with a 1% annual probability of occurrence including all 48 properties in Burton Joyce. This work is expected to be complete in 2009. Measures to protect individual properties in Gunthorpe, Bleasby and Gibsmere were undertaken in 2008. In addition further work is proposed in Hoveringham, Gunthorpe and Radcliffe on Trent. In Stoke Bardolph work is on-going to determine whether individual property protection measures can be used. All of this work will reduce the impact of the Nottingham Trent Left Bank FAS on the surrounding flood levels.

The majority of adverse impacts from the scheme will occur during this construction period and will therefore be temporary and short-term. This will include significant disturbance to the local human population during the construction period. This is a result of noise and vibration, increased traffic, road closures and reduced access to footpaths and recreational areas. This will include

the closure of Nottingham and Beeston Canal and the loss of use of Attenborough Village Green. The impacts will be of most significance in the 26 residential properties where construction is within their property boundary, and the 326 properties/businesses within 50m of the proposed works. Various mitigation measures will be implemented to reduce and manage these adverse impacts. These will include timing the works to avoid major public events, the appointment of a public liaison officer, minimising working areas, clear signage of necessary diversions and careful programming of the works.

The main impacts on flora and fauna will result from land take within Attenborough SSSI. 1.68ha will be permanently lost within the SSSI. The habitats will be re-instated and improved where possible. We have also agreed within Natural England and Nottinghamshire Wildlife Trust to provide 9.8ha of compensatory habitat. This compensation combined with further enhancement measures to be delivered by the project will ensure that there is no loss of nature conservation interest.

New structures will be introduced in some locations and existing defences raised. Consequently, this will have a landscape and visual impact. The main areas subject to an adverse landscape and visual amenity impact in the Attenborough, Erewash and Rylands scheme area are:

- The new wall around St. Mary's Church
- The new wall around No. 5 Adenburgh Drive and Ireton House (Reach 7);
- The new wall along The Strand (Reach 8);
- The proposed wall between Ferndale Close and Works Pond (Reach 9);
- The proposed wall and embankment adjacent to the Beeston Marina and Mobile Home Complex and allotments in Rylands.

The impacts will be minimised through sensitive detailed design and by the use of appropriate cladding and planting. Wherever the works impact on private properties the gardens will be full reinstated. The landscape and visual impacts from the 2.0m high wall along The Strand (Reach 8) will be minimised by raising the road to reduce the visual height of the wall on the road side, cladding the wall in materials appropriate to the area and reinstating the existing hedgerow in front of the wall.

We have identified that cultural heritage and archaeological features, such as the Fishponds Scheduled Monument, may be impacted during the construction works. However we will reduce the impact on these features by using a restricted working area adjacent to the Scheduled Monument and having a watching brief during any excavations. Therefore, the scheme is considered to have a limited impact on these features.

There are no significant residual impacts on air quality, water and land use. The impacts and the corresponding mitigation measures are summarised in more detail in Table B16.1 and set out in the EAP in *Section 13, Volume 1*. One of the Environment Agency's Framework Contractors will be used to construct the works. All such contractors have worked on a number of the Environment Agency's projects and are experienced in the construction of flood defences.

They will follow the mitigation measures proposed in this ES. Therefore, overall construction impacts are considered to be moderate adverse and short-term.

In line with our statutory duty to protect and enhance the local environment, several environmental enhancement opportunities have been identified in each area. The exact scope will be confirmed during detailed design and through ongoing consultation with landowners/managers and local communities. In the Attenborough, Erewash and Rylands scheme area we aim to:

- upgrade existing footpaths;
- improved health and safety works, such as signage and fencing, within the Rylands working area;
- improve amenities in Attenborough Village;
- installation of bird and bat boxes in Attenborough SSSI;
- create and restore habitat within the River Trent floodplain.

The project will bring significant reduction to the flood risk in Nottingham. The impacts of the project have been assessed, which are mainly due to construction activities, and the mitigation and enhancements proposed will reduce the adverse impacts associated with the scheme. Opportunities will be taken, as far as is possible within the framework of the scheme, to enhance the natural environment and the amenity for local people.

Table B16.1 Summary of Environmental Impacts for Attenborough, Erewash and Rylands

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
HUMAN POPULATION	**CONSTRUCTION IMPACTS**			
	Impact on local properties as a result of construction activities in close proximity	Minor to moderate adverse and short-term	• Liaison with residents. • Minimise working areas within private properties. • Full re-instatement of gardens. • Alternative access arrangements; refer to Section B2.2.	Minor to moderate adverse and short-term
	Impact on businesses as a result of construction related activity in close proximity	Minor to moderate adverse and short-term	• Liaison with local businesses.	Minor to moderate adverse and short-term
	Impact on local farming and commerce as a result of construction activities	Minor adverse and short-term	• Liaison with affected landowners.	Minor adverse and short-term
	Impact on sensitive sites as a result of construction activities occurring in close proximity	Minor to moderate adverse and short-term	• Liaison with St. Mary's Church and its users. • Suitable access arrangements agreed with Attenborough Preparatory School. Alternative nearby recreation facilities sought for school's use; refer to *Section B2.2.2*. • No construction activity during annual village fete, biennial flower festival and Christmas Bazaar. • Liaison with Rylands allotment plot holders adjacent to works area for Reach 12 and adequate advance notification of works.	Minor adverse and short-term

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
HUMAN POPULATION	Impacts on local recreational resources as a result of construction activities	Moderate to major adverse and short-term	• Formal closure and temporary diversion where possible of footpaths and bridleways with clear signage provided. • Ensure access is maintained to Attenborough Sailing Club and Attenborough SSSI during works in Reaches 5 and 6. • Alternative nearby football and cricket pitches sought for works to The Strand (Reach 8). • Carrying out works to the Beeston Lock gates during low-season (October to January) with a break in works over the Christmas holidays, to minimise impact on canal users. • Reduce the working area for Reach 11 and carry out works during winter months to minimise impact on golfers. Ensure advance notification of works	Minor to moderate (at Attenborough Village Green and for the canal closure) adverse and short-term
	OPERATIONAL IMPACTS			
	Impacts on local population as a result of reduction in flood risks	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
	Impact on villages outside the scheme area	Moderate adverse and permanent	Refer to *Section 8, Volume 1.*	
	Impact on flood regime as a result of local recreational resources and sensitive sites being outside new defences	No significant impact.	No mitigation required	None

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
FLORA AND FAUNA	**CONSTRUCTION IMPACTS**			
	Attenborough SSSI – site clearance and construction of defences including associated pollution risks and potential impacts on hydrology	Moderate adverse and short-term to permanent	• Areas of temporary works to be reinstated. • Remaining area of SSSI will have habitat creation. • Detailed mitigation method statement to be agreed in advance of works with NE/NWT/Cemex. • Wall facing to be 'rough' to allow small mammals to climb to escape floods, limited use of overhanging coping. Access also possible along the floodplain and over level-crossings. • Localised use of geotextile or Phos-lock to be discussed with NE. • Pollution control/good working practice. • Long-term monitoring of groundwater. • Compensatory habitat creation in SSSI and around the scheme (Refer to *Appendix F*).	Minor to moderate adverse in the short and medium-term None in long-term
	Attenborough SSSI - Site clearance and construction of compensatory habitat	Moderate adverse and medium-term	Detailed mitigation method statement to be agreed in advance with NE/NWT/Cemex but to include pollution control, protected species, surveys, appropriate timing of works, etc.	Moderate adverse in short-term None in medium-term Moderate beneficial in long-term
	Attenborough Pastures SINC – pollution from construction	Minor adverse and short-term	Pollution control/ good working practice	None in the medium to long-term
	Trees - Site clearance and construction	Moderate adverse and permanent	Detail design to retain as many trees as possible. Working width to be reduced where practical to retain trees. Retained trees to be fenced off. No works within tree canopy where practical. BS5837 guidance to be followed. Replacement and supplementary planting.	Minor adverse in long term None permanent
	Hedgerows – Site clearance and construction	Moderate adverse and short to long-term	Hedges replanted next to defence with mix of locally native species.	None in long-term

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
FLORA AND FAUNA	Birds – Site clearance and construction	Moderate adverse and short to long-term	Vegetation clearance to be undertaken outside of breeding bird season. Work within most sensitive lakes of SSSI carried out outside of breeding season. All vegetation in temporary working areas to be reinstated. Compensatory habitat measures within SSSI will create additional habitat in the medium to long term.	Minor adverse in short-term None in medium to long-term. Compensatory habitat measure may have moderate beneficial impact on SSSI in long- term
	Bats – Site clearance and construction	Minor adverse and medium-term to permanent	Further survey prior to construction phase. If bats confirmed, licence to be obtained and mitigation strategy agreed with NE. Compensatory habitat to include replacement planting and erection of bat boxes in local area.	Minor adverse in short-term None in the medium to long-term
	Otters – Construction disturbance	Minor adverse and short-term	Pre-construction surveys to ensure no holts or resting places have been established in the interim period which could be disturbed by the works.	None
	Water Voles – Site clearance and construction disturbance	No significant impact	Pre-construction surveys. Design and re-instatement of banks to improve water vole habitats.	None May be minor beneficial in medium term due to improved habitat
	Amphibians – site clearance and construction	No significant impact	Further survey required at Cemex pond to confirm population of smooth newts. Depending on findings, mitigation to be agreed with County Ecologist. May involve trapping/translocation.	None

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
	Invertebrates – site clearance	Minor adverse and medium-term	• Areas of temporary works to be reinstated. • The general mitigation/compensatory habitat measures proposed within the SSSI would be valuable for invertebrates. • Detailed mitigation method statement to be agreed in advance of works with NE/NWT/landowner.	Minor adverse – in medium term None – in the long term
	OPERATIONAL IMPACTS			
	Holme Pit and Attenborough SSSIs – Flood protection to left bank	No significant impact	None required.	None
	Holme Pit and Attenborough SSSIs – Maintenance of an easement/access adjacent to defence	Impacts are incorporated into construction impacts as above		
	SINC – Flood protection to left bank	No significant impact		
NOISE AND VIBRATION	**CONSTRUCTION IMPACTS**			
	Construction site noise	Moderate to major adverse and short-term	• Temporary fixed plant to be positioned as far as practically possible away from residential properties and screened to reduce noise emissions. • Liaison with residents and local businesses. • Site specific measures detailed in the EAP; refer to *Section 13, Volume 1*.	Minor to moderate adverse and short-term

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
NOISE AND VIBRATION	Sheet Piling Noise and Vibrations	Moderate to major adverse and short-term	• Liaison with residents and local businesses. • Pre-works condition survey of all properties that are within 20m of sheet piling. • A structural engineer to assess what the maximum tolerance level of vibration is for these buildings. • Use of appropriate piling rigs within noise sensitive areas and/or close to residential areas. • Continuous vibration monitoring during sheet piling. • The vibration of the hammer will be regulated by the operator to ensure that a careful balance between work output and noise/ vibration is reached. • Piling plant will be well maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated. • Training in the form of site inductions and tool box talks will reflect the need for consideration of noise issues such as switching off plant that is not in use, keeping engine covers closed, reporting defects and avoiding shouting and slamming of vehicle doors especially during out of hours working.	Moderate to major adverse (for properties within 50m of sheet piling activities) and short-term
	Construction Traffic Noise	See *Traffic & Transport*		
	OPERATIONAL IMPACTS			
	No significant impacts have been identified			
	CONSTRUCTION IMPACTS			
	Impact on the local environment from dust generating activities	Moderate adverse and short-term	• Site specific measures detailed in the EAP; refer to *Section 13, Volume 1.* • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.7.5, Volume 1.*	Minor adverse and short term

