Nottingham Trent Left Bank FAS Environmental Statement

APPENDIX C – MEADOWS AND COLWICK COUNTRY PARK

OCTOBER 2008

Reference number IMMI000642

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME ENVIRONMENTAL STATEMENT

APPENDIX C
MEADOWS & COLWICK COUNTRY PARK

CONTENTS

A list of abbreviations, glossary and references are included in *Sections 12 to 14, Volume 1.*

List of Tables

List of Figures

In Main Text

In Annex C2

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C1. INTRODUCTION

C1.1 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 that 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 being treated as a single 'flood cell'. By this term we mean that a breach at the defences at any location could, in theory, lead to flooding of 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 C1.1.

[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 C1.1 Scheme Area 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 C* and it describes the EIA for works within Nottingham City Council's jurisdiction; the area is referred to in this appendix as 'Meadows and Colwick Country Park'. This appendix contains a description of the baseline conditions, the proposed works, their associated impacts and the proposed mitigation measures for the Meadows and Colwick Country Park scheme area. It should be read in conjunction with *Volume 1*.

C1.2 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 Meadows and Colwick Country Park scheme area are as follows:

- The alignment along the Meadows has been altered to include an embankment across Wilford Grove Recreation Ground instead of raising the entire existing flood wall around Victoria Embankment to the suspension bridge. The new alignment includes the provision of a raised circular platform where it intercepts Wilford Grove. This change has been agreed and developed with Nottingham City Council to improve the recreational quality of this area.
- The use of demountable defences for the Meadows is no longer being considered after the recommendations of the Pitt Report on floods in 2007; refer to *Section C2.5*.
- Road and kerb raising works are no longer required along Racecourse and Daleside Road; refer to Figure CC2.2. The results of the new model show that the existing high ground is sufficient for a flood event with a 1% probability of occurrence.
- The existing section of flood embankment south of Candle Meadow does not need to be raised for the FAS; refer to Figure CC2.2.

C1.3 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, between Wilford Toll Bridge on the Victoria Embankment and Nottingham City Council's boundary at Colwick Country Park; refer to Figure C1.1.

C1.4 Description of the Scheme Area

The FAS proposes development to provide flood protection to the left bank of the River Trent through Nottingham. This includes alterations to the flood defences through the Meadows area up to and including Colwick Country Park. For the purposes of our work, the area is split into a number of reaches, which are characterised by the works proposed. For our purposes we have divided the area into four reaches as shown in Plates C1.1 to C1.4 and Figures CC2.1 and CC2.2 in *Annex C2*. 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.

C1.4.1 Meadows

The Meadows area is located in close proximity to the centre of Nottingham and comprises residential, industrial, commercial and recreational land uses. There are existing flood defences through a number of the reaches, which are principally flood walls that tie into areas of high ground.

The Meadows is divided into Reaches 1 to 3, shown in Plates C1.1 to C1.3:

- Reach 1: Wilford Toll Bridge to Suspension Bridge
- Reach 2: Suspension Bridge to Trent Bridge
- Reach 3: Trent Bridge to Ladybay Bridge

C1.4.2 Colwick Country Park

The Colwick Country Park reach is downstream from Meadows. It comprises a predominantly recreational area around the northern boundary of Nottingham Racecourse and Colwick Country Park as far as the Nottingham City Council boundary. There are existing flood defences through the Country Park which were built as part of the original 1950s scheme. The sections of these defences behind Candle Meadow typically provide flood protection against flood events with a 1% annual probability of occurrence. Around the racecourse and along Dale End Road the pavement and grass banks are above the required flood defence level.

Reach 4 is shown on Plate C1.4, with the numbering system following on from Meadows.

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MEADOWS & COLWICK COUNTRY PARK

AREA OF PLANNED REGENERATION

COLWICK COUNTRY PARK CAR PARK

CANDLE MEADOW HOUSING ESTATE

COLWICK COUNTRY PARK

NOTTINGHAM RACECOURSE

MEADOWS & COLWICK COUNTRY PARK SCHEME AREA

PERSONAL STORAGE

ARLA DEPOT

MEADOW LANE LOCK

TRENT BRIDGE

WAR MEMORIAL AND GARDENS

SUSPENSION BRIDGE

VICTORIA EMBANKMENT

WILFORD TOLL BRIDGE

A

B

C

D

E

SCALE
0km 0.5km 1km

Key

PROPOSED DEFENCES

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

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Meadows & Colwick Country Park Study Area

Environment Agency

Scale 1 : 14,000 @ A3

Figure C1.1

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Reach 1 Wilford Toll Bridge to Suspension Bridge already has an existing flood defence wall, which was constructed in the 1950s. The defence extends for a length of 840m until it merges with higher ground. This high ground continues for 440m, where it meets the Grade II listed Suspension Bridge. The combined defences and high ground typically provide protection against a 2% (1 in 50) flood event with a 1% annual probability of occurrence.

Reach 2 Suspension Bridge to Trent Bridge does not have any formal flood defences. Several small retail units, a public house and the Grade II listed War Memorial and gardens could potentially be affected during the construction of new defences. The high ground through the reach does not provide protection against an event with a 1% annual probability of occurrence.

Victoria Embankment is a privately owned road, which stretches the length of Reaches 1 and 2. Large mature London plane trees line the embankment on both sides of the road, making the area visually attractive. The river bank is maintained by Nottingham City Council and is frequently used by pedestrians.

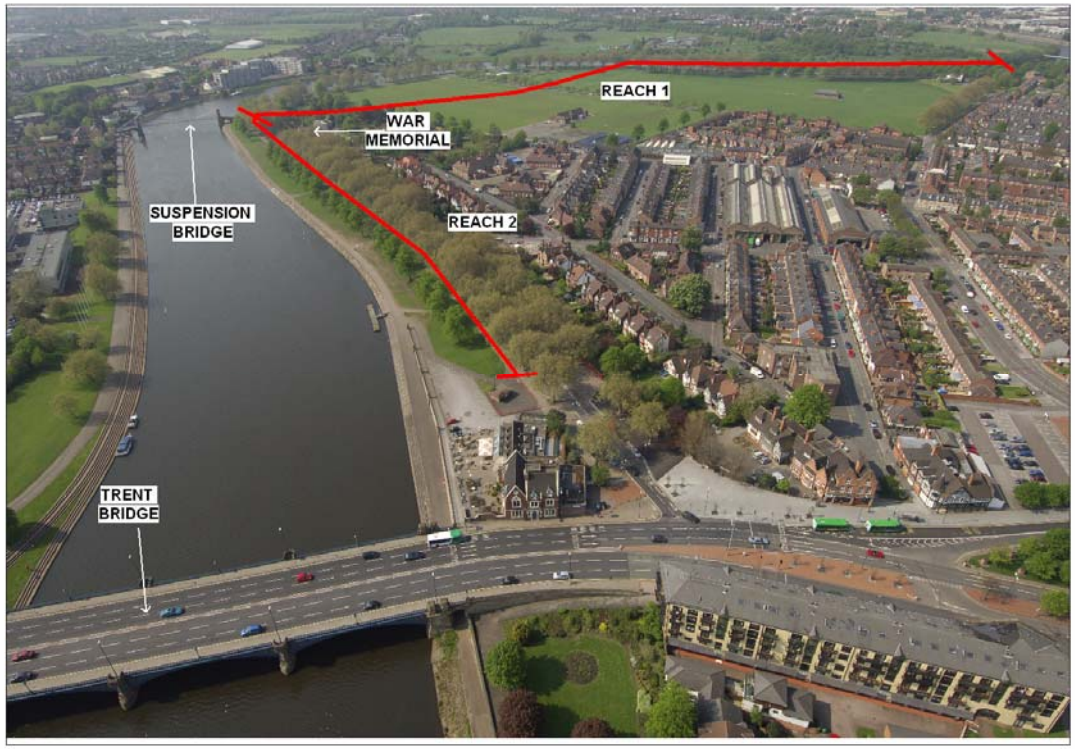

Plate C1.1 Meadows Reaches 1 and 2

Reach 3 Trent Bridge to Ladybay Bridge is split into the following 3 sub-reaches, because the works are not continuous. The defences through this reach do not currently provide protection against an event with a 1% annual probability of occurrence.

Sub-reach 3.1 Trent Bridge to Meadow Lane Lock is a section of works around Meadow Lane Lock, where the Nottingham and Beeston Canal joins the River Trent. Existing defences within this reach consist of a flood wall behind the Lock-Keepers Cottage.

Sub-reach 3.2 The Arla Depot is an open area immediately downstream of Tinkers Leen which contains a number of small industrial units and offices. The river wall to the depot provides some protection, although currently there are no formal defences.

Plate C1.2 Meadows Upstream Reach 3

Sub-reach 3.3 Personal Storage is a large warehousing facility, with a grass bank bordering the River Trent. It includes a youth centre adjacent to Ladybay Bridge.

Improvements to the flood protection immediately downstream of Ladybay Bridge are not included in this scheme. The ground behind the existing defences is sufficiently high and a failure of the defence would only result in localised flooding. The local authority has embarked on a 10 year regeneration plan to develop riverside apartments and amenities from Ladybay Bridge to Racecourse Road; refer to Figure C1.1. If required, the regeneration will incorporate designs for flood risk management which will tie in with the proposed FAS defences.

Plate C1.3 Meadows Downstream Reach 3

Reach 4 Colwick Country Park Car Park is accessed from Daleside Road East by recreational users of Colwick Country Park. Flood risk management is currently provided by an embankment through Colwick Country Park. The embankment typically provides flood protection from a flood event with a 2% (1 in 50) probability of occurrence.

Plate C1.4 Colwick Country Park Reach 4

C1.4.3 Future Status of the Meadows and Colwick Country Park

Should the proposed flood defence improvements not proceed, there will be long-term effects throughout Meadows and Colwick. The standard of protection provided by the existing defences is less than that recommended by the Department of Environment, Farming and Rural Affairs (Defra). Some of the defences are approaching the end of their useful life and there is an increasing risk of failure. Over time, the defences would continue to deteriorate and the risk of flooding would increase. This would be compounded because of the effects of climate change. Should the defences fail, approximately 16,000 properties on the left bank of 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 greenbelt 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 Meadows and Colwick Country Park 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 chance of occurrence.

Large areas of the Meadows and Colwick Country Park scheme area are designated for regeneration in the future and Nottingham City Council, supported by the Environment Agency, will ensure the responsibility for the provision of flood defences will rest with the developers. This approach is in compliance with planning guidance and demonstrates efficient use of public money.

[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.

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C2. PROJECT PROCESSES, RESIDUES AND EMISSIONS

C2.1 Physical Characteristics

18 different 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 options have also been considered following consultation with landowners and statutory bodies. *Section C2.5* describes the main options considered for Meadows and Colwick Country Park.

A summary of the proposed construction works is shown on the General Arrangement Figures (CC2.3 to CC2.7) which are in *Annex C2*.

C2.1.1 Works at the Meadows & Colwick Country Park

The main proposed works at Meadows and Colwick Country Park will comprise the following:

- replacing 700m of existing flood wall along Victoria Embankment downstream of the Toll Bridge in Reach 1;
- construction of 400m of new embankment across Wilford Grove Recreation Ground to accommodate future regeneration plans of Nottingham City Council in Reach 1;
- construction of 245m of floodwall around the Memorial Gardens in Reach 2;
- Raising the level of Victoria Embankment in front of the War Memorial in Reach 2;
- construction of 365m along the rear boundaries of properties on Fraser Road in Reach 2;
- raising walls around Meadow Lane Lock in Reach 3;
- construction of a new pumping station on the Tinkers Leen outfall in Reach 3;
- construction of new wall at the Arla Depot and Personal Storage on Meadow Lane in Reach 3;
- construction of 275m of new embankment through Colwick Country Park car park in Reach 4.

An outline of the works proposed for each reach is provided in Table C2.1.

Table C2.1 Proposed works at the Meadows and Colwick Country Park

Reach	Work Summary	Description	Length	Site Access	Alternatives Alignments Considered
MEADOWS					
1 – Wilford Toll Bridge to Suspension Bridge	Construct new wall	A new wall and access embankment will be constructed between the Toll House and the existing flood wall. The wall will be clad with natural stone to tie in with the Toll House. 700m of the existing flood wall will be demolished and replaced with a 1.45m high stone clad wall. Two ramps will be provided over the wall to maintain pedestrian access.	700m	Victoria Embankment & Wilford Grove	New wall along Victoria Embankment with alternative alignments. Refer to *Section C2.5.1*
	Raise road	A section of Victoria Embankment Road will be raised where the flood defence passes into the recreation ground.	40m		
	Construct new embankment	A new 170m embankment, 3.1m high will be constructed across the Wilford Grove Recreation Ground. At Wilford Grove a large terrace will be formed. Beyond Wilford Grove a new 200m embankment, 1.8m high, will be constructed across the recreation ground.	400m		
	Construct new wall	A new wall, 1.5m high, will be constructed through the landscaped area adjacent to the bandstand to tie in with Victoria Embankment opposite the Suspension Bridge.	85m		
2 – Suspension Bridge to Trent Bridge	Construct new wall	A new wall with natural stone cladding will be constructed on the front edge of the Memorial Gardens, either side of the War Memorial, in place of the existing hedge. The wall will be around 1m high.	160m	Victoria Embankment	New wall along an alternative alignment. Refer to *Section C2.5.2.*

Reach	Work Summary	Description	Length	Site Access	Alternatives Alignments Considered
	Road raising	In front of the War Memorial the flood defence will be incorporated into a wider landscaped scheme to include: raising the levels of Victoria Embankment road; reducing the road width to increase pedestrian areas; limiting parking in front of the Memorial.	80m		
	Construct new wall	A flood defence wall will be constructed along the rear boundaries of properties on Fraser Road, facing Victoria Embankment. This wall will be up to 1m high. The wall will incorporate a flood gate for each property and will extend to the gated entrance to Victoria Embankment.	365m		
	Road raising	The junction of Victoria Embankment with Bunbury Street will be raised by 0.5m and a floodgate installed. The junction layout may be revised for traffic management purposes.	20m		
3 – Trent Bridge to Ladybay Bridge	**Sub-reach 3.1**				None considered during outline design.[2]
	Raise existing walls	The wall immediately downstream of Trent Bridge will be raised by 200mm.	140m	London Road/ Meadow Lane/ Victoria Embankment	
	Construct new wall	The existing masonry wall between the River Trent and the Lock Keeper's Cottage will be demolished and rebuilt to a level 1.2m higher than the existing wall.	20m		
	Construct new wall	A new wall will then be constructed across the front of the lock cottage replacing the existing masonry wall.	15m		
	Raise existing wall	The existing concrete wall between the cottage and the lock will be raised by 100mm.	20m		

Reach	Work Summary	Description	Length	Site Access	Alternatives Alignments Considered
	Raise existing wall	A section of reinforced concrete wall by Meadow Lane Lock is to be raised by 100mm within the existing building at County Trucks forming the flood defence.	20m		
	Replace penstock	The existing penstock to the Nottingham and Beeston Canal overflow, upstream of the Lock Keepers Cottage, will be replaced with a new automated gate, with upstream and downstream level recorders.	-		
	Automation of floodgates	The existing floodgates across Meadow Lane Lock will be automated.	-		
	Sub-reach 3.2				
	Construct new wall	A 0.6m high wall with a sheet pile cut-off will be constructed immediately downstream of Tinkers Leen through the Arla Depot. This will be at an offset of 2m from the river frontage.	80m	Meadow Lane	
	Construct new pumping station	A new pumping station will be required to over-pump flows in the Tinkers Leen watercourse into the River Trent when the River Trent is in flood. The existing penstock will be modified.			
	Sub-reach 3.3				
	Construct new wall	A 1.1m high wall will be built at an offset of 3m from the crest of river bank.	135m	Personal Storage Depot	
COLWICK COUNTRY PARK					
4 – Colwick Country Park Car Park	Construct new embankment	Construction of a new 2.5m high earth embankment between Daleside Road and the existing embankment at Candle Meadow.	275m	Daleside Road	Alternative alignment. Refer to *Section C2.5.3.*

[2] Refer to *Volume 1* where eighteen alternative flood management options considered in the Fluvial Trent Strategy are described along with the flood defence alignments appraised at the Scoping stage. Alternative alignments were not considered for this reach as they were technically, environmentally and economically unfeasible.