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
AIR QUALITY	Impact on the local environment from construction plant and vehicle emissions	Minor adverse and short-term	As above plus: • Use of alternative products, systems, or materials where practicable, such as mains electricity in preference to a diesel generator and pre-mixed materials rather than mixing on site.	None
	OPERATIONAL IMPACTS			
	No significant impacts have been identified			
LANDSCAPE AND VISUAL AMENITY	**CONSTRUCTION IMPACTS**			
	The introduction of new small-scale elements within the existing landscape	Moderate/ major adverse	• Cladding in materials that are characteristic to the area. • Where no cladding is proposed ensure a good concrete finish. • Planting to screen new floodwalls where appropriate. • Integrated seating and cladding on village green side of the wall along The Strand	Moderate adverse
	The introduction of a new landform element within the existing landscape	Minor/ moderate adverse	• Tree, scrub and hedgerow planting to screen views of proposed embankment. • Where possible introduce varying slope gradients and profile.	Minor/ moderate adverse
	An increase in the height and overall footprint of existing embankments	Minor adverse	• Ensure raised embankments blend into their landscape setting through landform design and reinstatement grass seeding. Where it does not compromise operational requirements appropriate planting may be utilised to reduce the visual impact.	Minor/ negligible adverse
	Slight foreshortening of views over existing defences to be raised and/or over new defences	Moderate/major adverse	• Raising of the road to reduce the visual impact of the wall for users of The Strand	Moderate/major adverse
	Increased road and footpath levels that must be graded into the surrounding pavement surfaces	Minor/ moderate adverse	• Grade ramps so that a smooth road surface is achieved. • Ensure all existing access points are maintained. • Minimise disruption to existing vehicular and pedestrian movements during the construction phase.	Negligible adverse

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
LANDSCAPE AND VISUAL AMENITY	Removal of existing trees	Moderate adverse	• Where proposed works are in close proximity to trees of high landscape value ensure the construction process minimises any potential damage to root systems. • Where it does not compromise operational requirements trees removed due to construction should be replaced.	Minor adverse
	Impact on residential properties	Moderate/ major adverse	• All affected areas of residential properties to be reinstated in agreement with the individual property owners.	Moderate adverse
	Disturbance as a result of temporary construction activities	Moderate/ major adverse	• Where possible locate construction compounds and storage areas away from sensitive residential receptors and adjacent to suitable vehicle access points. • Reinstate all areas affected by the works to their former land use and at least the same condition.	Negligible
	OPERATIONAL IMPACTS			
	No significant impacts identified			
WATER	**CONSTRUCTION IMPACTS**			
	Pollution risk from construction activities near to watercourses and waterbodies	Moderate to major adverse and short-term	• Adhere to Environment Agency's PPGs.	None
	Disruption to potable and foul water pipeline from construction activities	Minor adverse and short-term	• Advance notice to water customers of disruption to supply. • Good planning to minimise period of disruption.	Minor adverse and short-term moderate adverse
	OPERATIONAL IMPACTS			
	Maintenance of new and raised flood defences and structures	No significant impact	None required.	None
	Impacts on local surface water drainage	Minor adverse and permanent	Construction of pumping station to over-pump any surface water on the dry side of the flood defences at The Strand.	None
	Impact on the River Erewash	No significant impact	None required.	None

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
	Impact on villages outside the scheme area	Moderate adverse and permanent	Refer to *Section 8, Volume 1 and Human Population above.*	
	CONSTRUCTION IMPACTS			
TRAFFIC AND TRANSPORT	Impact on local roads due to construction traffic	Moderate adverse and short-term	• Develop a TMP; refer to *Section 7*.10.5, *Volume 1*. • To avoid increasing traffic flows on main roads at peak hours - time deliveries of materials to the main site compounds between 9am and 4.30pm. • To minimise disturbance to sensitive residential areas agree alternative arrangements to The Strand; refer to *Section B2.2.2*. • To minimise heavy vehicle movements through Attenborough village use of the Old Fisherman's Car Park as a materials storage area.	Minor adverse and short-term
	Impact due to local road raising and construction activities requiring road closures	Major adverse and short-term	• Develop a TMP; refer to *Section 7*.10.5, *Volume 1*.	Minor adverse and short-term
	Impact on operation of railway network due to construction works adjacent to railway line	Moderate adverse and short-term	• Appropriate approvals from Network Rail.	Minor adverse and short-term
	OPERATIONAL IMPACTS			
	Impact of new and raised defences on local transport infrastructure	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
CULTURAL HERITAGE AND ARCHAEOLOGY	**CONSTRUCTION IMPACTS**			
	Impact on archaeology due to construction activities	Minor to moderate adverse and permanent	• A detailed mitigation strategy agreed with archaeological officers and English Heritage. • Adhere to CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.11.5, Volume 1.*	None

Receptor	Impact Description	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
	OPERATIONAL IMPACTS			
	Impact on the historic environment as a result of the reduction in flood risk	Minor beneficial and permanent	No mitigation required	Minor beneficial and permanent
SOIL, GEOLOGY AND HYDROGEOLOGY	**CONSTRUCTION IMPACTS**			
	Compaction of soil structure due to construction activities	Minor adverse and medium-term	• Restoration of ground conditions following completion of works e.g. rotovating and stripping the topsoil in advance of the works, careful storage during the works and reinstatement on completion. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.12.5, Volume 1*.	None
	Contamination of soil and groundwater due to construction	Minor adverse and short-term	• Follow Environment Agency's 'Policy and Practice for the Protection of Groundwater. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.12.5, Volume 1*.	None
	OPERATIONAL IMPACTS			
	Impact of the sheet pile cut-off on groundwater flows	Minor adverse and permanent	• Ongoing monitoring of groundwater levels.	None
	Impact of increased surface water flow	No significant impact	No mitigation required	None
LAND USE	**CONSTRUCTION IMPACTS**			
	Loss of land and associated productivity/disruption to industry	Minor adverse and short-term to permanent	• The Environment Agency land agents will discuss loss of grazing land with St. Leonard's Riding School. • Disturbed structures such as fences, hedges, ditches and water-troughs will be reinstated as soon as possible after construction.	None
	OPERATIONAL IMPACTS			
	Decrease in available floodplain	*Refer to Section 8, Volume 1 and 'Human Population' above.*		

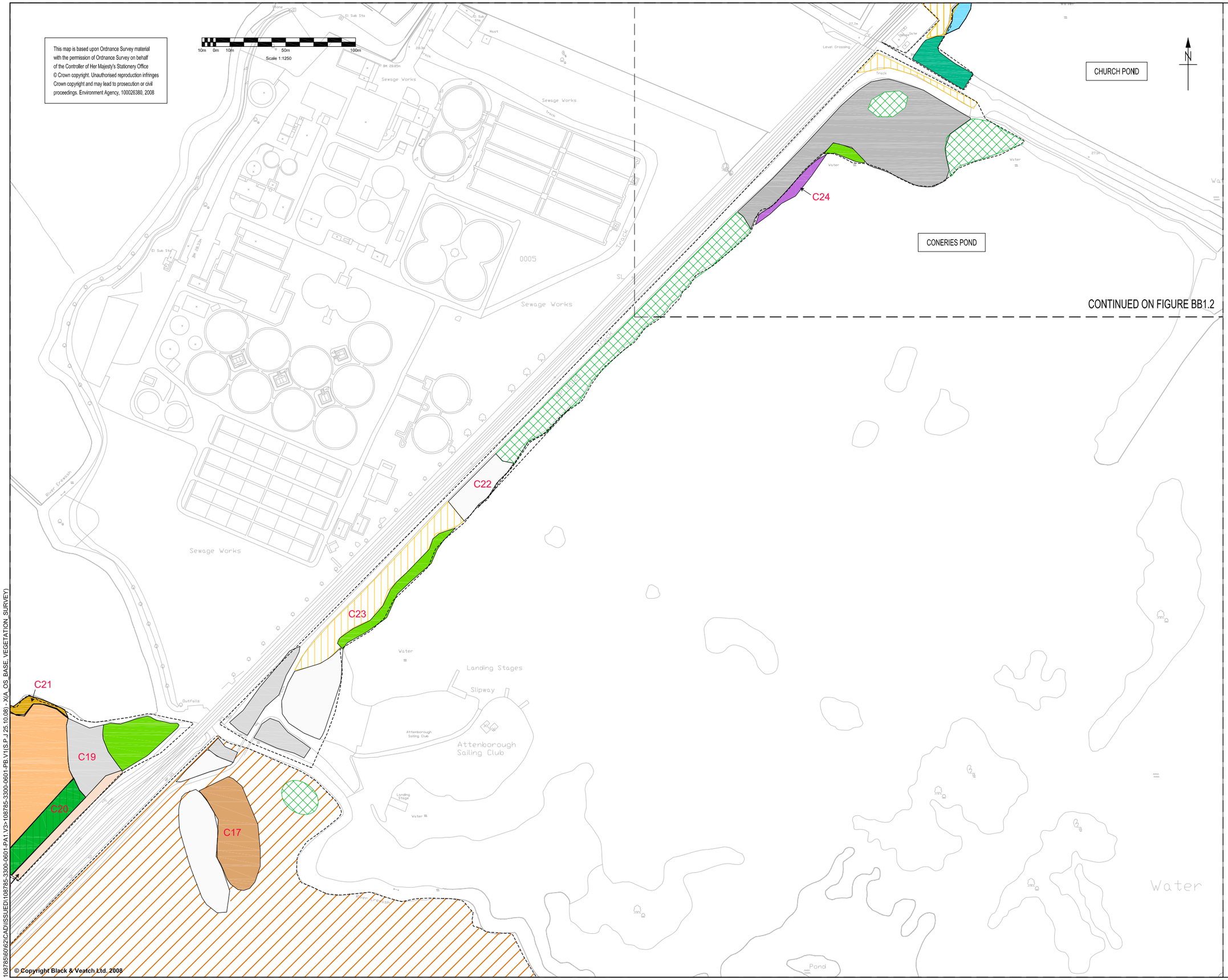
Note 1: Refer to EIA methodology in *Section 6, Volume 1.*

This page is intentionally blank

ANNEX B1
Botanical Survey Maps

This page is intentionally blank

10m 0m 10m 50m 100m
Scale 1:1250



KEY TO VEGETATION COMMUNITIES

- A2 Lemna minor community
- MG1 Arrhenatherum elatius grassland
- MG1a Arrhenatherum elatius grassland
- MG1b Arrhenatherum elatius grassland
- MG1 Arrhenatheum elatius grassland / MG4 Alopecurus pratensis grassland transition
- MG5 Cynosurus cristatus - Centaurea nigra grassland
- MG6b Lolium perenne - Cynosurus cristatus grassland
- MG7a Lolium perenne -Trifolium repens leys
- MG7e Lolium perenne - Plantago lanceolata grassland
- MG9 Holcus lanatus - Deschampsia cespitosa grassland
- OV24 Urtica dioica - Galium aparine community
- OV26 Epilobium hirsutum community
- OV26c Epilobium hirsutum community
- S4 Phragmites australis swamp and reed-beds
- S5 Glyceria maxima swamp
- S5a Glyceria maxima swamp
- S6 Carex riparia swamp
- S12 Typha latifolia swamp
- S12a Typha latifolia swamp
- S14 Sparganium erectum swamp
- S14 Sparganium erectum swamp / S15 Acorus calamus swamp transition
- S28 Phalaris arundinacea swamp
- W2 Salix cinerea - Betula pubescens - Phragmites australis woodland
- W6 Alnus glutinosa- Urtica dioica woodland
- W6b Alnus glutinosa- Urtica dioica woodland
- W21a Crataegus monogyna- Hedera helix scrub
- W24 Rubus fruticosus-Holcus lanatus underscrub
- W24a Rubus fruticosus- Holcus lanatus underscrub
- Dense scrub (other)
- Grassland - tall herb mosaic
- Tall herb vegetation
- Tall ruderal-grassland-scrub mosaic
- Mosaic non-NVC vegetation

C1 SAMPLE CODE

SURVEY BOUNDARY

1 TARGET NOTE

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	EAS	Date:	DEC.06
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project
NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title
FIGURE BB1.1
ATTENBOROUGH
BOTANICAL SURVEY - SHEET 1 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0601 | Revision PB

Drawing No. 108785-3300-0601 | Cad Ref | Rev. PB

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

108785\60\62\CAD\ISSUED\108785-3300-0601-PA1.V3>108785-3300-0601-PB.V1(S.P.J 25.10.08) - X(A_OS_BASE_VEGETATION_SURVEY)

This page is intentionally blank

TARGET NOTE	
No.	DESCRIPTION
6	Small area covered with a complex mosaic of species-poor MG1, Bramble *Rubus fruticosus* agg. and willow scrub. Impenetrable. Osier and Grey Willow are present at the water's edge. Other species include Elder *Sambucus nigra* and arching Bramble, False Oat-grass *Arrhenatherum elatius*, Cock's-foot *Dactylis glomerata* and Broad-leaved Dock *Rumex obtusifolius*. Scrub c 40%: MG1 30% and Bramble 30%.
9	Narrow strip on steep bank between a species-poor Hawthorn hedge and the water's edge. Is mostly OV24 but there are also thin strips of marginal vegetation dominated by Branched Bur-reed *Sparganium erectum*, Bulrush and Reed Sweet-grass *Glyceria maxima*, none of which forms an extensive area.

C25
C26
C35
C36
C24
C27
6
9
1
CHURCH POND
CONERIES POND
CONTINUED ON FIGURE BB1.1
CONTINUED ON FIGURE BB1.3

KEY TO VEGETATION COMMUNITIES

- A2 Lemna minor community
- MG1 Arrhenatherum elatius grassland
- MG1a Arrhenatherum elatius grassland
- MG1b Arrhenatherum elatius grassland
- MG1 Arrhenatheum elatius grassland / MG4 Alopecurus pratensis grassland transition
- MG5 Cynosurus cristatus - Centaurea nigra grassland
- MG6b Lolium perenne - Cynosurus cristatus grassland
- MG7a Lolium perenne -Trifolium repens leys
- MG7e Lolium perenne - Plantago lanceolata grassland
- MG9 Holcus lanatus - Deschampsia cespitosa grassland
- OV24 Urtica dioica - Galium aparine community
- OV26 Epilobium hirsutum community
- OV26c Epilobium hirsutum community
- S4 Phragmites australis swamp and reed-beds
- S5 Glyceria maxima swamp
- S5a Glyceria maxima swamp
- S6 Carex riparia swamp
- S12 Typha latifolia swamp
- S12a Typha latifolia swamp
- S14 Sparganium erectum swamp
- S14 Sparganium erectum swamp / S15 Acorus calamus swamp transition
- S28 Phalaris arundinacea swamp
- W2 Salix cinerea - Betula pubescens - Phragmites australis woodland
- W6 Alnus glutinosa- Urtica dioica woodland
- W6b Alnus glutinosa- Urtica dioica woodland
- W21a Crataegus monogyna- Hedera helix scrub
- W24 Rubus fruticosus-Holcus lanatus underscrub
- W24a Rubus fruticosus- Holcus lanatus underscrub
- Dense scrub (other)
- Grassland - tall herb mosaic
- Tall herb vegetation
- Tall ruderal-grassland-scrub mosaic
- Mosaic non-NVC vegetation

C1 SAMPLE CODE

SURVEY BOUNDARY

1 TARGET NOTE

Scale 1:1250

Drawing No.	Cad Ref	Rev.
108785-3300-0602		PB

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	EAS	Date:	DEC.06
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

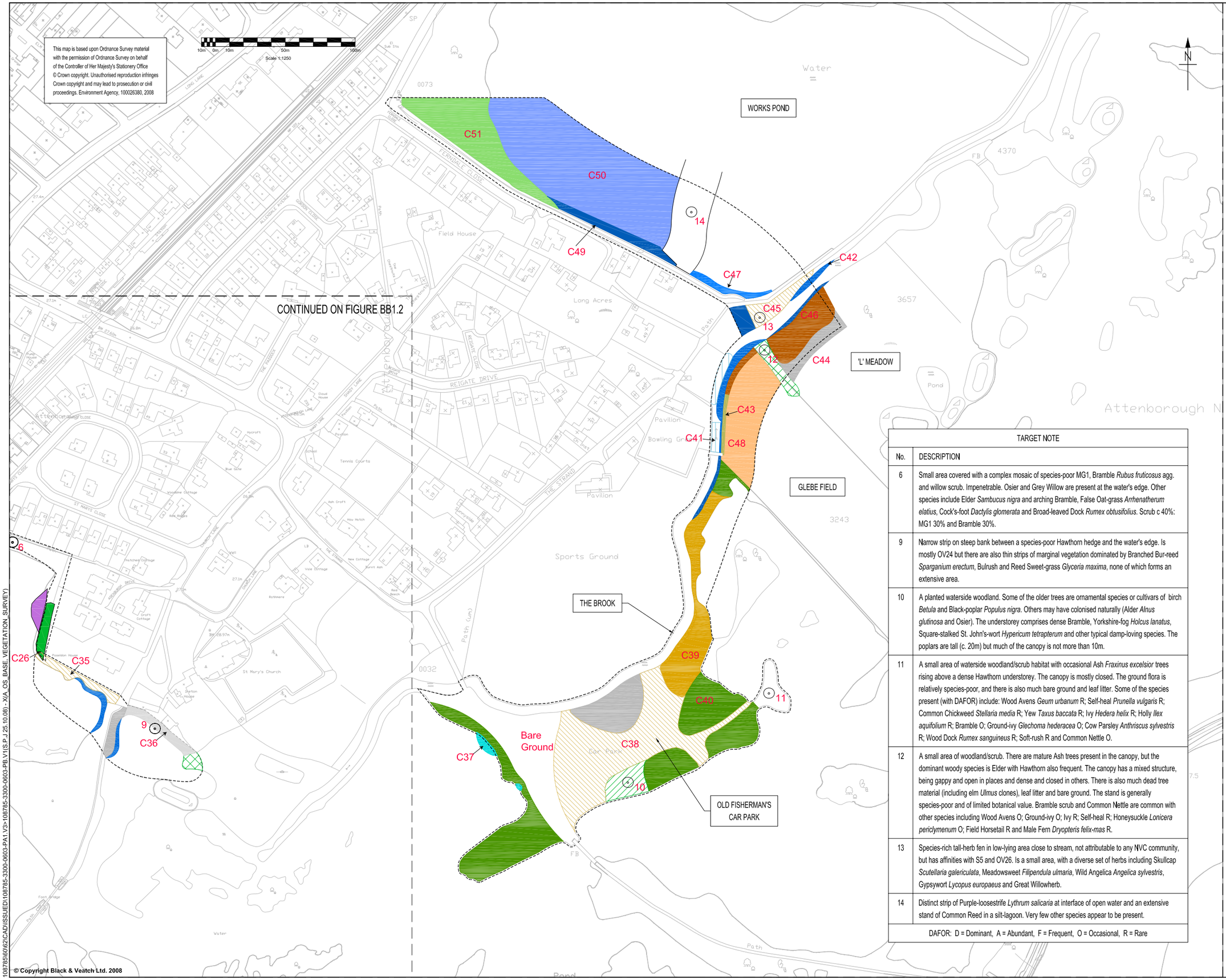
Drawing title

FIGURE BB1.2
ATTENBOROUGH
BOTANICAL SURVEY - SHEET 2 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0602 | Revision PB

This page is intentionally blank



TARGET NOTE	
No.	DESCRIPTION
6	Small area covered with a complex mosaic of species-poor MG1, Bramble *Rubus fruticosus* agg. and willow scrub. Impenetrable. Osier and Grey Willow are present at the water's edge. Other species include Elder *Sambucus nigra* and arching Bramble, False Oat-grass *Arrhenatherum elatius*, Cock's-foot *Dactylis glomerata* and Broad-leaved Dock *Rumex obtusifolius*. Scrub c 40%: MG1 30% and Bramble 30%.
9	Narrow strip on steep bank between a species-poor Hawthorn hedge and the water's edge. Is mostly OV24 but there are also thin strips of marginal vegetation dominated by Branched Bur-reed *Sparganium erectum*, Bulrush and Reed Sweet-grass *Glyceria maxima*, none of which forms an extensive area.
10	A planted waterside woodland. Some of the older trees are ornamental species or cultivars of birch *Betula* and Black-poplar *Populus nigra*. Others may have colonised naturally (Alder *Alnus glutinosa* and Osier). The understorey comprises dense Bramble, Yorkshire-fog *Holcus lanatus*, Square-stalked St. John's-wort *Hypericum tetrapterum* and other typical damp-loving species. The poplars are tall (c. 20m) but much of the canopy is not more than 10m.
11	A small area of waterside woodland/scrub habitat with occasional Ash *Fraxinus excelsior* trees rising above a dense Hawthorn understorey. The canopy is mostly closed. The ground flora is relatively species-poor, and there is also much bare ground and leaf litter. Some of the species present (with DAFOR) include: Wood Avens *Geum urbanum* R; Self-heal *Prunella vulgaris* R; Common Chickweed *Stellaria media* R; Yew *Taxus baccata* R; Ivy *Hedera helix* R; Holly *Ilex aquifolium* R; Bramble O; Ground-ivy *Glechoma hederacea* O; Cow Parsley *Anthriscus sylvestris* R; Wood Dock *Rumex sanguineus* R; Soft-rush R and Common Nettle O.
12	A small area of woodland/scrub. There are mature Ash trees present in the canopy, but the dominant woody species is Elder with Hawthorn also frequent. The canopy has a mixed structure, being gappy and open in places and dense and closed in others. There is also much dead tree material (including elm *Ulmus* clones), leaf litter and bare ground. The stand is generally species-poor and of limited botanical value. Bramble scrub and Common Nettle are common with other species including Wood Avens O; Ground-ivy O; Ivy R; Self-heal R; Honeysuckle *Lonicera periclymenum* O; Field Horsetail R and Male Fern *Dryopteris felix-mas* R.
13	Species-rich tall-herb fen in low-lying area close to stream, not attributable to any NVC community, but has affinities with S5 and OV26. Is a small area, with a diverse set of herbs including Skullcap *Scutellaria galericulata*, Meadowsweet *Filipendula ulmaria*, Wild Angelica *Angelica sylvestris*, Gypsywort *Lycopus europaeus* and Great Willowherb.
14	Distinct strip of Purple-loosestrife *Lythrum salicaria* at interface of open water and an extensive stand of Common Reed in a silt-lagoon. Very few other species appear to be present.
DAFOR: D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare	