C2.2 During Construction

C2.2.1 Timing and Sequence of Works

The works at Meadows and Colwick Country Park are programmed to take eighteen months to complete. The level of flood protection will not be complete until this scheme area and all of the construction on the Nottingham Trent Left Bank FAS is completed. An indicative construction programme is summarised in Table C2.2 and shows the likely duration of the works within each reach.

The current proposed start date is April 2011. 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, working methods, or to realise efficiencies in the sourcing of materials. The programme should therefore be treated as indicative only.

The site compound situated in Colwick Country Park will act as a site compound for the proposed embankment raising through Reach 1 of the Colwick scheme area, as these works will run simultaneously; refer to *Appendix D.*

Table C2.2 Outline Construction Programme for the Meadows and Colwick Country Park Scheme Area

REACH	2011									2012									
	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
Reach 1	■	■	■	■	■	■	■	■	■										
Reach 2					■	■	■	■	■	■	■								
Reach 3									■	■	■	■	■	■					
Sub-reach 3.1									■	■	■								
Sub-reach 3.2									■	■	■	■	■	■					
Sub-reach 3.3											■	■	■	■					
Reach 4														■	■	■	■	■	

C2.2.2 General Working Arrangements

Working Hours

Normal working hours will be from 7.30am to 6.00pm, Monday to Friday. Construction activities outside of these hours, on weekends or public holidays will be avoided as much as possible. Any changes to the working hours will be agreed in advance with the Local Authority.

Third parties, for example British Waterways, may impose restrictions on the working period. Such restrictions could necessitate some out of normal hours working.

Sensitive Sites

Victoria Embankment Works will be limited during late July and early August, to minimise the impact on the annual Riverside Festival. The exact dates are to be confirmed.

Colwick Country Park Car Park The car park will need to be closed to traffic for up to six months to facilitate construction of the new embankment through Reach 4. This car par park will also be used as a site compound for the works, thus resulting in the prolonged closure.

Site Compounds and Delineation of Working Areas

Two main compounds, supported by at least two satellite compounds, will be required for the works; refer to Table C2.3 for details. Compound A will be in use for the duration of the works and will act as the main compound for the works upstream of Ladybay Bridge (Reaches 1-3). Compound D will be used as the main compound to the works for Reach 4. Temporary lighting, security and parking restrictions may be required for the safe operation of the site compound.

The site compounds, working areas and temporary haul roads will be secured using appropriate fencing. Two metre high 'Heras', steel mesh construction site fencing will be used around all areas which interface with the public. Where the works abut private property, high security fencing may be deployed.

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

The location of services will be confirmed by survey and trial holes, and appropriate protection works will be undertaken.

All temporary haul routes 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.

The ground under all 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 in subsequent areas of the works.

A partial lane closure on the river side of Victoria Embankment and Daleside Road East will provide access for construction traffic along the Embankment and where appropriate a vehicle impact barrier will be placed along the outer edge of the closed lane.

Table C2.3 Details of Proposed Site Compounds

Compound Reference	Description	Figure Number
A	Within the working area of the works within the Wilford Grove Recreation Ground. The compound will be used for the works to Victoria Embankment. Access will be along Wilford Grove.	Figure CC2.4
B	A smaller satellite compound (approximately 50 x 15m) will be established in the yard close to the Lock Keeper's Cottage along Meadow Lane.	Figure CC2.6
C and D	Two satellite compounds at the Arla Depot (approximately 75 x 30m) and Personal Storage depot (approximately 10 x 30m), will be used for the storage of plant, equipment and fuel. There will also be staff welfare facilities and small secure offices.	Figure CC2.6
E	A satellite compound (approximately 90 x 50m) as described above will be established in the car park of Colwick Country Park. It will be used to service the works through the car park.	Figure CC2.7

Works within Residential Boundaries

Where flood walls are to be constructed within residential boundaries, extensive consultation will be undertaken with the affected resident to ensure that the 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 structural surveys of buildings will be conducted.

C2.2.3 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 C2.1:

- construct new wall;
- raise and/or replace existing wall;
- construct new embankment;
- construct new pumping station;
- raise existing road;
- install new flood gates;
- replace penstocks.

The construction methodologies for these activities are outlined in *Section 3.4, Volume 1*. Table C2.4 below summarises the work activities within each reach of the Meadows and Colwick Country Park scheme area. The working methods will be finalised when the detailed design is complete.

Table C2.4 Type of Works per Reach

Type of Works	Reach					
	1	2	3.1	3.2	3.3	4
Construct new wall	✓	✓	✓	✓	✓	
Replace and/or raise existing wall	✓		✓			
Construct new embankment	✓					✓
Construct new pumping station				✓		
Raise existing road	✓	✓				
Install new flood gates		✓				
Replace penstocks			✓			

The estimated quantities of the principal materials in the above works are:

- **28,200m^3** of earthworks for embankment construction and raising;
- **1,440m^3** of concrete for the construction of new flood walls;
- **25m^3** of steel for 210m of sheet piles for the cut off.

Section C13 details the types of materials to be used in the works.

C2.3 When Operational

The scheme is designed to be low maintenance. Planned inspections of the walls and embankments will be required annually by the Environment Agency Operations Team. Access easements between 1-5m will be maintained alongside all floodwalls for maintenance and inspection purposes. The crests of the raised and new embankments will be a minimum of 3m wide to facilitate maintenance and inspection access. There will be a regular mowing regime for the grassed embankments.

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 before a large flood on the River Trent in Nottingham.

C2.4 Residues and Emissions

This section deals with discharges to water, emissions to air and noise and vibration from the proposed construction activities. The discharges and emissions from the operation and maintenance will be negligible.

C2.4.1 Discharges to Water

The main areas where the risk of discharges to water is higher are:

- works along the waterfront and around the Lock Keeper's Cottage in Sub-reach 3.1;
- works along the river frontage at the Arla Depot in Sub-reach 3.2 and Personal Storage in Sub-reach 3.3.

During the construction of the defences in these areas, there could be some unavoidable disturbance and mobilisation of silt in the river. This may have temporary adverse impacts on the flora and fauna in the channel.

For all other sections, there should be no need to work in the river channel and, as a result, the risks of discharges to water are greatly reduced.

Section C8 sets out the assessment of the impacts on water quality and the mitigation.

C2.4.2 Emissions to Air

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

Section C6 assesses the impacts of these on the local air quality.

C2.4.3 Noise and Vibration

During construction, delivery vehicles accessing the site and plant operating on the site will cause some disturbance to the local environment.

Section C5 assesses the noise and vibration impacts from the construction activities and the required mitigation.

C2.4.4 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 in non-daylight hours. Lights will be positioned so as to minimise any disturbance to neighbouring properties. These will be carefully positioned and shielded to illuminate the worksite, without causing disturbance to the surrounding properties or wildlife.

C2.5 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 new flood defences to protect against flood events with a 1% annual probability of occurrence.

The Nottingham Trent Left Bank Scoping Report (Environment Agency 2005) presented a number of alternative defence alignments, which are described below. A summary of their environmental impacts is presented in *Annex C1*.

C2.5.1 Alignments Considered for Reach 1 – Wilford Toll Bridge to Suspension Bridge

The following alternative alignment options were considered:

- Rebuilding the existing wall to tie-in with the Suspension Bridge. This is presented in the Scoping Report as 'Alignment Choice A for Reach M2'.
- A raised defence around the northern boundary of the recreation grounds to maximise the available floodplain. The defence would return to the Victoria Embankment at the bandstand to ensure protection to the Memorial Gardens. This is presented in the Scoping Report as 'Alignment Choice B for Reach M2.'
- A raised defence around the northern boundary of the recreation grounds which crosses the easterly ground at a point where construction will be easier and the ground slightly higher. This is presented in the Scoping Report as 'Alignment Choice C for Reach M2.'

These alignments are shown in Figure C2.1.

Alignments B and C were discounted for the following reasons:

- there would be significant permanent damage to the London plane trees along Bathley Street, and many would have to be removed;
- significant alterations to the existing surface water drainage regime would be required. The recreation grounds currently form part of the natural storage for any large local rainfall event;
- it is a significant departure from the existing alignment, and it would result in considerable additional construction cost;

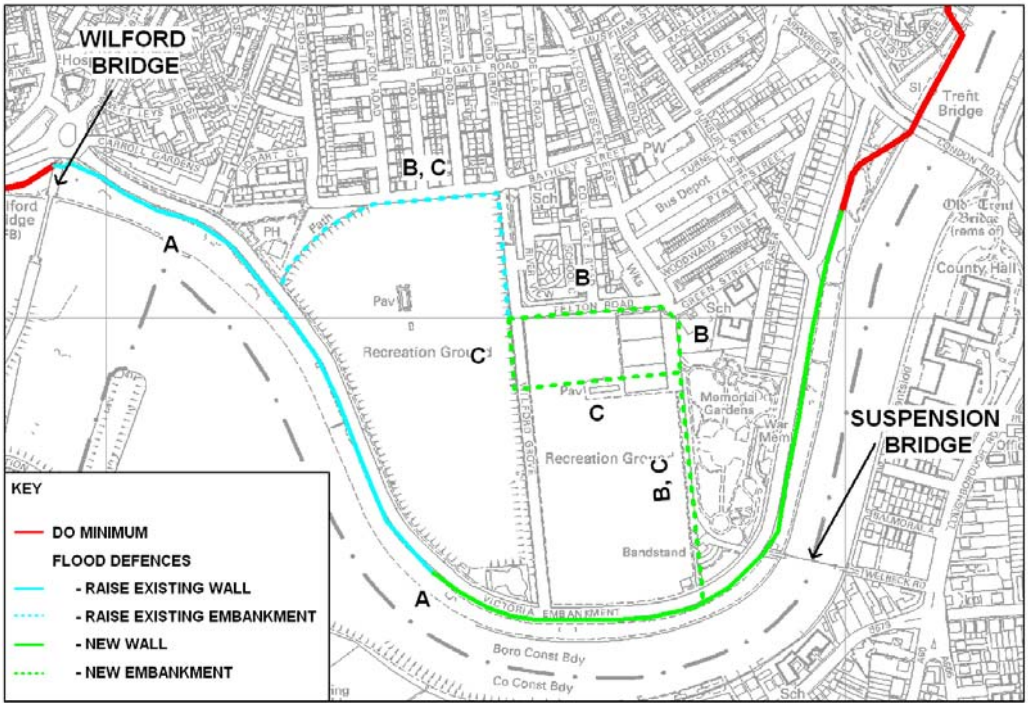

Figure C2.1 Alternative Alignments for Reach 1

Originally the landowner, Nottingham City Council, preferred 'Alignment Choice A for Reach M2', as presented in the Scoping Report and the original 2007 Environmental Statement. However, their plans for the Meadows area have

changed following their Living Landmarks lottery bid. This project, which aimed to regenerate the Meadows area, failed to secure lottery funding. However, the council are keen to continue the proposals in some form. The council's preferred alignment is therefore an embankment across the recreation ground, which follows the proposal in their Living Landmarks bid. The Environment Agency is fully supporting this alignment to assist in improving the amenity value of the area although it is more expensive and will create a greater visual impact than other options considered.

C2.5.2 Alignments Considered for Reach 2 – Suspension Bridge to Trent Bridge

The Scoping Report presented a single alignment for Reach 2, which is a new wall along Victoria Embankment, between the avenues of existing London plane trees.

The Scoping Stage identified the following constraints which need to be considered:

- the visual impact on the Grade II Listed War Memorial;
- the effect on using the Victoria Embankment for events such as the annual Riverside Festival, Nottingham Marathon and match day parking for Trent Bridge Cricket Ground and both football grounds;
- maintaining pedestrian access to and along the river frontage.

To minimise the potential impacts of the scheme on the above, the 2007 Environmental Statement proposed 240m of demountable defences starting in front of the War Memorial. Following the events of the 2007 flooding in Upton and the Pitt Report (Pitt *et al.*, 2008) demountable 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 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.

Other alternative alignment options were also considered:

- Alignments on the riverwards side of Victoria Embankment were rejected due to the impact it would have on the Riverside Festival and other recreational impacts it would have.
- Alignments along the middle of the road were rejected because of highways issues and the number of service diversions required.

The preferred is an alignment of a new flood wall along the residential property boundaries with individual floodgates for each property. This has been adopted as the option with least risk which maintains the current use of Victoria Embankment.

C2.5.3 Alignments Considered for Reach 4 – Colwick Country Park Car Park

During the scoping stage, it was thought that the level of Daleside Road was beneath the required flood defence level. Consequently, the following alternative alignments were considered from the Racecourse to the start of the Colwick section of the scheme:

- Set back the defence line to the A612 - Daleside Road and utilise the floodwater storage potential of Nottingham Racecourse. This is presented in the Scoping Report as 'Alignment Choice A for Reach C1'.
- A new defence through Colwick Country Park, following the route of high ground. This is presented in the Scoping Report as 'Alignment Choice B for Reach C1.'

These alignments are shown on Figure C2.2.

Following the results of the new hydraulic model (*refer to Volume 1, Section 2*) it was found that the level of Daleside Road is above the required flood defence level.