Drawing No. 108785-3300-0603 | Cad Ref | Rev. PB

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

KEY TO VEGETATION COMMUNITIES

- A2 Lemna minor community
- MG1 Arrhenatherum elatius grassland
- MG1a Arrhenatherum elatius grassland
- MG1b Arrhenatherum elatius grassland
- MG1 Arrhenatheum elatius grassland / MG4 Alopecurus pratensis grassland transition
- MG5 Cynosurus cristatus - Centaurea nigra grassland
- MG6b Lolium perenne - Cynosurus cristatus grassland
- MG7a Lolium perenne -Trifolium repens leys
- MG7e Lolium perenne - Plantago lanceolata grassland
- MG9 Holcus lanatus - Deschampsia cespitosa grassland
- OV24 Urtica dioica - Galium aparine community
- OV26 Epilobium hirsutum community
- OV26c Epilobium hirsutum community
- S4 Phragmites australis swamp and reed-beds
- S5 Glyceria maxima swamp
- S5a Glyceria maxima swamp
- S6 Carex riparia swamp
- S12 Typha latifolia swamp
- S12a Typha latifolia swamp
- S14 Sparganium erectum swamp
- S14 Sparganium erectum swamp / S15 Acorus calamus swamp transition
- S28 Phalaris arundinacea swamp
- W2 Salix cinerea - Betula pubescens - Phragmites australis woodland
- W6 Alnus glutinosa- Urtica dioica woodland
- W6b Alnus glutinosa- Urtica dioica woodland
- W21a Crataegus monogyna- Hedera helix scrub
- W24 Rubus fruticosus-Holcus lanatus underscrub
- W24a Rubus fruticosus- Holcus lanatus underscrub
- Dense scrub (other)
- Grassland - tall herb mosaic
- Tall herb vegetation
- Tall ruderal-grassland-scrub mosaic
- Mosaic non-NVC vegetation

C1 SAMPLE CODE

SURVEY BOUNDARY

1 TARGET NOTE

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	EAS	Date:	DEC.06
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project
NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title
FIGURE BB1.3
ATTENBOROUGH
BOTANICAL SURVEY - SHEET 3 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0603 | Revision PB

This page is intentionally blank

This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Environment Agency, 100026380, 2008

10m 0m 10m 50m 100m
Scale 1:1250

Chilwell Manor Golf Course

Attenborough Nature Reserve

Water

Pond

Attenborough

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34

7 8

TARGET NOTE	
No.	DESCRIPTION
7	Intricate mosaic between pit and railway embankment of species poor MG1a (sampled), OV27 (Rosebay Willowherb *Chamerion angustifolium*) OV24 (Common Nettle), scrub (Elder, Grey Willow, Osier and Hawthorn *Crataegus monogyna*). All very species poor.
8	Former pond, dried up and being reclaimed by surrounding willow carr (W6b).

Drawing No. 108785-3300-0604 | Cad Ref | Rev. PB

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

KEY TO VEGETATION COMMUNITIES

- A2 Lemna minor community
- MG1 Arrhenatherum elatius grassland
- MG1a Arrhenatherum elatius grassland
- MG1b Arrhenatherum elatius grassland
- MG1 Arrhenatheum elatius grassland / MG4 Alopecurus pratensis grassland transition
- MG5 Cynosurus cristatus - Centaurea nigra grassland
- MG6b Lolium perenne - Cynosurus cristatus grassland
- MG7a Lolium perenne -Trifolium repens leys
- MG7e Lolium perenne - Plantago lanceolata grassland
- MG9 Holcus lanatus - Deschampsia cespitosa grassland
- OV24 Urtica dioica - Galium aparine community
- OV26 Epilobium hirsutum community
- OV26c Epilobium hirsutum community
- S4 Phragmites australis swamp and reed-beds
- S5 Glyceria maxima swamp
- S5a Glyceria maxima swamp
- S6 Carex riparia swamp
- S12 Typha latifolia swamp
- S12a Typha latifolia swamp
- S14 Sparganium erectum swamp
- S14 Sparganium erectum swamp / S15 Acorus calamus swamp transition
- S28 Phalaris arundinacea swamp
- W2 Salix cinerea - Betula pubescens - Phragmites australis woodland
- W6 Alnus glutinosa- Urtica dioica woodland
- W6b Alnus glutinosa- Urtica dioica woodland
- W21a Crataegus monogyna- Hedera helix scrub
- W24 Rubus fruticosus-Holcus lanatus underscrub
- W24a Rubus fruticosus- Holcus lanatus underscrub
- Dense scrub (other)
- Grassland - tall herb mosaic
- Tall herb vegetation
- Tall ruderal-grassland-scrub mosaic
- Mosaic non-NVC vegetation

C1 SAMPLE CODE

SURVEY BOUNDARY

1 TARGET NOTE

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	EAS	Date:	DEC.06
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project
NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title
FIGURE BB1.4
ATTENBOROUGH
BOTANICAL SURVEY - SHEET 4 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0604 | Revision PB

This page is intentionally blank

ANNEX B2
Option Assessment

This page is intentionally blank

Matrix 1 – Flood Defence Alignments considered at Scoping Stage

DEFENCE REACH & OPTIONS Options sourced from the Fluvial Trent Strategy Scoping Report (Environment Agency, 2005)	KEY FEATURES OF ALIGNMENT										COMPARATIVE IMPACT ON EXISTING FEATURES/ENVIRONMENT											OPTION ACCEPTED OR REJECTED?	COMMENTS/SUMMARY
											LANDSCAPE		HUMAN POPULATION		WATER		ARCHAEOLOGY & CULTURAL HERITAGE		TRAFFIC & TRANSPORT	LAND USE	FLORA & FAUNA		
	HEIGHT OF DEFENCE (m)	NO. OF 'FLOW CONTROL STRUCTURES	NO. OF FLOODGATES	NO. OF DEMOUNTABLE ACCESS POINTS (TOTAL LENGTH, M)	NO. OF CROSSINGS OVER/ MODIFICATIONS TO EXISTING SERVICES	NO. OF CROSSINGS OVER HIGH VOLAGE ELECTRICITY CABLES	REQUIREMENT FOR GROUND WATER CUT-OFF	REQUIREMENT FOR MODIFICATION TO SEWERAGE SYSTEM (I.E. BACK OF WALL DRAINAGE)	IPMACT ON NATURAL WATERCOURSES	OPPORTUNITY FOR ENVIRONMENTAL ENHANCEMENT	ADVERSE IMPACT TO TREES (NO. OF TREES REMOVED)	VISUAL IMPACT OF PROPOSED FLOODWALL	IMPACT ON LOCAL RESIDENTS	IMPACT ON RECREATION/ PUBLIC AMENITY AREAS	MAXIMISING FLOODPLAIN POTENTIAL	IMPACT ON EXISTING STRUCTURES	IMPACTS ON LISTED BUILDINGS	IMPACTS ON FEATURES OF ARCHAEOLOGICAL SIGNIFICANCE	IMPACT ON EXISTING ACCESS ARRANGEMENTS	IMPACTS TO THIRD PARTY AREAS (I.E.ENGLISH NATURE, NETWORK RAIL)	IMPACT ON ATTENBOROUGH NATURE RESERVE (SSSI)		
SCOPING REPORT PHASE																							
Reaches around : Attenborough Nature Reserve																							
Alignment A *(Embankment through nature reserve lakes*	**0.5 to 1.0**	**4**	**0**	**0**	**0**	**0**	Y	Y	××	✓	×××	××	N/A	×××	×××	×	N/A	N/A	×××	×××	×××	×	**Although the defence is located away from both the high voltage electricity cables and railway line, Natural England are opposed to any works through the lakes.**
Alignment B *(Floodwall at edge of nature reserve lakes)*	**0.5 to 1.0**	**4**	**0**	**0**	**0**	**0**	Y	Y	××	××	×××	×××	N/A	×××	×××	×	N/A	N/A	×××	×××	×××	×	**Although the defence is located away from both the high voltage electricity cables and railway line, the option is opposed by Natural England as it will cut-off a large area of land from the SSSI.**
Alignment C *(Embankment over the top of the high voltage cables)*	**0.5 to 1.0**	**4**	**0**	**0**	**2**	**Entire Reach**	Y	Y	××	✓	××	×	N/A	××	×××	×	N/A	N/A	×××	××	××	×	**Covering of the high voltage cables by a large embankment is not permitted by Central Networks.**
Alignment D *(Floodwall close to railway fence but at a safe distance from the cables*	**0.5 to 1.0**	**4**	**0**	**0**	**2**	**2**	Y	Y	××	✓	××	×	N/A	×	✓	×	N/A	N/A	✓	×	×	✓	**Preferred option, best compromise between avoiding the high voltage cables and minimising the land take from the SSSI. A 1m offset of the wall from the railway boundary fence is permitted by Network Rail.**
Alignment E *(Floodwall on the Network Rail boundary fence)*	**0.5 to 1.0**	**4**	**0**	**0**	**2**	**2**	Y	Y	××	✓	××	×	N/A	×	✓	×	N/A	N/A	✓	×××	×	×	**Construction of the wall along the Network Rail boundary fence is not permitted by Network Rail.**
Flood Defences around St Mary's Church																							
Alignment F *(Floodwall running along Adenburgh Drive and Church Lane to the north of St Mary's Church)*	**0 to 1.5**	**1**	**0**	**0**	0	**1**	Y	Y	N/A	N/A	××	×	×××	N/A	✓✓	N/A	Y	×××	×××	×××	×××	N/A	×	**This option leaves 6(no) properties unprotected (one of which is listed) and requires for piling through the churchyard. This alignment would create significant disruption to residents.**
Alignment G *(Floodwall around the village; embankment through field to the south of St Mary's Church)*	**0 to 2.1**	**1**	**0**	**0**	0	**1**	Y	Y	N/A	N/A	××	××	×	N/A	✓	N/A	Y	×××	N/A	×××	×	✓	**All properties are protected by this option and visually it is less intrusive, as it does not pass through the core of the village.**
Alignment along The Strand																							
Alignment H *(Floodwall along The Strand, replacing the existing boundary hedge)*	**1.5**	**0**	**5**	**0**	2^3	**1**	Y	Y	N/A	N/A	×	××	×××	××	✓	N/A	N	N/A	××	N/A	N/A	✓	**Strong opposition from residents, but generally preferred by statutory consultees. Impact on high voltage cables is a manageable risk.**
Alignment I *(Embankment around cricket pitch/village green)*	**1.8**	**0**	**5**	**0**	2^3	**1**	Y	Y	×××	N/A	×××	×××	×××	×××	××	N/A	N	N/A	N/A	×	××	×	**This option would reduce the playing area of the cricket ground and would negatively affect the character of the village green.**
Alignment J *(Embankment Through SSSI along the SSSI side edge of the stream*	**2.0**	**2**	**4**	**0**	2^3	**1**	Y	Y	×××	N/A	×××	×××	×	×	×××	N/A	N	N/A	N/A	×××	×××	×	**Alignment would result in a significant and permanent loss of land from the SSSI, including loss of an important fen habitat. This option is environmentally unacceptable.**