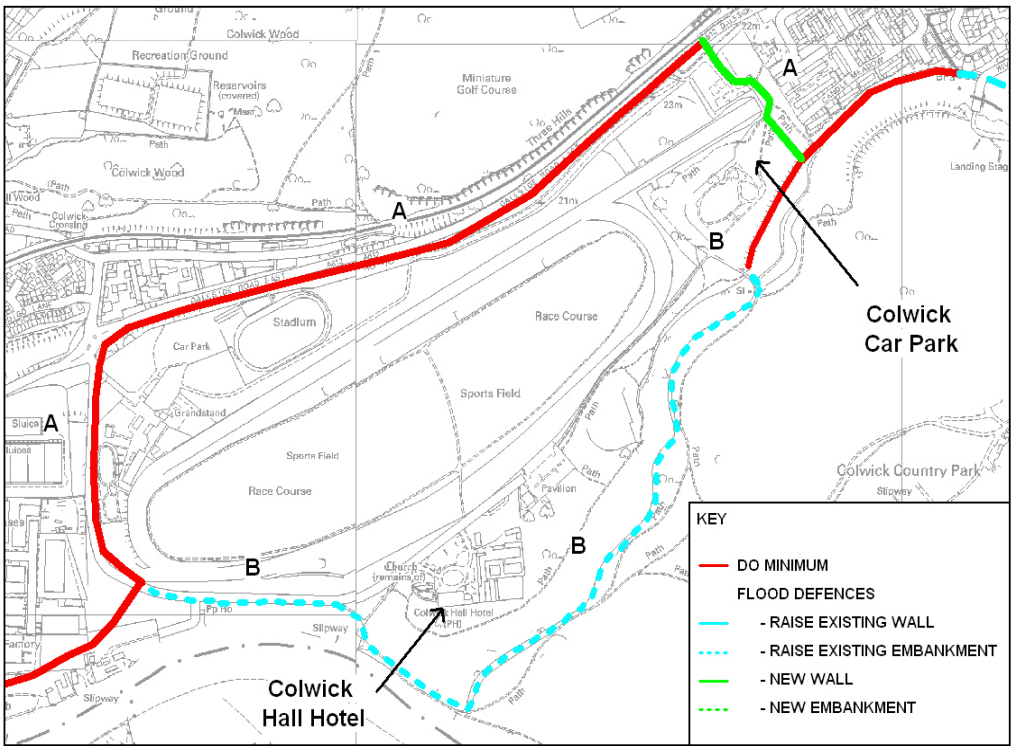

Figure C2.2 Alternative Alignments for Reaches 4 to 6

The high ground through the Country Park is the remains of a small earth embankment, which was constructed in the 1950s as part of the original Nottingham FAS. However, the embankments have fallen into disrepair and dense woodland has formed throughout the area.

The preferred alignment is 'Alignment Choice A for Reach C1' which sets back the defence line to the A612 - Daleside Road and utilises the floodwater storage potential of Nottingham Racecourse, and minimises construction activity and impacts on mature vegetation. No works are required to Daleside Road as it is above the required flood defence level. Alignment Choice A through Colwick

Country Park is still the preferred alignment route; however, the new design is for an embankment rather than a wall as this is considered to be more in keeping with the landscape character of the area.

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C3. HUMAN POPULATION

This section addresses the impacts on the local population, the recreational resources and 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 sections of this appendix, namely *Sections C5, C6* and *C9* respectively.

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

C3.1 Method of Assessment

Information on the local community was collated through a number of site visits, consultation with the local authority and landowners, and a review of the data in the Nottingham City Council Development Plan. A qualitative evaluation of the impacts on the human population during construction and operation was 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 from 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 C1.3.*

Section 7.3.2, Volume 1 sets out the methodology for the assessment in more detail.

C3.2 Baseline Conditions

C3.2.1 Local Population

The Meadows and Colwick Country Park study area covers an area of approximately 180ha.

The body of residential properties lies between Queens Drive to the west and London Road to the east. The area suffers from multiple deprivation according to Office of Deputy Prime Minister indices. There are reported to be high levels of unemployment, crime and widespread low educational achievement (Nottingham City Council, 2006).

There are approximately 872 residential properties within 200m of the proposed works; refer to Table B3.1. Assuming that each property contains an average of 2.36 people in England and Wales (Source: 2001 Census); the estimated local population would be 2,056.

The area was previously dominated by Victorian style housing until the 1970s when this was replaced by Radburn housing. This is characterised by low-density units with provision for car access and a large volume of footpaths which link the various streets.

The land between Trent Bridge and Racecourse Road (Reach 3) comprises mostly the Meadow Lane Industrial Estate, which is home to Notts County Football Club. The land immediately adjacent to the river has been identified for

redevelopment (Nottingham Regeneration Ltd) and the development zones are discussed further in *Section C12*. The Park Yacht Club Area development is already under construction and is nearing completion. This residential development will be completed before construction begins in this scheme area.

The Candle Meadow housing estate (Reach 4) is characterised by small residential units. The main access is from Daleside Road East, which splits into several cul-de-sacs.

Table C3.1 Human Receptors within 200m of the Proposed Defences

Distance from proposed defence (m)	Building Type (No. of buildings)						Total of all types
	Residential	Retail	Schools & Offices	Industrial	Leisure	Misc.	
Meadows (Reaches 1-3)							
<50	92	3	2	3	3	7	**110**
50 - 100	218	7	5	10	1	12	**253**
100 - 150	275	5	8	14	8	10	**320**
150 - 200	164	5	11	23	8	18	**229**
Total	**749**	**20**	**26**	**50**	**20**	**27**	**912**
Colwick Country Park (Reach 4)							
<50	15	-	-	-	1	-	**16**
50 - 100	28	-	-	-	-	-	**28**
100 - 150	45	-	-	-	-	-	**45**
150 - 200	35	1	-	-	1	-	**37**
Total	**123**	**1**	**-**	**-**	**2**	**-**	**126**

C3.2.2 Critical Infrastructure

There is no critical infrastructure in the Meadows and Colwick Country Park scheme area.

C3.2.3 Key Local Businesses and Employment

The Meadow Lane Industrial Estate (Reach 3) consists of predominantly industrial commercial units and although it contains a variety of businesses which provide employment to the area, it comprises mainly low density warehousing and transport and employs relatively few people for its size.

Meadow Lane Football Stadium, home to Notts County Football Club, is situated just to the north of Reach 3. The stadium has a capacity of approximately 20,300 and during match events sees a large influx of people to the area.

Nottingham Racecourse lies between Reaches 3 and 4. The racecourse is of economic and recreational importance to Nottingham and it is also used as a Park and Ride for Nottingham city centre.

C3.2.4 Sensitive Sites

The King's School is situated on Green Street/ Fraser Road and is less than 50m from Victoria Embankment (Reach 2). Emmanuel School and Beckett School are on the opposite bank of the River Trent to Reach 1. The latter is likely to close after the 2008/9 school year.

Small events are held throughout the year at the War Memorial (Reach 2) along Victoria Embankment. A civic event is held annually in November on Remembrance Sunday.

Ladybay Youth Centre (The Arches) is located between the arches of Ladybay Bridge (Reach 3). This centre is designed to provide activities and recreation for young people, such as use of the river, climbing and urban art.

C3.2.5 Recreation

Victoria Embankment and Wilford Grove Recreation Ground is a large area of river frontage near the centre of Nottingham and is well used by the public for informal recreation.

There are large recreation fields (Wilford Grove Recreation Ground) including a cricket pitch, a children's playing area and a Victorian paddling pool, behind the embankment. The recreation fields are used for Sunday football matches and for parking during cricket test matches. The area is also used during one weekend in August for the annual Riverside Festival, which includes a number of mobile fairground rides. Nottingham City Council have long term plans to regenerate this area.

Victoria Embankment is used for various sporting events over the summer, including as the finish line of the Robin Hood Marathon. The road is also used for match day parking for Trent Bridge Cricket Ground and by supporters of both Notts County and Nottingham Forest Football Clubs. The Toll Bridge Public House is a popular location to enjoy summer days.

Recreational moorings on the River Trent are located along Victoria Embankment in Reach 2 and in Colwick Country Park. There are no permanent houseboats moored along the left bank through the Meadows. River cruises on 'The Nottingham Princess' start and end at Trent Bridge and run throughout the year.

There are visitor moorings on the Nottingham and Beeston Canal in Reach 3 and the canal is used for recreational boating.

There is free fishing along Victoria Embankment in Reach 1. Due to the urban nature of the river, there is no further fishing until Colwick Country Park. At this location, the fishing rights are owned by Nottingham City Council.

Nottingham Racecourse hosts meetings from April to November at intervals of approximately ten days.

Colwick Country Park (Reach 4) is used by large numbers of people. It contains six waterbodies of various sizes and usage, and several of the larger lakes are used for angling and sailing. The park is dissected by many footpaths, which are

popular with pedestrians, cyclists and dog walkers. The park is adjacent to the River Trent and has a sheltered marina with landing stages and a slipway. Colwick Country Park is also along the route of the Great Nottinghamshire Bike Ride held in June each year. Colwick Hall Hotel is located between the Country Park and Nottingham Racecourse.

C3.3 Impact Assessment

The methodology used in the assessment for 'Human Population' is detailed in *Section 7.3, Volume 1*.

C3.3.1 Construction Impacts

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

- establishment of the site working areas and accesses, site clearance and associated construction activities;
- closure of Victoria Embankment;
- construction of a flood wall along the rear boundaries of Fraser Road properties;
- construction on Wilford Grove Recreation Ground will involve loss of open space;
- closure of Nottingham and Beeston Canal;
- closure of local footpaths;
- closure of one of the car parks at Colwick Country Park;
- construction of a new embankment through Colwick Country Park.

Impact on the Local Properties as a Result of Construction Activities Occurring in Close Proximity (Less Than 50m)

There will be disturbance to 107 residential properties within 50m of the works. The affected properties are identified in Table C3.2. While individual properties are of low sensitivity, the impact on each will vary from medium to high magnitude depending on its nature.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor** (for general disturbance) to **moderate adverse** (works within boundaries) and **short-term**.

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

- Reach 1: Potential disturbance to The Toll Bridge public house along Victoria Embankment.
- Reach 3: Disruption to businesses along the river frontage.
- Reach 3: The working areas will extend into the Arla Depot and the Personal Storage compound. The businesses will be able to operate during the works, although with reduced working areas.
- Reach 4: Potential disturbance to The Starting Gate public house which is within 50m of the works, although it is partially screened from the works by trees.

All these local businesses are of low sensitivity. All will be subject to works within their operational land or indirect disturbance from construction activity but will be able to continue to operate.

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

Table C3.2 Summary of Local Properties within 50m of Construction Activity

Reach	Disturbance within boundaries and/or to access and duration[1]	General disturbance and duration[1]
Meadows (Reaches 1-3)	• Direct disturbance to 24 properties on Fraser Road (including a block of flats) for up to seven months due to works occurring within their boundaries (Reach 2). • Land take and disturbance to the Lock Keeper's Cottage (Reach 3). Land take will be permanent and disturbance could last approximately three months.	• 38 properties in Carol Gardens are within 50m of the works (Reach 1) and will experience construction disturbance for up to nine months. • Two properties in Green Street (Reach 2) for up to seven months. • 25 properties in Meadow Close and Quayside Close are within 50m (Reach 3) and will experience general construction disturbance for up to three months. • Two properties on Fraser Road are within 50m of the works but no works are occurring within their boundaries (Reach 2) however, they will experience general construction disturbance for up to seven months.
Colwick Country Park (Reach 4)		• Disruption to residents of Candle Meadow housing estate where 15 residential properties lie within 50m of the proposed works. These properties will be subject to an increase in construction noise, dust creation and diversion of footpaths for up to five months.

[1] durations given are indicative only and in most cases are worst case as not all works in one reach will affect the properties all of the time. Refer to *Section C2.2* for the indicative construction programme.

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

- Reach 2: Disturbance to commemoration services at the War Memorial (medium sensitivity).
- Reach 2: Disturbance to King's School (medium sensitivity), which is close to Victoria Embankment.

- Sub-reach 3.3: Disturbance to Ladybay Youth Centre (low sensitivity) and a small amount of temporary land take. Access to the river would be unaffected.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **minor adverse** (Ladybay Youth Centre) **to moderate adverse** (King's School and the War Memorial) and **short-term**.

Impacts on Local Recreational Resources as a Result of Construction Activities

- Reaches 1: Reduction in public open space and disturbance to users of the Wilford Grove Recreation Ground. This will be most significant during public events such as the Riverside Festival and Robin Hood Marathon.
- Reaches 1 and 2: Reduction in available street parking and lane restrictions along Victoria Embankment for six months. A full road closure will also be required for part of this period for the road raising works. Works will be carried out sequentially along Victoria Embankment to limit areas of public open space affected by the works at any time. Access along the lower path of Victoria Embankment (the tow path) will be maintained at all times during construction. The suspension bridge will be unaffected.
- Reach 2: Disturbance to users of Victoria Embankment and the Memorial Gardens.
- Reach 3: Entrance to Nottingham and Beeston Canal will be closed for a period of approximately two to three months. This will impact on both the canal users and the visitor moorings.
- Reach 4: Disturbance to users of Colwick Country Park from construction activities.
- Reach 4: Temporary closure of the car park at Colwick Country Park for up to six months. Pedestrian access will be maintained. A bridleway diversion will be required for *Bridleway No.117.* Temporary diversion and one week closure of the Public Right of Way (PRoW) (*Footpath No. 118*) along the embankment at Candle Meadow. This is also the route of the Great Nottinghamshire Bike Ride.

Victoria Embankment, Wilford Grove Recreation Ground, the Nottingham and Beeston Canal and Colwick Country Park are all of city/county wide importance for recreation (medium sensitivity) and would all be subject to direct impacts. However, all but the Nottingham and Beeston Canal would be able to function at least in part during construction.

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

C3.3.2 Operational Impacts

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

The risk of flooding will be reduced for approximately 4,500 properties and businesses in the Meadows and Colwick Country Park scheme area. This has additional benefits in respect of property values and future development.

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

Impact of Flood Regime on 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. This will include the Racecourse, sections of Wilford Grove Recreation Ground, Colwick Country Park and Colwick Hall Hotel. During a flood event with a 1% annual probability of occurrence the depth of flooding will increase by approximately 0.07m.

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

Impact on Recreational Resources as a Result of Improvements to Wilford Grove Recreation Ground

The chosen alignment through the recreation ground will improve the recreational value of the site for public events.

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

Impact on Villages Outside the Scheme Area

The impact of the increase in flood risk to the villages downstream is discussed in *Section 8, Volume 1*. The maximum increase in flood levels during a flood event with a 1% annual probability of occurrence will be 0.07m to these villages as a result of the FAS.