This page is intentionally blank

DEFENCE REACH & OPTIONS	KEY FEATURES OF ALIGNMENT: HEIGHT OF DEFENCE (m)	NO. OF 'FLOW CONTROL STRUCTURES	NO. OF FLOODGATES	NO. OF DEMOUNTABLE ACCESS POINTS (TOTAL LENGTH, M)	NO. OF CROSSINGS OVER/ MODIFICATIONS TO EXISTING SERVICES	NO. OF CROSSINGS OVER HIGH VOLAGE ELECTRICITY CABLES	REQUIREMENT FOR GROUND WATER CUT-OFF	REQUIREMENT FOR MODIFICATION TO SEWERAGE SYSTEM (I.E. BACK OF WALL DRAINAGE)	IPMACT ON NATURAL WATERCOURSES	OPPORTUNITY FOR ENVIRONMENTAL ENHANCEMENT	COMPARATIVE IMPACT ON EXISTING FEATURES/ENVIRONMENT: LANDSCAPE: ADVERSE IMPACT TO TREES (NO. OF TREES REMOVED)	LANDSCAPE: VISUAL IMPACT OF PROPOSED FLOODWALL	HUMAN POPULATION: IMPACT ON LOCAL RESIDENTS	HUMAN POPULATION: IMPACT ON RECREATION/ PUBLIC AMENITY AREAS	WATER: MAXIMISING FLOODPLAIN POTENTIAL	WATER: IMPACT ON EXISTING STRUCTURES	ARCHAEOLOGY & CULTURAL HERITAGE: IMPACTS ON LISTED BUILDINGS	ARCHAEOLOGY & CULTURAL HERITAGE: IMPACTS ON FEATURES OF ARCHAEOLOGICAL SIGNIFICANCE	TRAFFIC & TRANSPORT: IMPACT ON EXISTING ACCESS ARRANGEMENTS	LAND USE: IMPACTS TO THIRD PARTY AREAS (I.E.ENGLISH NATURE, NETWORK RAIL)	FLORA & FAUNA: IMPACT ON ATTENBOROUGH NATURE RESERVE (SSSI)	OPTION ACCEPTED OR REJECTED?	COMMENTS/SUMMARY
SCOPING REPORT PHASE																							
Beeston Canal to Thane Road RYLANDS																							
Option 1 ***(Hold existing Line)***	**0.4**	✓	N/A	×	×	×××	×	×	✓✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	×		N/A	✓			**Opportunity to formalise access to the existing embankment to ease future maintenance requirements. Construction will cause significant disruption to the residents of the caravan park.**
Option 2 ***(Protection for Caravan Park)***	**1.0m**	×	N/A	×	××	×	×	×××	✓✓	×	N/A	N/A	N/A	××	N/A	N/A	××		N/A	N/A			**Alignment in breach of Defra rules regarding provision of flood defences for mobile/temporary homes.**

Notes (1) For further details of the Scoping Report and alignments refer to Section B2.5.
(2) This matrix is by no means exhaustive and should be used as a comparative summary of the alignments considered during the early phases of the project.
(3) Diversion of utilities includes works associated with drainage improvements associated with the scheme

Key

Significant of Impact

✓ Minor Positive
× Minor Negative
✓✓ Moderate Positive
×× Moderate Negative
✓✓✓ Major Positive
××× Major Negative
N/S No Significant Impact

This page is intentionally blank

ANNEX B3
Figures

This page is intentionally blank

ENVIRONMENTAL CONSTRAINTS LEGEND

- SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- LOCAL WILDLIFE SITE (LWS) / SITE OF INTEREST FOR NATURE CONSERVATION (SINC)
- LOCAL NATURE RESERVE
- ER037 LWS REFERENCE NUMBER AND NAME
- CONSERVATION AREA
- REGISTERED / HISTORIC PARKS AND GARDENS
- TREE PRESERVATION ORDER
- SMR / ARCHAEOLOGICAL CONSTRAINT *
- SMR / ARCHAEOLOGICAL CONSTRAINT AREA *
- SCHEDULED MONUMENT AREA
- PUBLIC RIGHT OF WAY
- 4 PUBLIC RIGHT OF WAY REFERENCE NUMBER
- CYCLE PATH
- LISTED BUILDING
- WATER VOLE BURROW (DESK STUDY RECORD)
- OTTER (DESK STUDY RECORD)
- GREAT CRESTED NEWT (DESK STUDY)
- BAT RECORD (DESK STUDY)
- COUNTY RARE PLANT SPECIES (DESK STUDY RECORD)
- COUNTY SCARCE PLANT SPECIES (DESK STUDY RECORD)
- JAPANESE KNOTWEED
- HIMALAYAN BALSAM
- GIANT HOGWEED
- NEW FOOTPATH

* ONLY SITES POTENTIALLY AFFECTED BY THE SCHEME SHOWN

PHASE 1 HABITAT SURVEY LEGEND

BOUNDARIES

- FENCE
- INTACT HEDGE (NATIVE SPECIES-RICH)
- INTACT HEDGE (SPECIES-POOR)
- HEDGE AND TREES (NATIVE SPECIES-RICH)
- DRY DITCH

OPEN WATER

- STANDING WATER
- RUNNING WATER

WOODLAND AND SCRUB

- CONTINUOUS SCRUB
- SCATTERED SCRUB
- SEMI-NATURAL BROADLEAVED WOODLAND

TALL HERB AND FERN

- TALL RUDERAL

MISCELLANEOUS

- A ARABLE

GRASSLAND AND MARSH

- UNIMPROVED ACID GRASSLAND
- SI SEMI-IMPROVED ACID GRASSLAND
- UNIMPROVED NEUTRAL GRASSLAND
- SI SEMI-IMPROVED NEUTRAL GRASSLAND
- I IMPROVED GRASSLAND
- MARSHY GRASSLAND
- SI SPECIES POOR SEMI-IMPROVED GRASSLAND

ENGINEERING LEGEND

- WALL
- SHEET PILING
- EMBANKMENT
- DRAINAGE
- LINE OF HIGH GROUND
- TEMPORARY EASEMENT / WORKING AREA
- ACCESS ROUTE
- CROSS SECTION

TREE SURVEY LEGEND

- T1 TREE SURVEY REFERENCE
- G1 TREE SURVEY REFERENCE (GROUP OF TREES)
- T2 TREE TO BE LOST
- G2 GROUP OF TREES TO BE LOST
- H2 SECTION OF HEDGE TO BE LOST
- T INDIVIDUAL OR SMALL GROUP OF TREES
- G GROUP OF TREES

NOTES

1. THE AMOUNT THAT EXISTING DEFENCES NEED TO BE RAISED IN mm, IN A PARTICULAR AREA IS DENOTED BY THE CLEAR BOXED NUMBER, e.g. 150 . THE EXISTING AVERAGED HEIGHT OF THE DEFENCE (IN mm) IS DENOTED BY THE BLACK BOXED NUMBER, e.g. 1700 .
2. EXACT LOCATION OF SITE COMPOUNDS TO BE AGREED.

Environment Agency

							Name	Date
PE	UPDATED ENVIRONMENTAL STATEMENT	SPJ	EAS	SGB	OCT.08	Drawn:	SPJ	SEP.06
PD	UPDATED ENVIRONMENTAL STATEMENT	SPJ	CJe	EAS	AUG.08	Checked:	EAS	MAR.07
Rev.	Nature of revision	Drawn	Check	Review	Date	Reviewed:	PSm	MAR.07

NOTTINGHAM TRENT LEFT BANK FAS

ENVIRONMENTAL STATEMENT

BLACK & VEATCH Black & Veatch Limited

Drawing no. 108785-3000-0001-PE

This page is intentionally blank

N

CHILWELL MANOR GOLF COURSE

REACH 11

LONG LANE

BEESTON POND

REACH 12

REACH 13

BEESTON LOCK

NEW FENCING TO ALLOW GRAZING

NEW WATER CONTROL STRUCTURE

REACH 10

CEMEX WORKS

REACH 9

WORKS POND

REACH 9

ATTENBOROUGH VILLAGE

NOTTINGHAM ROAD (A6005)

REACH 6

REACH 7

REACH 8

Attenborough SSSI

MAIN POND

NEW WATER CONTROL STRUCTURE

REACH 3

REACH 4

NEW WATER CONTROL STRUCTURE

BARTON LANE

CHURCH POND

FISHPONDS SCHEDULED MONUMENT

REACH 6

REACH 5

TWEEN POND

NOTTINGHAMSHIRE COUNTY / BROXTOWE BOROUGH

RIVER EREWASH

REACH 2

ER198
Attenborough Pastures

CONERIES POND

REPROFILING OF ISLANDS

RIVER TRENT

NEW WATER CONTROL STRUCTURE

REACH 1

REACH 5

ATTENBOROUGH SAILING CLUB

NEW OTTER HOLTS

Attenborough SSSI

CLIFTON POND

ERR6559
Trent Meadows
(Potential)

ER076
Attenborough
Junction Tip

ER075
Barton Pool

ER076
Attenborough West
Gravel Pits

100m 0m 100m 200m 300m
Scale 1:5000

108785\60622\CAD\ISSUED\108785-3300-0002-PC1.V4>108785-3300-0002-PD.V1(S.P.J 25.10.08)

Drawing No. 108785-3300-0002 | Cad Ref | Rev. PD

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

LEGEND

- FLOOD DEFENCE LINE
- EXTENT OF REACH
- SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- SITE OF INTEREST FOR NATURE CONSERVATION (SINC) / LOCAL WILDLIFE SITE (LWS)
- LOCAL NATURE RESERVE
- ER037 SINC REFERENCE NUMBER AND NAME
- PUBLIC RIGHT OF WAY
- 4 PUBLIC RIGHT OF WAY REFERENCE NUMBER
- CYCLE PATH
- CONSERVATION AREA
- LISTED BUILDING
- SCHEDULED MONUMENT AREA
- WATER
- WATER VOLE BURROW (DESK STUDY RECORD)
- OTTER (DESK STUDY RECORD)
- GREAT CRESTED NEWT SITE (DESK STUDY RECORD)
- BAT SITE (DESK STUDY RECORD)
- COUNTY RARE PLANT SPECIES (DESK STUDY RECORD)
- COUNTY SCARCE PLANT SPECIES (DESK STUDY RECORD)
- JAPANESE KNOTWEED
- HIMALAYAN BALSAM
- GIANT HOGWEED
- NEW MARGINAL HABITAT
- NEW MARGINAL HABITAT (TO BE CONSTRUCTED IN 2009)
- NEW WET WOODLAND
- STUDY AREA (FLOOD PLAIN WITH 1% ANNUAL FLOODING PROBABILITY)

* ONLY SITES POTENTIALLY AFFECTED BY THE SCHEME SHOWN

Rev	Drawn	Checked	Reviewed	Date	Description
PD	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	OCT.06
Drawn by:	SPJ	Date:	OCT.06
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project
NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title
FIGURE BB3.1
ATTENBOROUGH, EREWASH AND RYLANDS OVERVIEW - SHEET 1 OF 2

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:5000	Sheet size:	A1

Drawing No. 108785 — 3300 — 0002 | Revision PD

This page is intentionally blank

N

NOTTINGHAM ROAD (A6005)

CHILWELL BROOK

CHILWELL MANOR GOLF COURSE

REACH 10

REACH 11

REACH 12

SIEMENS

BEESTON POND

BOOTS

REACH 14

TURNOVER BRIDGE

BEESTON LOCK

REACH 13

LONG LANE

NEW FENCING TO ALLOW GRAZING

NEW WATER CONTROL STRUCTURE

CEMEX WORKS

REACH 9

WORKS POND

ATTENBOROUGH VILLAGE

REACH 8

REACH 7

REACH 6

Attenborough SSSI

MAIN POND

29922

FISHPONDS SCHEDULED MONUMENT

CHURCH POND

TWEEN POND

REACH 5

NOTTINGHAMSHIRE COUNTY / BROXTOWE BOROUGH

CONERIES POND

REPROFILING OF ISLANDS

NEW OTTER HOLTS

CLIFTON POND

RIVER TRENT

Holme Pit SSSI

100m 0m 100m 200m 300m

Scale 1:5000

Drawing No.	Cad Ref	Rev.
108785-3300-0006		PC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

LEGEND

- FLOOD DEFENCE LINE
- EXTENT OF REACH
- SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- SITE OF INTEREST FOR NATURE CONSERVATION (SINC)
- LOCAL NATURE RESERVE
- ER037 SINC REFERENCE NUMBER AND NAME
- PUBLIC RIGHT OF WAY
- 4 PUBLIC RIGHT OF WAY REFERENCE NUMBER
- CYCLE PATH
- CONSERVATION AREA
- LISTED BUILDING
- SCHEDULED MONUMENT AREA
- WATER
- WATER VOLE BURROW (DESK STUDY RECORD)
- OTTER (DESK STUDY RECORD)
- GREAT CRESTED NEWT SITE (DESK STUDY RECORD)
- BAT SITE (DESK STUDY RECORD)
- COUNTY RARE PLANT SPECIES (DESK STUDY RECORD)
- COUNTY SCARCE PLANT SPECIES (DESK STUDY RECORD)
- JAPANESE KNOTWEED
- HIMALAYAN BALSAM
- GIANT HOGWEED
- NEW MARGINAL HABITAT
- NEW WET WOODLAND
- STUDY AREA (FLOOD PLAIN WITH 1% ANNUAL FLOODING PROBABILITY)

* ONLY SITES POTENTIALLY AFFECTED BY THE SCHEME SHOWN

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PA	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	CJe	Date:	AUG.08
Drawn by:	SPJ	Date:	AUG.08
Checked by:	AJB	Date:	AUG.08
Reviewed by:	EAS	Date:	AUG.08

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.2
ATTENBOROUGH, EREWASH AND RYLANDS OVERVIEW - SHEET 2 OF 2

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:5000	Sheet size:	A1

Drawing No. 108785 — 3300 — 0006 | Revision PC

This page is intentionally blank

CONSTRUCT NEW FLOOD EMBANKMENT, 1.0m TO 1.4m HIGH

A6005 NOTTINGHAM ROAD

ACCESS

REACH 3

REACH 4

SI (ungrazed)

SITE COMPOUND A

FLOOD EMBANKMENT TIES INTO EXISTING HIGH GROUND

REACH 3

CHILWELL RETAIL PARK

TREES AND SHRUBS WITHIN THE WORKING AREA TO BE REMOVED. WHERE POSSIBLE, SIGNIFICANT TREES ARE TO BE RETAINED AND PROTECTED DURING CONSTRUCTION

NEW FLOOD WALL TIES INTO NOTTINGHAM ROAD BRIDGE ABUTMENT

REACH 4

CONSTRUCT NEW BRICK CLAD REINFORCED CONCRETE FLOOD WALL, 0.85m TO 1.0m HIGH, OFFSET 2m AWAY FROM TOP OF RIVER BANK

NEW 1:10 ACCESS RAMP OVER EMBANKMENT

EXISTING FLOOD RELIEF CHANNEL INTO RIVER EREWASH TO BE MAINTAINED

ACCESS

MANOR GARAGE

CONTINUED ON FIGURE BB3.4

NEW BRICK CLAD REINFORCED CONCRETE FLOOD WALL, 0.2m TO 0.4m HIGH, TO BE BUILT IN LOCATION OF EXISTING WORK SHEDS. THE FLOOD WALL IS TO BE CONSTRUCTED 2m AWAY FROM TOP OF RIVER BANK

EXISTING RIVER BANK TO BE REGRADED AND PROTECTED TO LIMIT FUTURE EROSION

2m WIDE ACCESS TRACK FOR THE MAINTENANCE AND INSPECTION OF THE FLOOD DEFENCE. REINSTATEMENT OF BOUNDARY FENCING AND ASSOCIATED ACCESS GATES TO BE AGREED WITH EACH LANDOWNER

SI (horse grazed)

NEW FLOOD EMBANKMENT TIES INTO HIGH GROUND TO THE REAR OF THE RETAIL PARK

CONSTRUCT NEW FLOOD EMBANKMENT UP TO 0.8m HIGH

ST. LEONARD'S RIDING SCHOOL

NEW FLAP VALVE TO BE FITTED TO EXISTING OUTFALL

RIVER EREWASH

ER076 Attenborough Pastures

CONSTRUCT NEW REINFORCED CONCRETE FLOOD WALL, 0.7m TO 0.85m HIGH

ACCESS

REACH 2

RESTRICTED WORKING AREA DUE TO EXISTING TANK

CONSTRUCT NEW FLOOD EMBANKMENT 0.2m TO 0.6m HIGH

TOTON SEWAGE TREATMENT WORKS

ACCESS

RESTRICTED ACCESS DUE TO OVERHEAD ELECTRICITY CABLES

RESTRICTED WORKING AREA DUE TO EXISTING BUILDINGS AND ELECTRICAL SUB-STATION

SITE COMPOUND B

CONSTRUCT NEW REINFORCED CONCRETE FLOOD WALL, 1.0m HIGH

ACCESS

REACH 2

EXISTING HIGH GROUND FORMS FLOOD DEFENCE

FLOOD WALL TIES INTO EXISTING HIGH GROUND

SECTION HH

Scale 1:200

BOUNDARY FENCING BETWEEN PROPERTIES TO BE AGREED

BRICK CLAD REINFORCED CONCRETE FLOOD WALL WITH COPING STONE

FDL = 28.63m OD

RIVER BANK TO BE REPROFILED

EXISTING FLOOD BUND (CONSTRUCTED IN THE 80's)

SHEET PILE

Drawing No.	Cad Ref	Rev.
108785-3300-0501		PC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

5m 0m 5m 10m
Scale 1:200

10m 0m 10m 50m 100m
Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.3
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 1 OF 8

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0501 | Revision PC

This page is intentionally blank

NEW FLOOD EMBANKMENT TIES INTO HIGH GROUND TO THE REAR OF THE RETAIL PARK

CONSTRUCT NEW FLOOD EMBANKMENT UP TO 0.8m HIGH

CONSTRUCT NEW REINFORCED CONCRETE FLOOD WALL, 0.7m TO 0.85m HIGH

RESTRICTED WORKING AREA DUE TO EXISTING TANK

CONSTRUCT NEW FLOOD EMBANKMENT 0.2m TO 0.6m HIGH

RESTRICTED ACCESS DUE TO OVERHEAD ELECTRICITY CABLES

RESTRICTED WORKING AREA DUE TO EXISTING BUILDINGS AND ELECTRICAL SUB-STATION

CONSTRUCT NEW REINFORCED CONCRETE FLOOD WALL, 1.0m HIGH

FLOOD WALL TIES INTO EXISTING HIGH GROUND

EXISTING HIGH GROUND FORMS FLOOD DEFENCE

FLOOD WALL TIES INTO BRIDGE ABUTMENT

ACCESS POINT. WALL 0.15m HIGH

CONSTRUCT NEW FLOOD EMBANKMENT, 0.6m HIGH, TO TIE INTO HIGH GROUND

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), 0.5m TO 0.75m HIGH, OFFSET 1m FROM RAILWAY FENCE

BACK OF WALL DRAIN

BACK OF WALL DRAIN TO OUTFALL INTO LAKE

SHEET PILING OFFSET FROM HIGH VOLTAGE ELECTRICITY CABLES

SHEET PILING OFFSET FROM ELECTRICITY CABLES.

BARTON LANE TO BE RAISED BY 0.68m

SITE COMPOUND B

SITE COMPOUND C

STORAGE AREA D

GATE HOUSE

TOTON SEWAGE TREATMENT WORKS

ATTENBOROUGH SAILING CLUB

CONERIES POND

VISITOR CENTRE

Attenborough SSSI

ER076 Attenborough Pastures

RIVER EREWASH

RAILWAY LINE

BARTON LANE

ACCESS

REACH 1

REACH 2

REACH 5

REACH 6

T80 T81 T82 T83 T84 T85 T86 T87 T88 G39 G40

CONTINUED ON FIGURE BB3.3

CONTINUED ON FIGURE BB3.5

RAILWAY FENCE TO BE TAKEN DOWN AND REINSTATED ON COMPLETION OF THE WORKS

FDL = 28.49m OD

TIMBER CLAD REINFORCED CONCRETE FLOOD WALL

SECTION JJ

Scale 1:200

Scale 1:200

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Drawing No. 108785-3300-0502 | Cad Ref | Rev. PC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.0
Reviewed by:	PSm	Date:	MAR.07

Client: Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

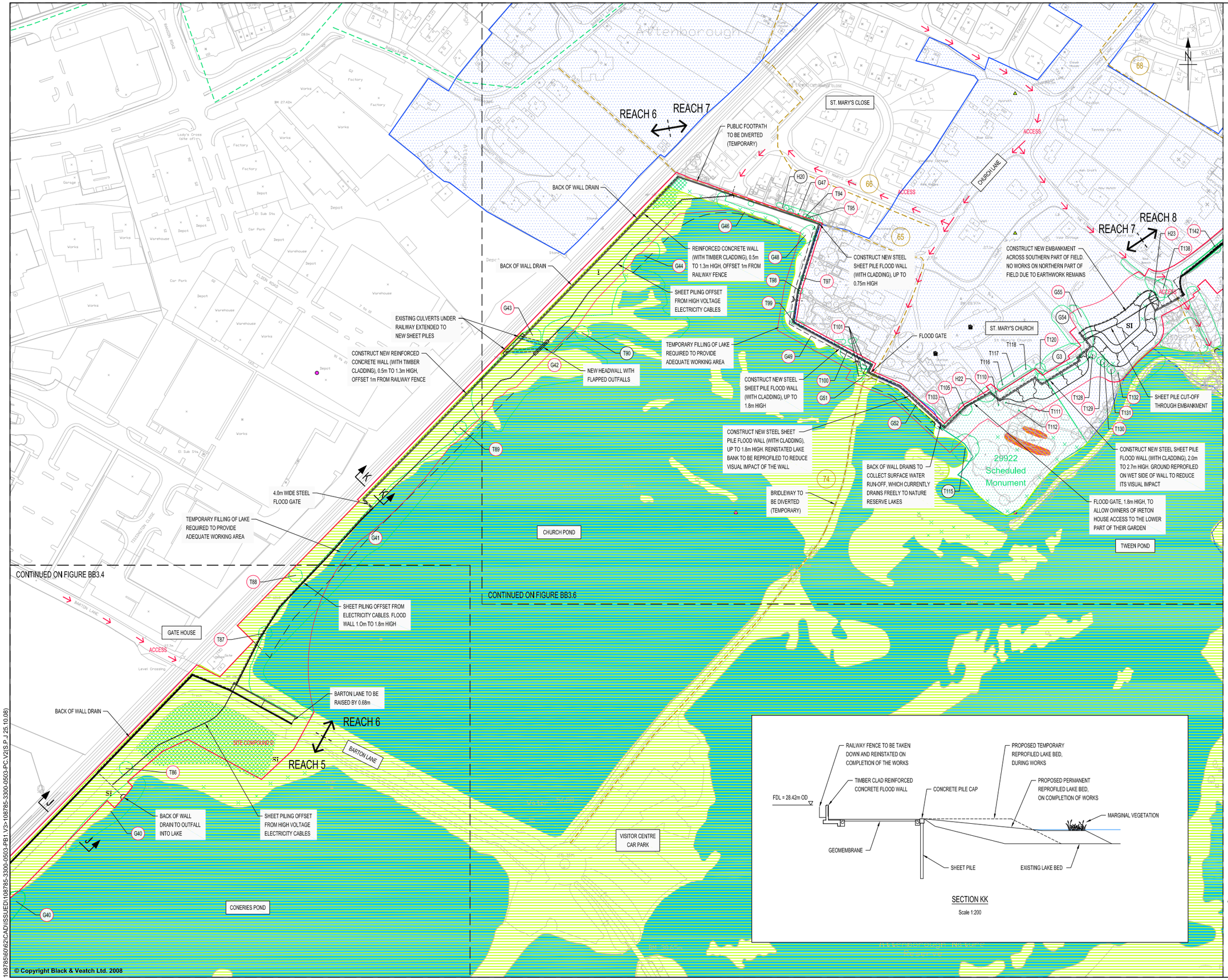
Project: NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title: FIGURE BB3.4 ATTENBOROUGH, EREWASH AND RYLANDS GENERAL ARRANGEMENT - SHEET 2 OF 8