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

C3.4 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 the impacts related to landscape and visual amenity, local traffic and noise and vibration are addressed in *Sections C5, C7 and C9*. Other mitigation measures for the potential impacts on the human population are listed in Table C3.3. These include scheduling of works to minimise impact on important local events, prior notification and agreement of the nature and the programme of the construction and the full reinstatement of any gardens affected. In addition, an Environmental Clerk of Works will be appointed to monitor the environmental impacts.

General mitigation for the potential impacts on the human population are given in *Section 7.3, Volume 1*.

C3.5 Residual Impacts

Table C3.3 summarises the residual impacts on the human population. Residual impacts are those which remain after all mitigation has been undertaken. There

will still be **adverse** impacts on local residents and businesses caused by construction related activities. The impacts will be **short-term,** with durations of disturbance dependent on location relative to the working areas. Direct impacts cannot be avoided and although we will take measures to minimise them they will remain a **moderate adverse** impact. However, the indirect impacts will be reduced to a **minor adverse** significance through the proposed mitigation.

On completion, the reduction in the flood risk to the properties and businesses are considered to be **moderate beneficial** and **permanent** impact. The alignment of the defence across Wilford Grove Recreation Ground has been requested by Nottingham City Council as part of future plans to improve its recreational value. This is considered to be a **minor beneficial** and **permanent** impact.

Table C3.3 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	• Liaise with residents. • Minimise working areas within private properties. • Full re-instatement of gardens. A landscape architect will agree garden reinstatement drawings with the affected landowner before the works commence.	Minor to moderate adverse and short-term
Impact on key businesses as a result of construction activities in close proximity	Minor adverse and short-term	• Liaise with local businesses. • Minimise working areas in private properties, notably Arla Depot and Personal Storage.	Minor adverse and short-term
Impact on sensitive sites as a result of construction activities in close proximity	Minor to moderate adverse and short-term	• Liaise with King's School and Ladybay Youth Centre. • Maintain access to the river for the Ladybay Youth Centre. • No construction activity along Victoria Embankment during the Remembrance services. • Ensure works do not affect the Riverside Festival. • Use concrete bored piles along Victoria Embankment to reduce noise and vibration.	Minor adverse and short-term
Impacts on local recreational resources as a result of construction activities	Moderate to major adverse and short-term	• Widely publicised notification of canal closure. • Works to canals to be undertaken in winter months. • Sequential working along Victoria Embankment	Moderate adverse and short-term

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
		to minimise length of disruption and land take in each area. Works will be timed to avoid disruption to main public events along Victoria Embankment. • Maintain access at all times along the tow path at the bottom of Victoria Embankment. • Formal closure and temporary diversion of bridleways, cycleways and footpaths in Wilford Grove Recreation Ground and Colwick Country Park with clear signage. • Maintain pedestrian access into Colwick Country Park through car park. • Re-instate footpaths/cycleways/bridleways to the existing or improved standard. • Ensure no access restrictions during the Great Nottinghamshire Bike Ride.	
OPERATIONAL IMPACTS			
Impacts on local population as a result of the reduction in flood risk	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
Impact of flood regime on recreational resources and sensitive sites outside new flood defences	None	No mitigation required.	None
Impacts on recreational resources as a result of improvements to Wilford Grove Recreation Ground	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent
Impact on villages outside the scheme area	Moderate adverse and permanent	See *Section 8, Volume 1*.	

C4. FLORA AND FAUNA

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

C4.1 Method of Assessment

The impacts are assessed using the Institute of Ecology and Environmental Management Ecological Impact Assessment methodology (IEEM, June 2006), which are 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. We also consulted with nature conservation organisations and undertook a number of field surveys, which are listed in *Annex 2, Volume 1*.

C4.2 Baseline Conditions

C4.2.1 Statutory Sites of Nature Conservation Interest

There is one Site of Special Scientific Interest (SSSI) within 2km of the proposed flood defence works at Meadows and Colwick Country Park, which is **Colwick Cutting SSSI**, designated for its geological interest.

The nearest biological SSSI is **Wilford Claypits SSSI**. It is located on the right bank of the River Trent and is designated for its marsh community. However, it is approximately 2.5km away from the proposed works.

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

C4.2.2 Non-statutory Nature Conservation Designations

There are 25 designated non-statutory Sites of Interest for Nature Conservation (SINCs) within 2km of the proposed flood defences. However, of these 17 are on the opposite bank of the River Trent. Only two of the sites on the left bank have the potential to be affected by the scheme:

Nottingham Racecourse Wetland (Pond) SINC (between Reaches 3 and 4). The Nottingham Racecourse Wetland (Pond) SINC comprises two wetland areas, which are connected by culverts beneath the racecourse; refer to Figure CC2.2. The site includes valuable marsh and open water communities of botanical and zoological interest, including a notable variety of dragonflies and damselflies.

Colwick Country Park SINC (Reach 4). This 87ha site includes landscaped areas of former sand and gravel workings, and an old course of the River Trent; refer to Figure CC2.2. The park supports a variety of habitats, including open grassland, planted woodland, swamp areas and lakes. The main interest is its vertebrate zoology but it is also of value for its invertebrate and plant communities. Over 200 species of birds and 14 species of dragonflies have been recorded.

C4.2.3 Habitats

National and Nottinghamshire Biodiversity Action Plan (BAP) habitats are listed in *Table 4.3, Volume 1*. The Phase 1 Habitat Survey data is shown on the General Arrangement Drawings in *Annex C2*.

Terrestrial habitat

Much of the habitat outside of the SINCs is either urban or improved recreational grassland. Trees provide the main interest and mainly border the River Trent. Of particular note is the line of mature trees along Victoria Embankment (Reaches 1 and 2) and the shelterbelt of planted trees, which separate Colwick Country Park Car Park and Candle Meadow (Reach 4).

Watercourses

The margins of the left bank of the River Trent, between Wilford Toll Bridge and Trent Lane, are mainly engineered and provide limited nature conservation value.

The Nottingham and Beeston Canal joins the River Trent at the Lock Keeper's Cottage (Reach 3) but the course of the canal is heavily engineered and provides no habitat of interest.

Tinkers Leen joins the River Trent in Reach 3. It is an overflow from the River Leen and the various canals through the city centre. It is culverted through this scheme area, except for a short section where it meets the River Trent, and it provides little ecological interest.

Colwick Country Park Car Park contains a number of drainage ditches. They are mainly overgrown by trees, which limit the growth of the marginal vegetation and fill the ditches with leaf litter. The ditches were subject to specialist survey for great crested newts *Triturus cristatus*; refer to the following text.

C4.2.4 Protected Species

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

Birds

All of the trees and scrub through the scheme area will provide habitat for a range of passerine birds e.g. blue tit *Cyanistes caeruleus*. The data sheet for Colwick Country Park SINC states that the site is good for waterfowl and in addition to the more usual ducks, geese and grebes, there are common winter visits from goldeneye *Bucephala clangula*, ruddy duck *Oxyura jamaicensis* and smew *Mergellus albellus*. It also supports approximately 64 breeding species.

Bats

A bat survey of the proposed working area in Colwick Country Park was undertaken in July/August 2006; refer to *Volume 1* for further details of methodology. The location of the survey is shown in Figure C4.1 (Reach 4).

The strip of woodland adjacent to the Colwick Country Park Car Park is approximately 10m wide. All the trees are young and have no features suitable for use as bat roosts. The transect survey in 2006 recorded foraging common pipistrelles *Pipistrellus pipistrellus*, brown long-eared *Plecotus auritus* and noctules *Nyctalus noctula*.

There are three bat boxes on the opposite side of the car park. Nine soprano pipistrelles *Pipistrellus pygmaeus* were found on the bat box on the mature hornbeam *Carpinus betulus* (bat box T10) in 2006. This roost is considered to be either a small maternity colony or, given the lateness of the season when the survey was undertaken, the remnant of a larger maternity colony. There were no signs of recent use by bats in the other two boxes, which are in poor condition and had suffered damage by squirrels. Both had been used by nesting birds.

There are also desk study records of pipistrelle bats in Candle Meadow and Colwick Country Park.

Changes to the alignment of the defences along Victoria Embankment mean that a number of trees will now need to be removed which were not at risk in the original design. All these trees potentially affected by the scheme were inspected in May/June 2008 but were considered not be suitable as potential bat roosts.

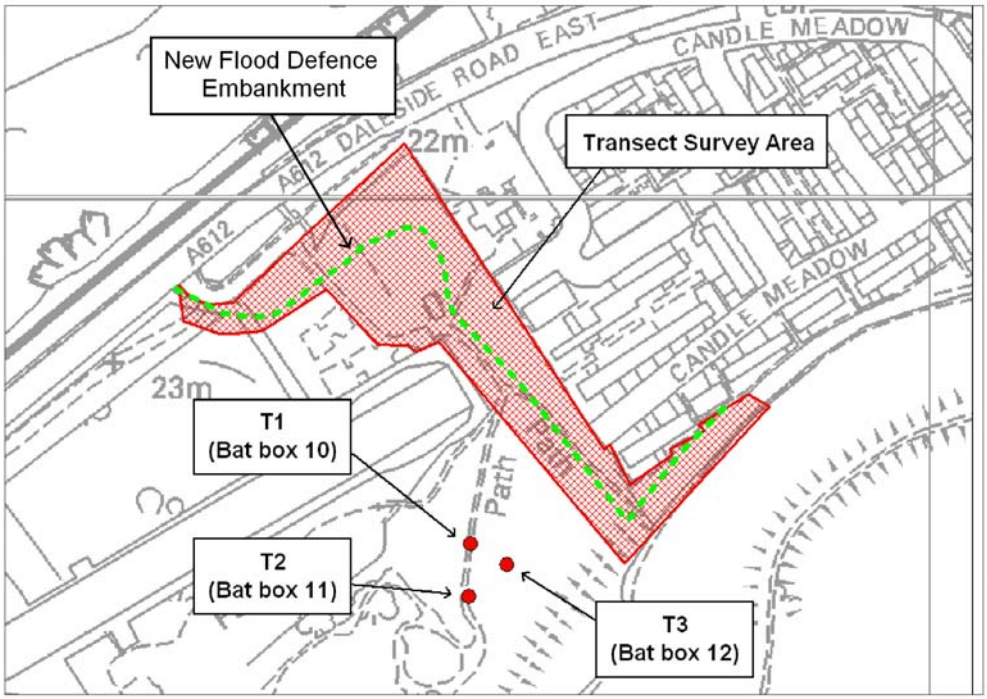

Figure C4.1 Bat Survey Area in 2006 at Colwick Country Park

Badgers

No badger *Meles meles* setts or other field signs were recorded during the 2006 or 2008 surveys.

Otters

Otters *Lutra lutra* are known to be present on the River Trent but no field signs were recorded during the 2006 or 2008 surveys. This may be due to the highly urbanised nature of much of the Meadows and Colwick Country Park scheme area.

Water Voles

There are desk study records for water voles *Arvicola terrestris* in Colwick Country Park but no signs were recorded during the 2006 or 2008 surveys within the Meadows and Colwick Country Park scheme area.

Amphibians (including Great Crested Newts)

No great crested newts were found during the 2006 survey and there are no desk study records for the Meadows and Colwick Country Park scheme area. One smooth newt *Triturus vulgaris* was found at the ditch at the entrance to the car park at Colwick Country Park (Reach 4); refer to Figure CC2.7.

In 2008, the ditch was revisited and evidence was found of extensive fly tipping and oil pollution. The ditch is heavily shaded by trees and has little aquatic vegetation and is considered sub-optimal for the presence of great crested newts. Consequently, no updated great crested newt survey was undertaken of this waterbody in 2008.

Invertebrates

The entire Meadows and Colwick Country Park scheme area was assessed by a qualified entomologist in the summer of 2006. Colwick Country Park was the only site identified as having invertebrate potential and was subject to detailed surveys in 2006; refer to Table C4.1.

Table C4.1 Invertebrate Survey Results

Site Name	Site Description	Importance	Survey Results
Colwick Country Park	This site comprised an area of scrub and young woodland with an area of unkempt improved grassland and rough herbage.	Local	The fauna comprised species with wide habitat affinities without any particular wetland influences. This was the only site for the relatively uncommon ground beetle *Harpalus puncticeps*, which is a species of disturbed areas and is a seed eating species. Other more widespread species encountered here included the spider *Pachygnatha degeeri*.

C4.2.5 Invasive species

Japanese knotweed *Fallopia japonica*, is evident to the south of Lock Keeper's Cottage (Reach 3).

C4.3 Summary of Ecological Interest

The flood defences pass through a predominantly urban landscape with low biodiversity. The main ecological interest is associated with Nottingham Racecourse Wetland SINC, Colwick Country Park and the River Trent. The following ecological receptors are present in the Meadows and Colwick Country Park scheme area and are considered during the ecological impact assessment (EcIA):

- SINCs
- trees
- watercourses
- birds
- bats

Invasive species are also discussed.

Each of these ecological resources is valued on a geographical scale. The definition of these values is given in *Annex 2, Volume 1*. The specific evaluation method for invertebrates is also given in *Annex 2, Volume 1*.

C4.4 Impact Assessment

Table C4.2 summarises the impact, mitigation and significance for all the ecological receptors. The assessment of significance in brackets moderates the EcIA to the standard determination of Impact Assessment given in *Table 6.1 Volume 1* for comparative purposes across all the environmental receptors.

C4.4.1 Construction Impacts

Sites of Interest for Nature Conservation (SINC)

The working area for Reach 4 is adjacent to the Colwick Country Park SINC; refer to Figure CC2.7. The SINC may be subject to impacts from construction related activities throughout Reach 4, such as dust, run-off, etc. There will be no permanent land take within the SINC.

The *impact* has been assessed *prior to mitigation* as being **not significant** at a **County** Level. **(Minor adverse)**

Trees

The trees which will be lost are shown on Figure CC2.3 to CC2.7. A total of 17 trees will be felled. 13 groups of trees will be partially or completely cleared as they are located in the working area. Most of the vegetation clearance will occur within Colwick Country Park where it is mainly immature shrubs and scrub vegetation. The defence runs close to the mature avenue of trees at Victoria Embankment, many of which are of high quality. To minimise damage to the trees the flood defence will be founded on concrete bored piles which create much less vibration than standard sheet piling operations.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **permanent** at a **Local** level. (**Minor adverse**).

Birds

The working area is narrow and, as it is mainly through an urban area, there will be a minor loss of vegetation. However, construction works will cause disturbance to birds nesting in the vicinity, as a result of both land take and noise disturbance. Most impact would be during the breeding season of mid-March to September. However, species likely to be affected are abundant and widespread, both locally and nationally. The impact on the local breeding bird population is therefore likely to be minimal.