Approved by:	EAS	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0502 | Revision PC

This page is intentionally blank



Drawing No. 108785-3300-0503 | Cad Ref | Rev. PC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.
2. WALL AROUND THE PERIPHERY OF ATTENBOROUGH VILLAGE IS TO BE CLAD WITH NATURAL STONE AND AGREED WITH LOCAL PLANNING AUTHORITY.

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client: Environment Agency

Client drawing No. | Revision

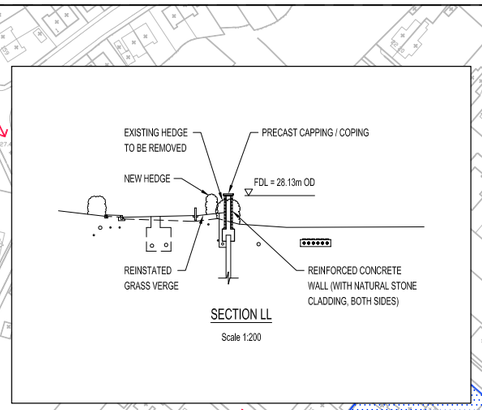
BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project: NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title: FIGURE BB3.5 ATTENBOROUGH, EREWASH AND RYLANDS GENERAL ARRANGEMENT - SHEET 3 OF 8

Approved by:	EAS	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1
Drawing No.	108785 — 3300 — 0503	Revision	PC

This page is intentionally blank



SECTION LL

Scale 1:200

CONTINUED ON FIGURE BB3.7

CONTINUED ON FIGURE BB3.5

CONSTRUCT NEW EMBANKMENT WITH SHEET PILE CUT-OFF

ACCESS SHARED WITH CEMEX

CONSTRUCT NEW SHEET PILE FLOOD WALL (WITH CLADDING), 1.4m HIGH

PERMANENT ACCESS STRIP ON WET SIDE OF WALL. GAPS TO BE INCLUDED TO MAINTAIN SECURITY

BACK OF WALL DRAINS TO COLLECT SURFACE WATER RUN-OFF, WHICH CURRENTLY DRAINS FREELY TO NATURE RESERVE LAKES

TEMPORARY INFILLING OF LAKE REQUIRED TO PROVIDE ADEQUATE WORKING AREA

REACH 9

REACH 8

1.0m WIDE SINGLE FLOOD GATE

1.8m HIGH, FLOOD GATE ACROSS FOOTPATH

2.0m HIGH, DOUBLE FLOOD GATE

CONSTRUCT NEW REINFORCED CONCRETE FLOOD WALL (WITH CLADDING) ALONG EDGE OF ROAD, 1.8m HIGH

2.0m HIGH, DOUBLE FLOOD GATE TO ACCESS

EXISTING TIMBER FRAME GARAGE TO BE DEMOLISHED AND REBUILT ON TOP OF NEW FLOOD WALL

BOWLING GREEN

CRICKET PAVILLION

CONSTRUCT NEW STEEL SHEET PILE FLOOD WALL (WITH CLADDING). EXISTING ROAD TO BE REPROFILED TO REDUCE THE WALL'S VISUAL IMPACT TO 1.5m HIGH ON ROAD SIDE.

GLEBE FIELD

THE BROOK

OLD FISHERMAN'S CAR PARK

STORAGE AREA E

STORAGE AREA ON EXISTING HARD STANDING

MAIN POND

TWEEN POND

CHURCH POND

REACH 6

REACH 7

REACH 8

PUBLIC FOOTPATH TO BE DIVERTED (TEMPORARY)

BACK OF WALL DRAIN

REINFORCED CONCRETE WALL, (WITH TIMBER CLADDING) 0.5m TO 1.3m HIGH, OFFSET 1m FROM RAILWAY FENCE

CONSTRUCT NEW STEEL SHEET PILE FLOOD WALL (WITH CLADDING), UP TO 0.75m HIGH

SHEET PILING OFFSET FROM HIGH VOLTAGE ELECTRICITY CABLES

NEW HEADWALL WITH FLAPPED OUTFALLS

EXISTING CULVERTS UNDER RAILWAY EXTENDED TO NEW SHEET PILES

TEMPORARY FILLING OF LAKE REQUIRED TO PROVIDE ADEQUATE WORKING AREA

CONSTRUCT NEW STEEL SHEET PILE FLOOD WALL (WITH CLADDING), UP TO 1.8m HIGH

CONSTRUCT NEW STEEL SHEET PILE FLOOD WALL (WITH CLADDING), UP TO 1.8m HIGH. REINSTATED LAKE BANK TO BE REPROFILED TO REDUCE VISUAL IMPACT OF THE WALL

BRIDLEWAY TO BE DIVERTED (TEMPORARY)

BACK OF WALL DRAINS TO COLLECT SURFACE WATER RUN-OFF, WHICH CURRENTLY DRAINS FREELY TO NATURE RESERVE LAKES

FLOOD GATE, 1.8m HIGH, TO ALLOW OWNERS OF IRETON HOUSE ACCESS TO THE LOWER PART OF THEIR GARDEN

CONSTRUCT NEW STEEL SHEET PILE FLOOD WALL (WITH CLADDING), 2.0m TO 2.7m HIGH. GROUND REPROFILED ON WET SIDE OF WALL TO REDUCE ITS VISUAL IMPACT

SHEET PILE CUT-OFF THROUGH EMBANKMENT

CONSTRUCT NEW EMBANKMENT ACROSS SOUTHERN PART OF FIELD. NO WORKS ON NORTHERN PART OF FIELD DUE TO EARTHWORK REMAINS

2.0m HIGH DOUBLE FLOOD GATE TO ACCESS

FLOOD GATE

ST. MARY'S CHURCH

29922 Scheduled Monument

SI (ungrazed)

SI (amenity)

WORKS POND

LONG LANE

ATTENBOROUGH LANE

ALLENDALE AVENUE

ST. MARY'S CLOSE

CHURCH LANE

THE STRAND

REIGATE DRIVE

ACCESS

Drawing No. 108785-3300-0504 | Cad Ref | Rev. PD

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.
2. WALL AROUND THE PERIPHERY OF ATTENBOROUGH VILLAGE IS TO BE CLAD WITH NATURAL STONE AND AGREED WITH LOCAL PLANNING AUTHORITY.

5m 0m 5m 10m
Scale 1:200

10m 0m 10m 50m 100m
Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PD	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.6
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 4 OF 8

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0504 | Revision PD

This page is intentionally blank

CHILWELL MANOR GOLF COURSE

CONSTRUCT NEW 0.3m HIGH EARTH EMBANKMENT. 1.0m WIDE CREST, 1 IN 3 SIDE SLOPES

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), 1.8m TO 2.5m HIGH, OFFSET FROM 1m RAILWAY FENCE

BRIDLEWAY TO BE DIVERTED (TEMPORARY)

STEEL SHEET PILING OFFSET FROM RAILWAY FENCE

BACK OF WALL DRAIN

CONTINUED ON FIGURE BB3.8

REACH 11

ACCESS

STORAGE AREA G

POND WAS DRY IN MAY 2008

BRIDLEWAY TO BE DIVERTED (TEMPORARY)

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), UP TO 1.2m HIGH, OFFSET 1m FROM RAILWAY FENCE

SITE COMPOUND F

LONG LANE

EXISTING VISUAL SCREENING BUND. TREES TO BE FELLED. BUND TO BE REMOVED. PLANTING OR FENCING TO BE ERECTED UPON ON COMPLETION OF WORKS

STEPS OR RAMPED ACCESS AT LEVEL CROSSING ON BOTH SIDES

CEMEX WORKS SITE

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), UP TO 1.2m HIGH, OFFSET 1m FROM RAILWAY FENCE

REACH 10

REACH 9

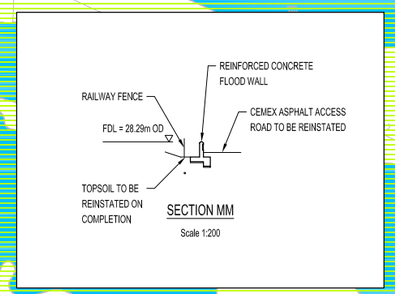
RAMP IN ACCESS ROAD (0.9m HIGH)

CONTINUED ON FIGURE BB3.6

CONSTRUCT NEW EMBANKMENT WITH SHEET PILE CUT-OFF

ACCESS SHARED WITH CEMEX

WORKS POND



SECTION MM

Scale 1:200

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

5m 0m 5m 10m

Scale 1:200

10m 0m 10m 50m 100m

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EA	Date:	MAR.0
Reviewed by:	PS	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.7
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 5 OF 8

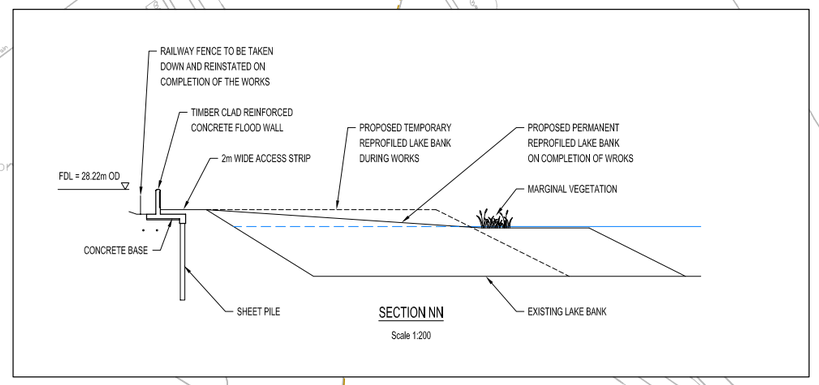
Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0505 | Revision PC

Drawing No. 108785-3300-0505 | Cad Ref | Rev. PC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

This page is intentionally blank



SECTION NN

Scale 1:200

CHILWELL BROOK

CONSTRUCT NEW 0.3m HIGH EARTH EMBANKMENT. 1.0m WIDE CREST, 1 IN 3 SIDE SLOPES. EMBANKMENT TIES INTO HIGH GROUND

ACCESS

REACH 11

CHILWELL MANOR GOLF COURSE

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), 1.8m TO 2.5m HIGH, OFFSET 1m FROM RAILWAY FENCE

BACK OF WALL DRAIN DISCHARGES INTO BROOK. NEW HEADWALL, FLAP VALVE AND CULVERT EXTENSION, PASSING THROUGH SHEET PILES

BACK OF WALL DRAIN

STEEL SHEET PILING OFFSET FROM RAILWAY FENCE

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH CLADDING), 0.8m TO 1.5m HIGH, OFFSET 1m FROM RAILWAY FENCE

BACK OF WALL DRAIN

STEEL SHEET PILING, OFFSET FROM RAILWAY FENCE. CONCRETE SLAB BETWEEN FLOOD WALL AND PILE, COVERED WITH TOPSOIL

FOOTPATH JUNCTION

BRIDLEWAY TO BE DIVERTED (TEMPORARY)

PUBLIC FOOTPATH TO BE DIVERTED (TEMPORARY)

CONTINUED ON FIGURE BB3.7

CHILWELL MANOR GOLF COURSE

NEW FLAP VALVE REQUIRED

NEW PENSTOCK TO BE MOUNTED ON EXISTING MASONRY HEADWALL

TEMPORARY FILLING OF LAKE REQUIRED TO PROVIDE ADEQUATE WORKING AREA

REPLACEMENT PENSTOCK AND HEADWALL REQUIRED. BACK OF WALL DRAIN DISCHARGES INTO NEW CULVERT. NEW CULVERT PASSES THROUGH SHEET PILES

CONSTRUCT NEW REINFORCED CONCRETE WALL (WITH TIMBER CLADDING), 0.8m TO 1.5m HIGH

BACK OF WALL DRAIN

SHEET PILING OFFSET FROM RAILWAY FENCE

REPLACEMENT FLAP VALVE AND HEADWALL REQUIRED

BEESTON POND

POSSIBLE ACCESS FROM 'SIEMENS'

SIEMENS

REACH 10

REACH 12

NEW 0.4m HIGH MASONRY WALL, OFFSET 1m FROM ACCESS ROAD

BOAT SLIPWAY RAMP RAISED

CONTINUED ON FIGURE BB3.9

Attenborough SSSI

MEADOW LANE

LONG LANE

BARKERS LANE

BURNHAM AVENUE

WHEATLEY GROVE

Allotment Gardens

BEESTON

Chilwell Manor

Attenborough

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

5m 0m 5m 10m

Scale 1:200

10m 0m 10m 50m 100m

Scale 1:1250

PD	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.04	UPDATED ENVIRONMENTAL STATEMENT
Rev	Drawn	Checked	Reviewed	Date	Description

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EA	Date:	MAR.07
Reviewed by:	PS	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.8
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 6 OF 8

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0506 | Revision PD

Drawing No. 108785-3300-0506 | Cad Ref | Rev. PD

108785\60\62\CAD\ISSUED\108785-3300-0506-PC1.V3> 108785-3300-0506-PD.V1(S.P.J 25.10.08)

This page is intentionally blank

CONTINUED ON FIGURE BB3.8

CONTINUED ON FIGURE BB3.10

NEW 0.4m HIGH MASONRY WALL, OFFSET 1m FROM ACCESS ROAD

BOAT SLIPWAY RAMP RAISED

SIEMENS STREAM

EXISTING SLUICE TO BE REPLACED

WORKS COMPRISE RAISING AND REPROFILING LANDWARD SIDE OF EXISTING EMBANKMENT

ALLOTMENTS

SITE COMPOUND H

SPORTS GROUND

EXISTING RAMP ACROSS RIVERSIDE ROAD EXTENDED

NEW BORED PILE FLOOD WALL, UP TO 2.3m HIGH

BEESTON MARINA AND MOBILE HOME COMPLEX

WORKS COMPRISE RAISING AND REPROFILING EXISTING EMBANKMENT

RAISE WALL

WORKS COMPRISE RAISING AND REPROFILING EXISTING EMBANKMENT

EXISTING RAMP ACROSS RIVERSIDE ROAD TO BE RAISED BY 0.65m

RIVERSIDE ROAD

CONSTRUCT NEW FLOOD WALL ALONG LINE OF EXISTING EMBANKMENT THROUGH CARAVAN PARK

REACH 12

REACH 13

EXISTING WALL DEMOLISHED AND NEW 1.8m HIGH FLOOD WALL CONSTRUCTED IN ITS PLACE

RIVER TRENT

BEESTON LOCK COTTAGE

NO VEHICLES

SITE COMPOUND I

EXISTING LOCK GATES AND ASSOCIATED STRUCTURE REPLACED WITH NEW GATES, 1.1m HIGHER

BEESTON WEIR

NEW BORED PILE FLOOD WALL BUILT AGAINST EXISTING WALL. NEW WALL 600mm HIGHER THAN EXISTING WALL

NEW 700mm HIGH BORED PILE FLOOD WALL

EXISTING EMBANKMENT RAISED AND REPROFILED TO CREATE A BERM ADJACENT TO THE CANAL

NOTTINGHAM AND BEESTON CANAL

ACCESS FROM NOTTINGHAM POWER LEAGUE (OFF THANE ROAD)

FOOTPATH REINSTATED ON EMBANKMENT CREST

CYCLE PATH AND FOOTPATH TO BE CLOSED DURING WORKS (TEMPORARY)

CHANGING ROOMS / PAVILION (ON STILTS)

WEIR FIELD RECREATION GROUND

EXISTING EMBANKMENT TO BE RAISED AND REPROFILED

FOOTPATH TO BE DIVERTED (TEMPORARY)

TRENT VALLEY WAY PATH

Attenborough SSSI

I (Amenity)

Weir Field Recreation Ground

I (Amenity)

A

EMBANKMENT

BOUNDARY FENCE (POST AND WIRE TYPE) TO BE REINSTATED AT TOE OF NEW EMBANKMENT ON COMPLETION OF WORKS

4000

CARAVAN PARK BOUNDARY FENCE (POST AND WIRE TYPE) TO BE REINSTATED ON COMPLETION OF WORKS

SECTION PP

Scale 1:200

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

5m 0m 5m 10m

Scale 1:200

10m 0m 10m 50m 100m

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PD	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	LBo	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EA	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.9
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 7 OF 8

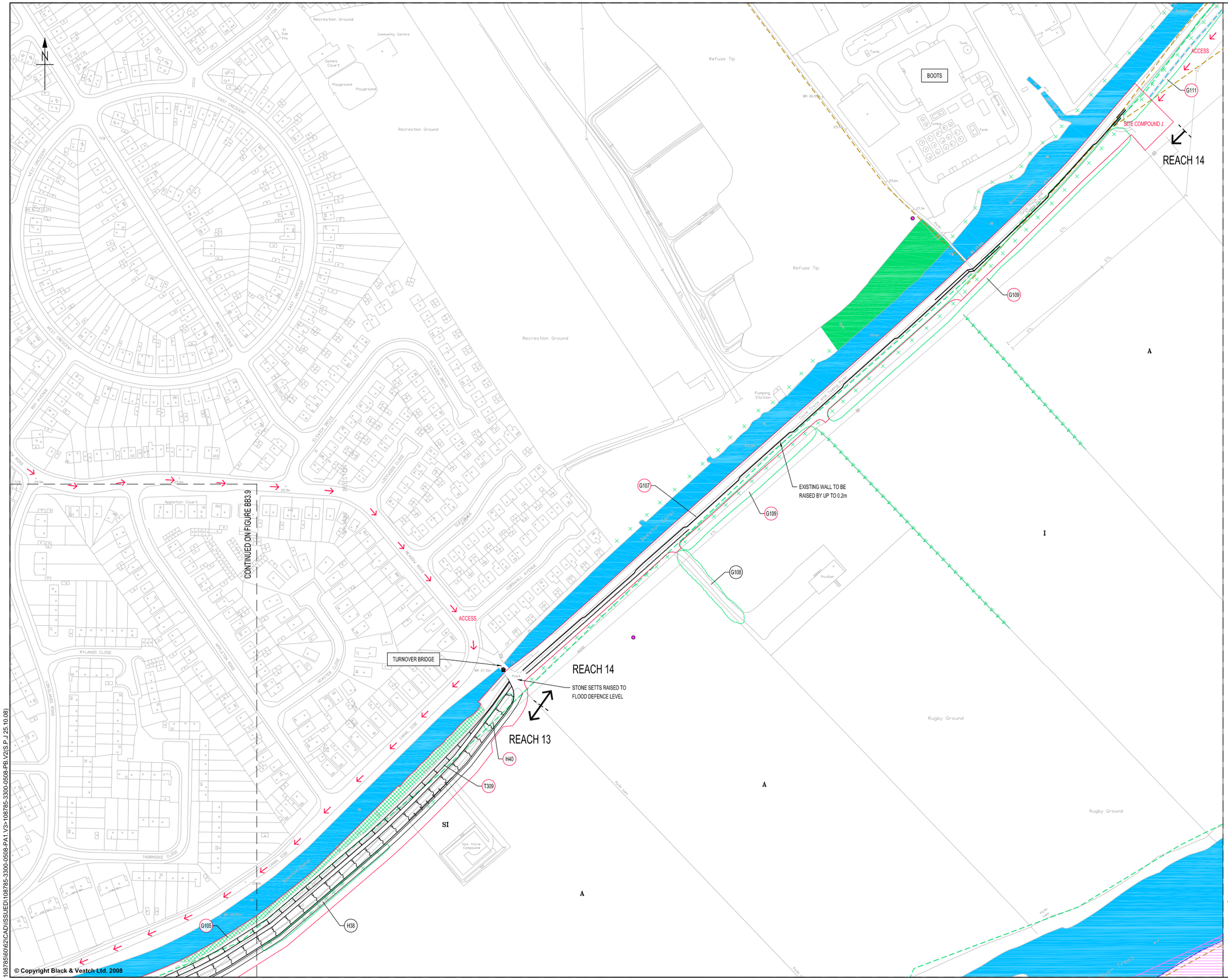
Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0507 | Revision PD

Drawing No. 108785-3300-0507 | Cad Ref | Rev. PD

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

This page is intentionally blank



1087856\60\62\CAD\ISSUED\108785-3300-0508-PA1.V3>108785-3300-0508-PB.V2(S.P.J 25.10.08)

Drawing No.	Cad Ref	Rev.
108785-3300-0508		PB

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

10m 0m 10m 50m 100m

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PA	SPJ	CJe	EAS	AUG.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	CJe	Date:	AUG.08
Drawn by:	SPJ	Date:	AUG.08
Checked by:	AJB	Date:	AUG.08
Reviewed by:	EAS	Date:	AUG.08

Client

Environment Agency

Client drawing No. | Revision

BLACK & VEATCH
Black & Veatch Limited
38 City Road, Chester, CH1 3AE. United Kingdom
Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE BB3.10
ATTENBOROUGH, EREWASH AND RYLANDS
GENERAL ARRANGEMENT - SHEET 8 OF 8

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:1250	Sheet size:	A1

Drawing No. 108785 — 3300 — 0508 | Revision PB

This page is intentionally blank