The working area for the works in Reach 4 is adjacent to the perimeter of Colwick Country Park SINC. Therefore, there is the potential to disturb waterfowl on the adjacent lagoons.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **short-term** at a **Local to County** level. **(None** (impacts to local bird population) **Minor adverse** (impacts to birds in Colwick Country Park SINC**)**

Bats

No potential bat roost trees will be lost and the bat boxes in Colwick Country Park will not be disturbed. The embankment through Colwick Country Park Car Park (Reach 4) is designed to minimise the loss of trees around the perimeter, which is a feeding corridor for bats. A permanent easement up to 5m wide either side of the embankment will need to be kept free of trees for the Environment Agency's maintenance operations. This will reduce the connectivity of the tree line.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **permanent** at a **Local** level. **(Minor adverse)**

Invasive plant species

No invasive species were present in the designated working areas or site access routes at the time of this report. However, Japanese knotweed is present close to the working area in Reach 3, to the south of Nottingham and Beeston Canal.

C4.4.2 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 a 0.07m during a flood event with a 1% probability of occurrence and will affect areas in front of the proposed alignment and in the unmanaged areas on the opposite bank. It is not considered that this will have an adverse impact on the nature conservation interest of the area, because all species and habitats are already in the floodplain and subject to periodic flooding.

The original Nottingham FAS, which was developed in the 1950s, includes earth embankments through Colwick Park to protect Nottingham Racecourse. However, these have fallen into a state of disrepair. At present, the area is protected against flood events with a 2% annual probability of occurrence.

The proposed works in these reaches include setting back the defence line to the high ground along the A612 – Daleside Road. This will allow the Nottingham Racecourse Wetland (Pond) SINC to retain its link with the River Trent and its current protection against flood events with a 2% annual probability of occurrence. For events of greater magnitude, the racecourse will act as off-line storage. During a flood event with a 1% annual probability of occurrence, there will be a maximum increase of 0.07m in the peak water level.

The flood waters which will affect the Nottingham Racecourse (Pond) SINC will have a low velocity and there will not be any significant change in the frequency or maximum depth of flooding. Overall, the impacts are not considered to be significant.

C4.5 Mitigation Measures and Monitoring

Designated Nature Conservation Sites

The indirect effects on the Colwick Country Park SINC during construction will be minimised by good working practices to control dust/noise and pollution.. Details of the construction practices are given in *Section 3.4, Volume 1*.

Biodiversity enhancements within Colwick Country Park will be agreed with Nottingham City Council's Ecologist and may include vegetation management for amphibians, creation of shallows and reedbed planting, and restoration of the old river channel to improve habitat for fisheries; refer to *Appendix F*.

Trees

Detailed design will ensure that as many trees as possible are retained. The retained trees will be protected in accordance with best practice, such as BS 5837: 2005 *Trees in Relation to Construction*; refer to *Volume 1* for details. Sufficient replanting will be undertaken to ensure the ecological value of the area is retained and that there will be no net loss of trees. All species will be native and appropriate to the local area.

There will be an arboricultural watching brief during works along Victoria Embankment.

Breeding Birds

The 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 that could be disturbed. All wild birds are protected under the Wildlife and Countryside Act 1981 (as amended) whilst actively nesting.

Bats

The detailed design will ensure that as many trees as possible are retained in Colwick Country Park. Wherever possible, trees within the temporary working areas will be replanted. As compensation, additional bat boxes will be erected and any existing ones that are in a state of disrepair will be replaced.

Invasive Species

Pre-construction surveys will be undertaken to identify any invasive species that may have moved into the working areas since previous surveys or fall within a 7m buffer zone. This is the radius considered potentially contaminated by Japanese knotweed rhizomes from an individual plant. Any soils within this zone must be considered as contaminated and treated in accordance with Environment Agency's best practice guidelines.

C4.6 Residual Impacts

With the above mitigation measures, any adverse impacts on the majority of habitats and species will be avoided.

Permanent gaps in the tree line at the car park in Colwick Country Park will have a residual **adverse** impact on the local bat population as they will reduce the connectivity of the habitat. The bat surveys concluded this was likely to be an important feeding area and replanting and the erection of bat boxes will help mitigate the impacts and the overall impact is considered to be **not significant (none)**.

Table C4.2 Summary of Impacts on Flora & Fauna

Ecological Receptor (Value)	Proposed Activity	Characterisation of Unmitigated Impact	Significance without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Construction Impacts					
Colwick Country Park (County)	Site clearance and construction	Only indirect impacts to SINC including pollution risk and indirect disturbance to birds.	Adverse effect on conservation status; extremely unlikely. Therefore, no significant impact at the County level: certain. **(Minor adverse)**	• Enhancement measures; refer to *Appendix F*. • Pollution control.	Certain adverse effect at the County level in short-term; not significant. **(None)** Probable that compensatory habitat measures within Colwick Country Park would have a significant beneficial impact in the long-term. **(Minor beneficial)**
Trees (Local)	Site clearance and construction	A total of 17 trees will be lost and approximately 13 groups of trees will be partially or completely cleared for the construction works.	Adverse effect on conservation status; unlikely. Therefore, significant adverse effect at the Local level: unlikely. **(Minor adverse)**	Detailed 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 without working method agreed in writing. BS 5837 to be followed. Replacement and supplementary planting. Arboricultural watching brief of works to Victoria Embankment.	Probable no significant adverse effect at the Local level in long-term; not significant **(Minor adverse)** Certain no permanent adverse effect at the Local level; not significant. **(None)**
Birds (Local to County)	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. No Schedule 1 birds highlighted in baseline or survey.	Adverse effect on conservation status: unlikely. Therefore, no significant adverse impact at the Local level: probable. **(None to minor adverse)**	Vegetation clearance to be undertaken outside the breeding bird season. All vegetation in the temporary working areas to be reinstated.	Probable adverse impact at the Local to County level in the short-term; not significant. **(None)** Certain adverse impact at the Local to County level in the medium to long-term; not significant. **(None)**

Ecological Receptor (Value)	Proposed Activity	Characterisation of Unmitigated Impact	Significance without Mitigation	Mitigation, Compensatory Habitat & Enhancement	Residual Significance and Confidence
Bats (Local)	Site clearance and construction	Gaps to be made in tree line used as foraging corridor.	Adverse effect on conservation status: unlikely. Therefore, no significant adverse impact at the Local to County level: probable. **(Minor adverse)**	Mitigation and compensatory habitat to include replacement planting and erection of bat boxes in the local area.	Certain adverse impact at the Local level in the medium to long-term; not significant. **(None)**
Operational Impacts					
SINCs (County)	Flood protection to left bank	Very slight increase in the depth and duration of flooding for SINCs on opposite bank or in front of the existing defences. These sites are already in the floodplain so will not have an adverse impact.	Adverse effect on conservation status; certain. Therefore, no significant adverse impact at the County level: certain. **(None)**	None required.	Certain adverse impact at the County level; not significant. **(None)**
	New defence aligned landward of Nottingham Racecourse Wetland (Pond) SINC	Maximum 0.07m increase in peak water level. Low velocity of flow of flood waters. No significant change in frequency.	Adverse effect on conservation status: unlikely. Therefore, significant adverse impact at the county level: unlikely. **(None)**	None required.	Likely adverse impact at the County level; not significant. **(None)**
	Overall significance of effect		Adverse effect at the County level: not significant **(None)**		Certain adverse impact at the County level; not significant. **(None)**

C5. NOISE AND VIBRATION

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

C5.1 Method of Assessment

The evaluation of the impacts considered the effects of noise and vibration from construction and operation activities on sensitive receptors. In accordance with the guidance set out in BS 5228, this assessment applies to the properties within 200m of the works, where the noise and vibration impact will be most significant. Using the depreciation guide in *Table 7.11 Volume 1*, the following precautionary impact magnitude thresholds were devised (prior to mitigation):

High level	=	less than 50m from works
Medium level	=	50 to 99m
Low level	=	100 to 149m
Very low level	=	150 to 199m
No change	=	200m and greater

Section 7.6.2, Volume 1 sets out the methodology in more detail.

C5.2 Baseline Conditions

There are 1,038 buildings within 200m of the existing defence as illustrated in Table C3.1. This figure includes buildings on the opposite right bank of the River Trent, which include two schools and Nottinghamshire County Council's offices at Trent Bridge House.

Properties along Fraser Road near Victoria Embankment are subject to higher levels of background noise as a result of traffic along Victoria Road and London Road (A60), which is a major highway connecting Nottingham city centre to the surrounding area.

C5.3 Impact Assessment

C5.3.1 Construction Impacts

Impacts from Construction Site Noise (excluding piling)
The typical plant that will be utilised on the 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 C3.1 shows that there are **126** buildings within 50m of the works i.e. that are at risk of a high level of noise disturbance.

This number includes **24** residential properties and a block of flats that are going to be directly affected along Victoria Embankment with works occurring within or immediately adjacent to their boundaries. In addition the owner of the Lock

Keeper's Cottage by Meadow Lane Lock will be directly affected by the scheme. The residents of these properties are at a risk of a high level of noise disturbance.

Along the Meadows there are a further **253** buildings within 50 to 100m and **320** within 100 to 150m of the working area. These may experience a medium to low level of noise disturbance. The numbers include properties on the right bank.

Candle Meadow housing estate contains **123** residential properties within 200m of the proposed flood defences. The construction of a new embankment in Reach 4 will have a significant noise impact on these local residents. There is the potential for construction noise to affect horses on race days at the nearby Nottingham Racecourse.

There will be some increase in noise for the recreational users of Victoria Embankment and Colwick Country Park, but this will only be during the construction period, after which the background noise level will return to that prior to construction.

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 of any noisy activities, will reduce the sensitivity of a receptor's subjective response.

There are a total of **1,038** properties within 200m of the defence works. Buildings over 200m are not considered to be at risk from significant noise impacts.

The *significance* of the *impact* from construction site noise has been assessed *prior to mitigation* as being **moderate adverse** (for properties between 50-200m of works) to **major adverse** (for properties within 50m of works) 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 C9*.

Impacts from Sheet Piling Noise and Vibration

- **Reaches 1 and 2:** To minimise damage to the London plane tree roots and the noise impacts on the residents of Fraser Road, the flood defence will be founded on intermittent concrete bored piles. The bored piles are constructed by 'drilling' into the ground and infilling the resulting void with concrete and steel reinforcement. With the exception of the noise made by the piling rig, the procedure eliminates the significant vibration and noise levels that are associated with sheet piling operations.
- **Sub-reaches 3.2 and 3.3:** A sheet pile cut-off is required for the wall along the Arla Depot (Sub-reach 3.2) and Personal Storage (Reach 3.3). Piles will be installed using a combination of high frequency vibratory hammers and impact

driving. These reaches are in an industrial estate, away from residential areas, and the disturbance should not be significant.

Figure C5.1 shows the zones of potential disturbance from piling activity.

While the use of bored piles will significantly reduce the vibration and noise levels associated with sheet piling operations, the worst case scenario has been assumed in that any properties within 50m will be subject to a high level of impact. Recreational users are less sensitive as they can move away from the source of the noise or vibration.

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

C5.3.2 Operational Impacts

No significant impacts were identified.

C5.4 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 used to limit noise and vibration from the works; refer to *Section 7.6.5, Volume 1*. Their application will depend on local circumstances and the methods of working detailed in the Environmental Action Plan (EAP); refer to *Section 13, Volume 1*.

- Any temporary fixed plant, such as generators, will be positioned as far away as practically possible from residential properties and screened to reduce noise emissions.
- The contractor will use the smallest construction plant that is practical, in particular alongside Victoria Embankment close to King's School, and the Lock Keeper's Cottage.
- Concrete bored piles will be used along Victoria Embankment and will reduce noise and vibration impacts to residents along Fraser Road.
- In addition to specific measures, adequate warning and written notice of construction works will be provided to all the affected landowners. Health and Safety issues will be addressed through the Contractor's Health and Safety Plan.

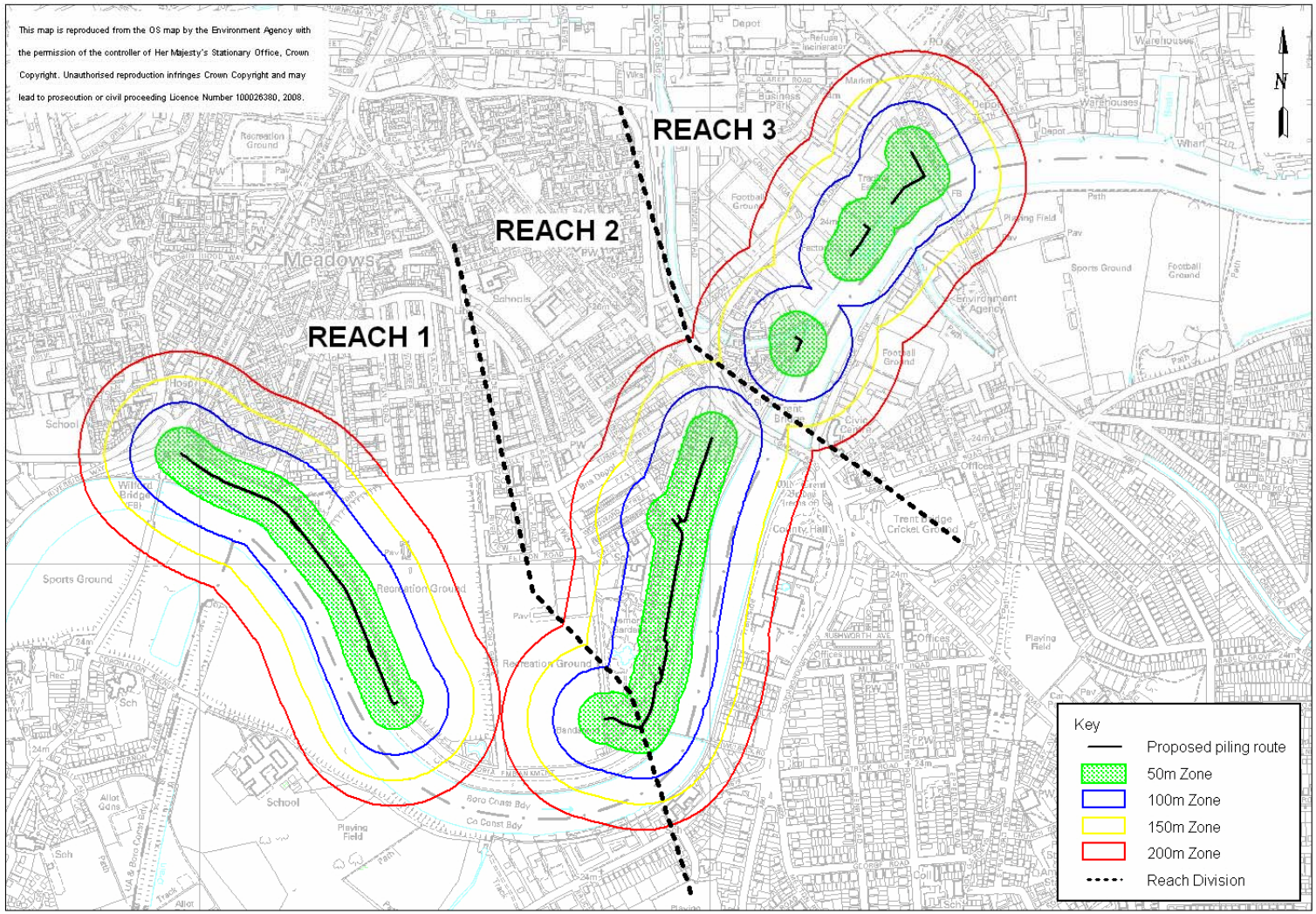

Figure C5.1 Zones of Potential Disturbance from Piling Activity

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 will be undertaken by a structural surveyor prior to any works commencing. These surveys 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.
- 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.
- Limits on noise and vibrations will be discussed and agreed with the EHO.
- 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.

C5.5 Residual Impacts

Taking the above into account, the majority of the impacts will be **minor adverse**. However, due to the urban nature of the area, a number of properties within 50m of the works may experience **major adverse** impacts from piling noise and vibration. These impacts will **short-term** and there would be no noise impacts after construction; refer to Table C5.1.

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Table C5.1 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 generic mitigations measures are detailed in *Section 7.6, Volume 1*.	Minor to moderate adverse and short-term
Construction Traffic Noise	See *Section C9*		
Sheet Piling Noise and Vibrations	Moderate to major adverse and short-term	• Use of bored piles along Victoria Embankment. • Liaison with residents and local businesses. • Pre-works condition survey of all properties that are considered to be at risk within 200m of sheet piling. • 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) and short term
Operational Impacts			
No significant impacts have been identified			

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C6. AIR QUALITY

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

C6.1 Method of Assessment

Identification of the ambient conditions was undertaken through a search of Nottingham City Council's Air Quality website section. No specialist investigations were undertaken.

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, sets 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 other wall materials, such as bricks, are less likely to break and they will generate less dust particles. It is assumed that once generated, dust will be dispersed predominantly by wind and the deposition of the material is determined to an extent by the particle size. The potential for severe impacts is greatest within 100m of dust generating activities (ODPM, 2000) and in most circumstances 70% of dust emissions deposit within 200m of the source (Various, 1994).

C6.2 Baseline Conditions

The Meadows and Colwick Country Park scheme area has the potential for poor air quality due to city centre congestion and traffic. It is bisected by the following major roads:

- London Road (A60) - Reaches 2 and 3
- Meadow Lane (A6011) - Reach 3
- Daleside Road (A612) - Adjacent to Reach 4

The roads are identified in Nottingham City Council's Local Air Quality Management Plan for their potential for nitrous oxide (NO_x) pollution.

The industrial area along Meadow Lane has two major source polluters of NO_x, namely the London Road Heat Station and the Eastcroft Incinerator. However, they do not lie within 200m of the proposed work.

There are no designated Air Quality Management Areas (AQMAs) in the Meadows and Colwick Country Park scheme areas; the closest is situated approximately 1km to the north. This is also the approximate distance to the nearest automatic monitoring station.

C6.3 Impact Assessment

C6.3.1 Construction Impacts

Impacts on the Local Environment from Dust Generation Activities

Dust emissions will arise from the day to day operation of machinery/vehicles over dry ground and from general construction activities. The embankment works in Reaches 1 and 4 are likely to create the most dust from the movement of soil. Properties at Candle Meadow (Reach 4) are partially separated from the main works by a screen of vegetation. Breaking out the existing footpath and road along Victoria Embankment will also create dust (Reaches 1 and 2).

The *significance* of the *impact* has 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 will 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 materials storage areas. Operatives will travel to and from the site each day in a number of private 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 with air and disperse.

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

C6.3.2 Operational Impacts

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

C6.4 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 local 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 detail in *Section 7.7.5 Volume 1* but their application will depend on local circumstances and the methods of working; refer also to the EAP in *Section 13, Volume 1*.

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

C6.5 Residual Impacts

A quantitative assessment of the effect 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 on assessment does not appear warranted. Table C6.1 summarises the impacts of the FAS on air quality.

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

Table C6.1 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	• Generic mitigation measures; refer to *Section 7.7, Volume 1.* • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.7.5, Volume 1.* • Refer also to *Section C9.*	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			

C7. LANDSCAPE & VISUAL AMENITY

This section addresses the impacts on the local landscape and visual amenity of the Meadows and Colwick Country Park scheme areas.

C7.1 Method of Assessment

This landscape and visual impact assessment of the proposed works at Meadows and Colwick Country Park has been based on the second edition of the 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA) published by the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA) 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*.

C7.2 Baseline Conditions

Meadows

Meadows is an urban area within walking distance of Nottingham City Centre. It is predominantly an area of residential housing and industrial trading estates. However, it also contains a substantial area of public open space including Victoria Embankment, which runs parallel with the River Trent between Wilford Bridge and Trent Bridge; refer to Plate C7.1. This riverside embankment forms an important movement and recreation corridor through the area for both pedestrian and vehicular traffic and is dominated by an avenue of mature London plane and lime trees. Victoria Embankment and the adjacent recreation ground are identified within the Nottingham Local Plan as part of the City's Open Space Network.

The location of Plates C7.1 to C7.13, which show existing landscape conditions and 'photosketch' visualisations, can be found in Figure C7.1.

The tree lined avenue and grassed slopes of Victoria Embankment create an attractive riverside setting for recreation. Adjacent to Victoria Embankment is the large Wilford Grove Recreation Ground and the ornamental Memorial Gardens. A War Memorial acts as a gateway to the Memorial Gardens and dominates views to the embankment from the right bank of the River Trent; refer to Plate C7.2. The Victoria Embankment, Memorial Gardens and the adjacent recreation ground are listed as 'Registered Parks & Gardens' by English Heritage whilst the War Memorial is a Grade II Listed Building. Near Trent Bridge the Victoria Embankment is bordered by the attractive Fraser Road residential properties that have views out to the river. Victoria Embankment is used to host the increasingly popular annual Riverside Festival during the summer.

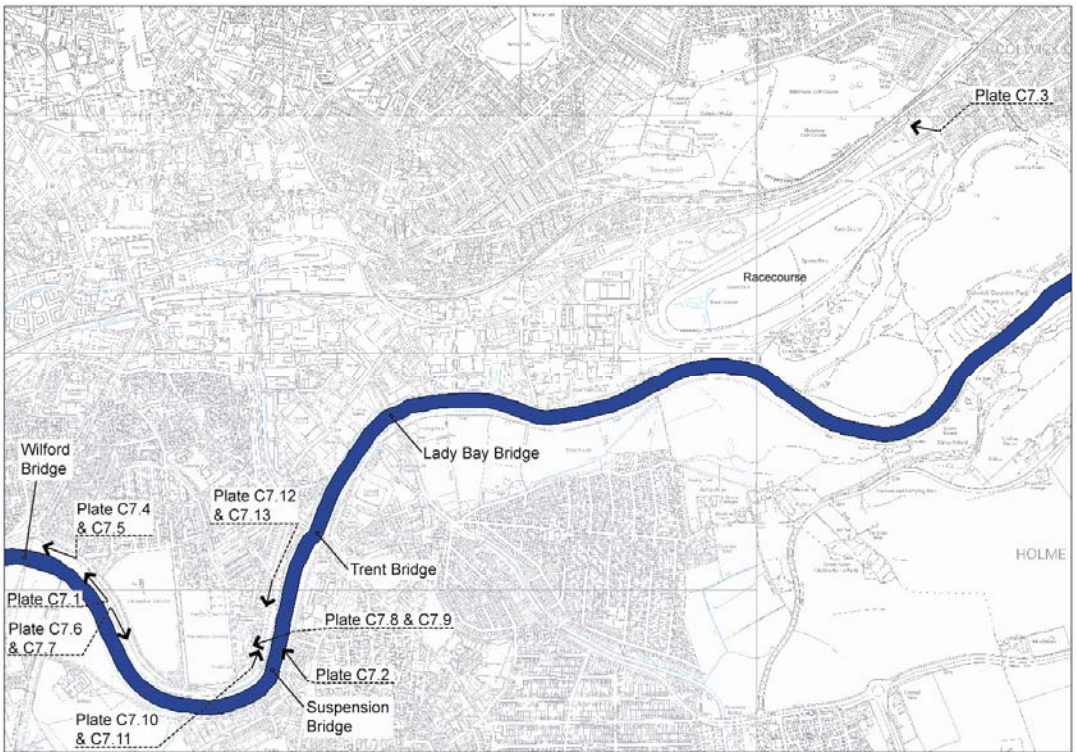

Figure C7.1 Location Plan of Plates and Visualisations of New Flood Defence

Plate C7.1 Victoria Embankment

Plate C7.2 Victoria Embankment War Memorial

Trent Bridge is a Listed Structure whilst downstream the remains of the old bridge abutment are still evident adjacent to Quayside Close near the Meadow Lane Lock.

Between Trent Bridge and Nottingham Racecourse the area is dominated in landscape and visual terms by industrial units and is designated within the Nottingham Local Plan as a Regeneration Zone.

Colwick Country Park

Colwick Country Park provides a significant part of the Meadows Open Space Network and is identified as such within the Local Plan; refer to Plate C7.3. This network also includes Nottingham Racecourse. These areas form part of the Nottingham Green Belt.

Plate C7.3 Photograph of Colwick Country Park Car Park

C7.3 Impact Assessment

C7.3.1 Construction Impacts

Impacts of Construction Works on Local Landscape and Visual Amenity

During the construction period machinery, storage materials and construction compounds will be intrusive new elements in the landscape and evident in existing views for localised visual receptors. It is considered that these will be short-term temporary impacts and as such, will not be considered in detail in this assessment.

The *significance* of these construction *impacts* has been assessed *prior to mitigation* as being **slight (minor) adverse** and **short-term**.

Impacts of New and Raised Defences on Local Landscape and Visual Amenity at Meadows (Reaches 1 to 3)

Reach 1 – Victoria Embankment Wall

- The replacement of the existing Victoria Embankment flood wall with a new wall that is 1.25m – 1.45m high, (0.35 to 0.55m higher than the existing wall), will restrict the current views between the road and the riverbank. Currently motorists can regularly be observed parking on the road verge to enjoy views out to the river from the comfort of their cars. Raising the floodwall will have a **moderate adverse** effect for these receptors. There may however, be **slight beneficial** effects for pedestrians and cyclists on the riverside footpaths as a result of reduced views to the vehicular traffic thus enhancing the recreational experience of the riverside setting for them.
- A pedestrian access ramp will retain existing access over the wall.
- Where the flood protection crosses into the recreation ground the road will be raised by around 1.0m, this will have a **moderate adverse** impact,

- The road raising will be carried out within the existing footprint of the road to reduce the likelihood of disturbance to the native tree. This is a minor element of works within the wider landscape.

Reach 1 – Recreation Ground

- The new embankment across Wilford Grove Recreation Ground will interrupt views across the open space from the Wilford Grove Recreation Ground and Victoria Embankment. The embankment will have a **moderate/substantial adverse** affect on the landscape character and visual amenity for pedestrians, cyclists and vehicle users. However, the two parts of the recreation ground will still be large, open flat grass landscapes as existing, and their existing use will largely remain.
- A new surfaced footpath will be created on the crest of the embankment, and a raised circular terrace with reinstated tree planting will form a central focal point, where the path intersects Wilford Grove. The alignment of the embankment will allow a line of sight between the raised circular platform and the Suspension Bridge, and is aimed at encouraging pedestrian movement across the recreation ground.
- The new floodwall adjacent to the bandstand links the new flood embankment back to Victoria Embankment. The clearance of trees required to construct the wall will have a **moderate adverse** impact on the landscape character, however views to the Suspension Bridge will be opened up and the bandstand forms a backdrop to the wall, therefore limiting its visual impact.
- The copper beech behind the bandstand is to be retained if possible and protected during construction works, as it is considered to be a tree of high value.

Reach 2 – War Memorial and Gardens

- The new wall along the front boundary of the Memorial Gardens, either side of the War Memorial, will replace an existing hedge of similar height. The loss of this hedge will have the greatest visual impact when viewed from the road, and is considered to be **moderate adverse**. However, the visual impact will be **slight adverse** for visual receptors within the Memorial Gardens, due to other, existing, screening vegetation.
- A continuing wall across the front of the War Memorial would create a **significant adverse** visual intrusion to the setting of the Grade II listed structure. Therefore, the required flood defence will be incorporated into a full landscape design aimed at enhancing the setting of the structure. The road in front of the Memorial will be raised and its width significantly reduced both to slow traffic and prevent vehicles parking in front the Memorial. This will improve views of the Memorial from the opposite bank of the River Trent. The design will create a greater pedestrian area and create more space for Memorial services.
- The significant landscape improvements in front of the War Memorial will enhance the importance of this monument, emphasising the positive landmark the Memorial represents. There will be a **significant beneficial** effect on the landscape character of the immediate area; views of the Monument will be retained. Liaison with the Royal British Legion will be undertaken to ensure the proposals facilitate the Memorial parades and remain sensitive to the purpose of the Memorial area.

- The existing grass and bedding areas in front of the War Memorial are to be retained. This design also avoids disturbance to the existing avenue of mature trees.

Reach 2 – Residential Properties

- The proposed 1.0m high flood wall along the rear property boundaries on Fraser Road (backing on to Victoria Embankment) will replace existing boundary treatments. The properties to the west of Bunbury Street have a variety of boundaries including walls, fences, hedges and tree planting, which creates a positive visual interest in the area. To the east of Bunbury Street the boundaries are predominantly 2m high closed boarded fences. Reinstatement of these boundaries, in consultation with landowners, is likely to follow existing styles. The loss of tree and shrub planting will have a **moderate adverse** impact on the visual amenity and landscape character of these gardens.
- Access between the properties and Victoria Embankment/Bunbury Street will be maintained with flood gates, and access steps (or ramps) within the gardens where necessary. These access arrangements will have a **slight adverse** impact on the visual amenity and landscape character of the gardens.
- The road raising and new flood gate across Bunbury Street will have a **moderate adverse** effect on the landscape character. Cladding treatment of the floodgate will be placed on the side of the gate that will be the most frequently visible.
- A revised road layout will reduce the width of the entrance on to Fraser Road in an attempt to reduce the number of people using this private road as a 'rat-run'. The reduction in road width will also help reduce the speed of traffic in this area. This will have a **slight beneficial** impact on the landscape character for pedestrians, cyclists and local residents.
- Visual receptors on the opposite bank of the River Trent include the residents of Wilford Lane and Trentside, pedestrians and cyclists along the riverside path and workers at the County Hall Council offices. These receptors will view the flood wall as a small-scale landscape element, which will be screened by the existing tree avenue; overall there will be a **slight adverse** visual impact.

Reach 3 – Downstream of Trent Bridge

- The Lock Keeper's Cottage flood wall will have a **moderate adverse** impact on views from the residential property. There will be a **moderate adverse** impact on the landscape character, which will be mitigated through reinstatement of the affected area.
- The Arla Depot flood wall and Personal Storage flood wall will have a **slight adverse** visual impact when viewed against the wider industrial landscape. The alignment is to be agreed with the property owners to minimise any potential impacts on existing working methods. An appropriate concrete finish to the flood wall will help mitigate the visual impact of the wall.
- For the employees of Rushcliffe Borough Council, Nottingham Forest Football Club and the Environment Agency, as well as pedestrians and cyclists on the riverside footpath on the opposite bank, there will be a **slight adverse** visual impact.
- For road users of Trent Bridge and Ladybay Bridge there will be a **negligible** impact on the landscape character and visual amenity.

The *significance* of landscape and visual *impacts* on the Meadows has been assessed *prior to mitigation* as being **moderate adverse** and **permanent.** There are number of permanent **beneficial** impacts.

Impacts of New and Raised Defences on Local Landscape and Visual Amenity at Colwick Country Park (Reach 4)

- Following the establishment of reinstatement planting and grass seeding the proposed Colwick Country Park Car Park embankment (Reach 4) will have a **moderate adverse** visual impact. However, any adverse impacts will be offset by the inclusion of a 2.0m wide unbound aggregate material footpath to the crest of the embankment that will improve the existing pedestrian link between the car park and the existing footpath network.
- The existing access between the Country Park and the 'Starting Gate' Public House will be retained through 1:12 access ramps.
- Where possible replacement trees will be replanted in agreement with the Local Authority.

The *significance* of landscape and visual *impacts* around Colwick Country Park has been assessed *prior to mitigation* as being **moderate adverse** and **permanent.**

C7.3.2 Operational Impacts

No significant impacts were identified.

C7.4 Mitigation Measures and Monitoring

The mitigation measures in Table C7.1 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. Flood walls will be appropriately clad after full design consultation with Nottingham City Council Development Control Officers and as appropriate English Heritage advisors. Appropriate cladding of flood walls is adopted as good practice and part of the baseline design of the flood walls.

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

Table C7.1 Mitigation Measures and Wall Treatments

Impacts Associated with Proposed Works	Mitigation Measures and Wall Treatments
Visual appearance of new flood walls	• Cladding in materials that are characteristic to the area. • Reach 1 & 2 – Natural stone cladding for new walls on Victoria Embankment. • Reach 1 - Where possible store and reuse natural stone from demolished walls such as the existing Victoria Embankment flood wall. • Reach 2 – Improvements to the public open space creating a more pedestrian – friendly area. • Reach 3 – Ensure appropriate concrete finish to new walls at Arla Depot and Personal Storage.
Foreshortening of views	• Reach 1 – New footpath on crest of embankment, to allow views across the recreation ground.
Impacts on existing mature trees	• Where proposed works are in close proximity to trees of high landscape value the construction process will avoid, or minimise damage to root systems. • Where loss of significant trees or groups of trees, where appropriate, replacement planting and new tree planting should occur. • Reach 1 – Road raising within existing footprint of road to reduce impact on adjacent trees.
Impacts of raised embankments	• Ensure embankments blend into their landscape setting through landform design (i.e. raised circular terrace). Where it does not compromise operational requirements appropriate planting may be utilised to reduce the visual impact. • Reach 4 – 2.0m wide unbound footpath on crest of embankment in Colwick Country Park, to link to wider path network.
Temporary adverse visual impact of construction activities and site compounds	• 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 quality of finish.
Impact on residential properties	• All affected areas of residential properties (predominantly gardens and garden boundaries) to be reinstated in agreement with the individual property owners, including access arrangements.
Impacts on access	• Reach 1 – Access across flood wall to be retained with ramped access. • Flood gates to be clad on the visible side with appropriate cladding materials to suit their immediate location. • Reach 4 - Retain pedestrian access between Colwick Country Park and 'Starting Gate' Public House with 1:12 access ramps. • Ensure smooth re-grading of road surfaces.
Impacts on road users	• Reach 1 – Narrowing of road where raised, acts as a traffic-calming measure. • Reach 2 – Revision to road layout to discourage vehicular access to an already restricted section of Victoria Embankment. This will benefit recreational users as well as the local residents.

C7.5 Residual Impacts

Residual impacts are those impacts which remain after all practicable 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 residual impact. This is due to the very nature of the proposed works; for example if an existing view out over open countryside is interrupted, reinstatement planting will not bring back this view.

Summary Tables C7.2 and C7.3 outline the residual impacts.

Where new flood walls are proposed along Victoria Embankment (Reach 1), the scheme could result in significant adverse residual impacts, through damage to the mature trees. These potential impacts have been mitigated through the use of bored pile foundations in the design. It should be noted that any potential damage to the tree roots that may occur during the construction period might not become evident in the physical condition of the canopy until several years after completion

Discussions will be held with Nottingham City Council Arboricultural Officer to agree the monitoring and inspection regime. Any potential tree losses as a result of the construction of the proposed flood defences will be replaced to retain the existing landscape character of Victoria Embankment.

Overall the flood wall along Victoria Embankment will be viewed as a small-scale element within the landscape, and so will **not significantly** alter the character of the landscape.

A raised circular terrace area, where Wilford Grove intersects the new embankment (Reach 1), will break up the visual line of the embankment. The embankment will have a **moderate/substantial adverse (significant)** residual impact on the visual amenity, with views from the main access across the open space restricted. The new footpath along the crest of the embankment will particularly mitigate for the loss of unrestricted views.

Where the rear boundaries of properties along Fraser Road are to be reinstated, the loss of tree and shrub planting will have a **moderate adverse (not significant)** residual impact on the landscape character and visual amenity of the gardens. However once reinstatement planting has successfully established this impact will reduce to a **negligible** residual impact.

The flood protection across the front of the War Memorial will have a **significant beneficial** residual impact, through positive improvements to the public open space, creating a more pedestrian – friendly environment and informal seating opportunities.

Road-raising in Reaches 1 and 2, as well as the revised road layout in Reach 2 will have a **moderate beneficial** residual significance for the residents, cyclists and pedestrians on Victoria Embankment, as the changes will result in traffic calming and, in Reach 2, will emphasise vehicular restrictive zones.

The residual impacts downstream of Trent Bridge (Reach 3) are considered to be **slight adverse (not significant)** in the long term.

The selection of suitable cladding materials for floodwalls, the reinstatement of all footpaths and road surfaces, and the grass seeding of all embankments, will substantially reduce the residual impact of the proposed structures.

The proposed embankment through Colwick Country Park car park will result in an improved pedestrian link between the existing car park and the wider footpath network in the Country Park; achieved by the footpath on the crest of the embankment. There will be a loss of existing established tree and scrub vegetation along the footprint of the embankment and for areas of temporary construction activities. When construction is complete full reinstatement planting will be carried out where planting will not affect operational requirements. There will be a **slight/moderate adverse** residual impact as a result of this work.

It is considered that any adverse impacts will be mitigated by sensitive design proposals and the reduced risk from flooding. Existing views and visualisations of the new defences are shown on Plates C7.4 to C7.13; refer to Figure C7.1 for the location of these plates.

C7.6 Summary

The two areas where it is considered there will be a significant impact on the landscape character and visual amenity are as follows:

- The embankment across Wilford Grove Recreation Ground;
- The flood protection works across the front of the War Memorial.

Overall it is considered that the scheme will result in a **moderate adverse** residual impact to the landscape character and visual amenity of the Meadows and Colwick Country Park scheme area. However, it should be noted that the improvements to the public open space in front of the War Memorial will have a **significant beneficial** residual impact. These improvements will be permanent.

Plate C7.4 View towards Wilford Toll Bridge

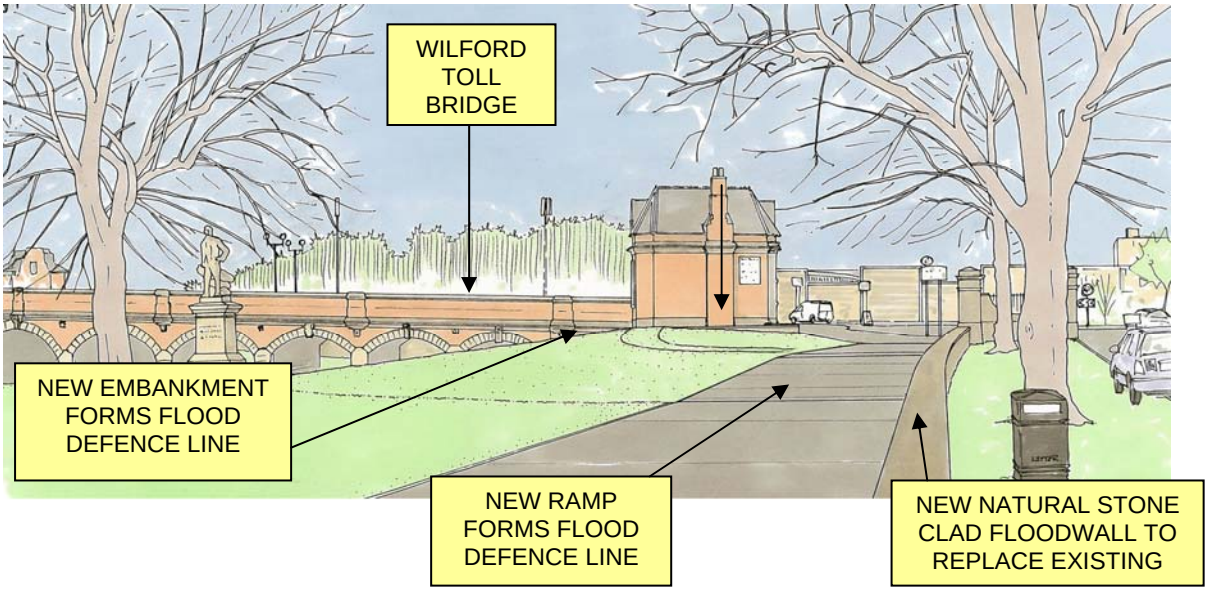

Plate C7.5 Visualisation of New Flood Defence at Wilford Toll Bridge

Plate C7.6 View of Existing Floodwall along Victoria Embankment

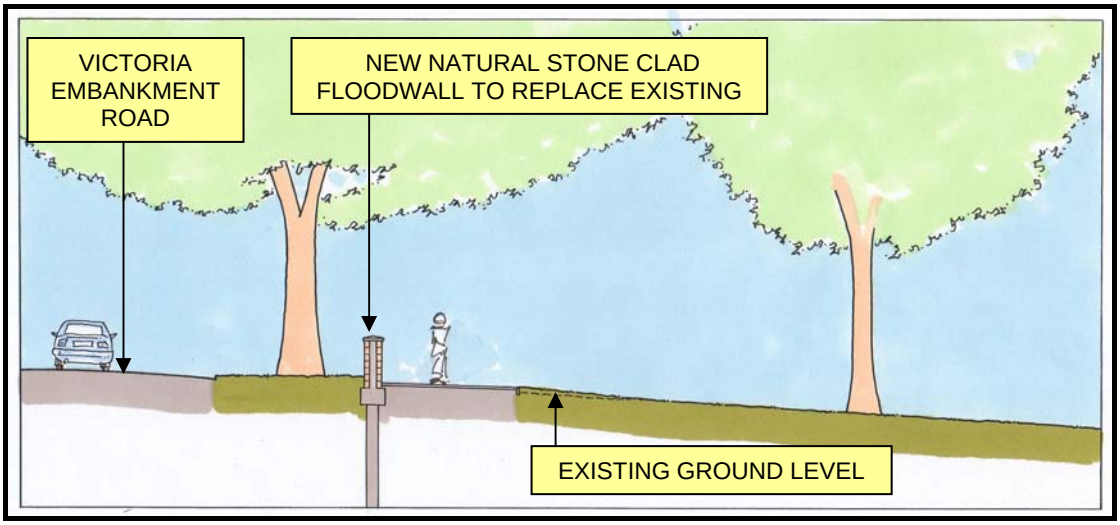

Plate C7.7 Cross Section of New Floodwall at Victoria Embankment; wall along existing alignment

Plate C7.8 Existing Aerial View of Wilford Grove Recreation Ground

Plate C7.9 Aerial View Visualisation of New Embankment across Recreation Ground

Plate C7.10 **Existing View of War Memorial looking along Victoria Embankment towards Trent Bridge. Car parking sites immediately in front of the Memorial at present**

Plate C7.11 **Visualisation of War Memorial looking along Victoria Embankment towards Trent Bridge, with improved Memorial Garden area to its front**

Plate C7.12 **Existing view along Rear Boundaries of Fraser Road Properties, existing mature trees along Victoria Embankment visible on left**

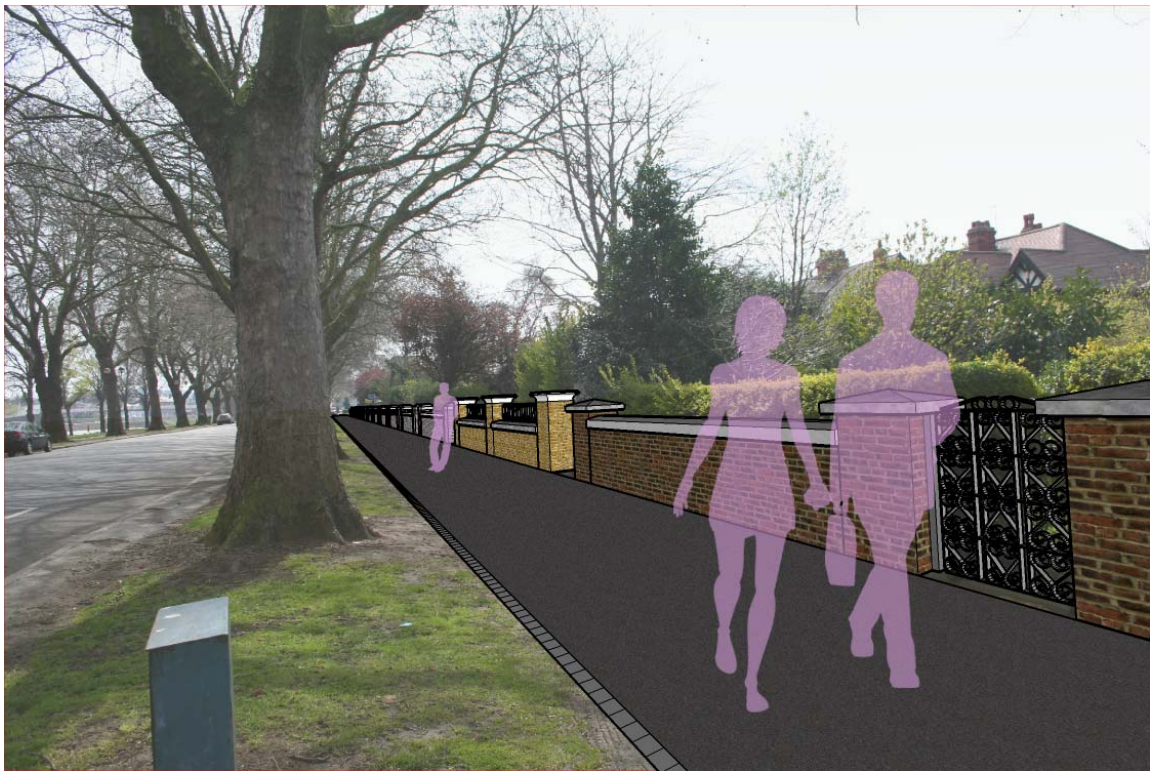

Plate C7.13 **Visualisation of Rear Boundaries of Fraser Road Properties with new Floodwalls and Re-surfaced Path**

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Table C7.2 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**
MEADOWS							
Reach 1 Raising 'Victoria Embankment Floodwall'	High	Low	Moderate / Not Significant	• Retention of existing avenue of mature trees by use of bored pile foundations. • Pedestrian access ramp to replace existing access.	Low	Moderate / Not Significant	
Raising Victoria Embankment Road	High	Low	Moderate / Not Significant	• Ensure smooth re-grading of road surface. • Within existing footprint of road, to reduce potential disturbance to mature trees.	Low	Moderate / Not Significant	Minor element of works within the wider context of the landscape.
New embankment across Wilford Grove Recreation Ground	High	Medium	Moderate/ Substantial / Significant	• New surfaced footpath along crest of embankment. • Raised circular terrace with reinstated tree planting creates a central focal point where the path intersects Wilford Grove.	Medium	Moderate/ Substantial / Significant	10+ years for establishment planting
Flood wall adjacent to existing bandstand	High	Low	Moderate / Not Significant	• Copper beech tree behind bandstand to be retained if possible and protected during construction works.	Low	Moderate / 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**
Reach 2 Defences in front of War Memorial and Gardens	High	Medium	Moderate/ substantial (major) Significant	• Improvements to public realm in front of War Memorial, whilst retaining the existing grass and bedding areas. • Narrowing of road, will act as a traffic calming measure. • Design mitigates disturbance to existing avenue of mature trees.	Medium	Moderate/ substantial beneficial (major) Significant	
Construct new flood wall (along rear property boundaries of Fraser Road properties)	High	Low	Moderate Not Significant	• Full reinstatement of boundaries and gardens. • Maintain access between properties and Victoria Embankment/ Bunbury Street with flood gates and access steps or ramps. • Bored piled flood wall to reduce potential disturbance to existing mature avenue of trees.	Low	Moderate Not Significant	3-5 years for establishment of ornamental planting; 10 years for tree planting.
Road raising and new flood gate across Bunbury Street	High	Low	Moderate Not Significant	• Junction with Victoria Embankment and Bunbury Street revised, to introduce traffic calming measures. • Suitable cladding to flood gate. • Ensure smooth re-grading of road surface.	Low	Moderate 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**
Reach 3 Existing flood wall to be raised by 100mm.	High	Low	Moderate / Not Significant	No mitigation measures possible.	N/A	Moderate / Not Significant	
Lock Keeper's Cottage floodwall	High	Low	Moderate / Not Significant	• Suitable floodwall cladding materials. • Full reinstatement of all affected areas of garden.	Low	Moderate / Not Significant	
Arla Floodwall (Reach 3.2) and Personal Storage floodwall (Reach 3.3)	Low	Low	Slight (minor) / Not Significant	• Agree floodwall alignment with property owner to minimise any potential impacts on existing working methods. • Ensure an appropriate concrete finish to the proposed floodwall.	Low	Slight (minor) / Not Significant	
COLWICK COUNTRY PARK							
Reach 4 New embankment	Medium	Medium	Moderate / Not Significant	• Provision of a 2m wide unbound stone footpath to the embankment crest to link the area with the wider footpath network. • Pedestrian access into Country Park and 'Starting Gate' Public House retained via 1:12 ramps. • Replacement tree planting, where possible, including areas cleared for temporary construction activities.	Low	Slight (minor)/ moderate / Not Significant	

Table C7.3 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**
MEADOWS							
Reach 1 Victoria Embankment pedestrians and cyclists	Medium	Medium	Moderate / Not Significant	• Retention of existing mature trees. • Inclusion of ramp access over the proposed floodwall.	Medium	Moderate / Not Significant	
Victoria embankment road users	Low	Medium	Slight (minor)/ moderate / Not Significant	• Retention of existing mature trees.	Medium	Slight (minor)/ moderate / Not Significant	
Users of recreation ground	Medium	Medium	Moderate / Not Significant	• Retention of existing mature trees. • Reinstatement tree planting on raised circular platform.	Medium	Moderate / Not Significant	
Users of the bandstand area.	Medium	Medium	Moderate / Not Significant	• Retain mature copper beech tree if possible.	Medium	Moderate / Not Significant	

[4] Unless otherwise stated the residual impacts are adverse. The duration of effects 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 2 Visitors to the War Memorial and Memorial Gardens	High	High	Substantial (major) / Not Significant	• Retention of existing mature trees. • Landscape improvements to the front of the War Memorial.	High	Substantial (major) / Not Significant	
Fraser Road residential properties adjacent to Victoria Embankment	High	Low	Moderate / Not Significant	• Full reinstatement of gardens where affected by works. • Reinstatement of suitable boundary treatments. • Suitable material finish to flood gates and access steps.	Low	Moderate / Not Significant	3-5 years for establishment of ornamental planting; 10+ years for tree planting
Residents of properties on the opposite river bank	High	Low	Moderate / Not Significant	• Retention of existing avenue of mature trees.	Low	Moderate / Not Significant	
Pedestrians and cyclists on the opposite river bank	Medium	Low	Slight (minor)/ moderate / Not Significant	• Retention of existing avenue of mature trees.	Low	Slight (minor)/ moderate / Not Significant	
Workers within the County Hall Council Offices looking to the opposite river bank	Low	Low	Slight (minor) / Not Significant	• Retention of existing avenue of mature trees	Low	Slight (minor) / 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**
Reach 3 Residents of Lock Keeper's Cottage and Quayside Close	High	Low	Moderate / Not Significant	• Suitable cladding of the proposed floodwall. • Full reinstatement of all affected gardens.	Low	Moderate / Not Significant	
Employees of Arla Depot and Personal Storage	Low	Low	Slight (minor) / Not Significant	• Ensure an appropriate concrete finish to the proposed floodwall.	Low	Slight (minor) / Not Significant	
Employees of Rushcliffe Borough Council, Nottingham Forest Football Club and the Environment Agency on the opposite river bank	Low	Low	Slight (minor) / Not Significant	• Retention of existing avenue of mature trees. • Suitable cladding of proposed floodwall. • Ensure an appropriate concrete finish to the proposed floodwall.	Low	Slight (minor) / Not Significant	
Recreational users of the Trentside North riverside footpath and the Trentside North Kayak Club	Medium	Low	Slight (minor)/ moderate / Not Significant	• Ensure an appropriate concrete finish to the proposed floodwall.	Low	Slight (minor)/ moderate / Not Significant	
Road users of Trent Bridge and Ladybay Bridge	Low	Negligible	Negligible / Not Significant	• Retention of existing avenue of mature trees. • Suitable finishes to proposed floodwalls.	Negligible	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**
COLWICK COUNTRY PARK							
Reach 4 Users of the Colwick Country Park Car Park	Medium	Medium	Moderate / Not Significant	• Provision of footpath/cycleway to crest of proposed embankment.	Medium	Moderate / Not Significant	

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C8. 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 C11*.

C8.1 Method of Assessment

An assessment of the potential impacts on waterbodies is made using 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 the 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.

C8.2 Baseline Conditions

C8.2.1 Surface waterbodies

The River Trent flows from west to east through the study area and the Nottingham and Beeston Canal joins the River Trent in Reach 3.

There are a number of surface water outfalls and combined sewer overflows (CSO) into the River Trent through the area. There is also a significant discharge from the overflow channel at Meadow Lane Lock. There is one ordinary watercourse in the area, Tinkers Leen, which discharges to the River Trent downstream of Meadow Lane Lock. Tinkers Leen receives the overflow from the top pound of the Nottingham and Beeston Canal and surface water from the city centre. When water levels in the River Trent are high, a manually controlled actuated penstock is closed at the outfall of Tinkers Leen.

C8.2.2 Water Quality

The Environment Agency assesses the chemical and biological quality of rivers using the General Quality Assessment (GQA) system, which is described in *Section 7.9.3, Volume 1*; refer to Table C8.1 for details.

Table C8.1 Water Quality Grades

Watercourse Stretch	GQA Chemistry Grade (2006)	GQA Biology Grade (2004)
River Trent confluence with River Soar to Nottingham Sewage Treatment Works (STW)	B (Good)	C (Fairly good)

C8.3 Impact Assessment

C8.3.1 Construction Impacts

Impact on Watercourses and Waterbodies due to Pollution from Construction Activities

Construction activities have the potential to cause pollution in local watercourses. This may arise from the movement of construction plant and material, or run-off from the site. There is the risk of spillages from poor handling, transportation or storage of construction materials, such as fuel.

During the refurbishment of the canal flood gates in Reach 3, there is the potential to disturb silt deposits in the canal during pumping of water from the temporary cofferdam.

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

C8.3.2 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.

Impacts 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 *impact* has been assessed *prior to mitigation* 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 and pose a flood risk. The peak flows in them are likely to occur before the corresponding peak in the River Trent. Consequently, the flood defence works will not increase the flood risk from such watercourses.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **not significant.**

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 *impact* has been assessed *prior to mitigation* as being **moderate adverse** and **permanent**.

C8.4 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*.

Mitigation method statements will be prepared to ensure water quality is not affected, especially during works around the Nottingham and Beeston Canal.

Impacts on watercourse and water bodies from pollution will be prevented by the following during construction:

- Ensuring that equipment and storage facilities are protected by secure fences and locked up where possible.
- Spill kits and trained personnel will be available.
- Unnecessary transportation of fuels and potentially polluting chemicals will be minimised and all vehicles, including the fuel bowser, 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 and 50m of a borehole.
- Site roads will be kept free from dust and mud.

To deal with the run-off from exposed ground and stockpiles, silt fences, ‘dip and lip’ earth banks or sandbags may be used to divert it away from watercourses.

C8.5 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 (none)**.

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 C8.2 Summary of Impacts on Water

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Impact on watercourses and waterbodies due to pollution from construction activities	Moderate to major adverse and short-term	Adhere to the Environment Agency's PPGs. Method Statements.	None
OPERATIONAL IMPACTS			
Impact on River Trent and its floodplain	No significant impact	None required.	None
Impacts from maintenance of new and raised flood defences and structures	No significant impact	None required.	None
Impacts on local surface water drainage and raised watercourses	No significant impact	None required.	None
Impact on surrounding villages	Moderate adverse and permanent	*Refer to Section 8, Volume 1.*	

C9. TRAFFIC AND TRANSPORT

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

C9.1 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 C3*.

C9.2 Baseline Conditions

The River Trent has influenced the development of the road network throughout the Meadows. There are four bridges across the river, namely Wilford Toll Bridge, the Suspension Bridge, Trent Bridge (A60) and Ladybay Bridge (A6011).

There can be heavy traffic throughout the day in the Meadows and Colwick Country Park scheme area due to its proximity to the city centre. The main commuter routes include Meadow Lane and Daleside Road. Victoria Embankment is a private road owned and maintained by Nottingham City Council, who periodically close the road for recreational amenity.

C9.3 Impact Assessment

C9.3.1 Construction Impacts

Impact on Local Roads due to Construction Traffic

In Reaches 1 and 2, there will be an increase in heavy vehicle movements in residential areas adjacent to works, specifically Victoria Embankment and Bunbury Street

In Reaches 3 and 4, there will be an increase in heavy vehicle movements on the A6011 and A612, although these roads already carry significant traffic numbers.

The location of the proposed access points are shown on Figures CC2.3 to CC2.7. In addition, material will be transported along the haul routes adjacent to the defences. Estimated lorry movements are shown in Table C9.1. These may be subject to change as the detailed design develops.

The *significance* of the *impact* on local roads due to construction traffic has been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

Table C9.1 Estimated Lorry Movements

Reach	Volume of Earthworks (m^3)	Volume of Concrete (m^3)	Other Materials and exportation of waste m^3 (1)	Total Number of Lorry Movements(2)
Meadows				
Reach 1	17,550	830	2755	5,350
Reach 2	750	360	165	350
Reach 3	-	250	-	90
Colwick Country Park				
Reach 4	9,900	-	1,485	2,850
Totals	**28,200**	**1,440**	**4,445**	**8,640**

(1) Other building materials include sheet piles, stone and timber cladding amongst other construction materials. The volume of these materials and the volume of waste produced are hard to assume at outline design stage therefore it has been calculated that other building materials are 15% of the total volume of permanent earthworks and concrete is 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 Land Raising Operations and Construction Activities Requiring Road Closures

Reaches 1 and 2: Lane closures along Victoria Embankment and Bunbury Road will be required for approximately six months. A full road closure will be required along Victoria Embankment for part of this period for the road raising works.

The *significance* of the *impact* on local roads due to construction traffic has been assessed *prior to mitigation* as being **moderate adverse** and **short-term**.

C9.3.2 Operational Impacts

Impact of New and Raised Defences on Local Transport Infrastructure

There will be a reduced risk of flooding of the city centre road network and the main railway line behind the flood defences.

The *significance* of the *impact* on the local transport infrastructure has been assessed as being **minor beneficial** and **permanent**. No mitigation is required.

C9.4 Mitigation Measures and Monitoring

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

Specific considerations are to:

- Avoid residential areas and other sensitive locations.
- Carry out repairs to the highway surfaces and kerb lines after the works have been completed.
- Avoid increasing traffic flows on the main roads during peak periods – time deliveries of materials to the main compounds to between 9am and 4:30pm.
- Prepare risk assessments for access through existing industrial areas.

C9.5 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. This results from the need to transport equipment, workers and material to and from the site and lane/road closures. There will be a **minor beneficial permanent** impact due to a decrease in flood risk to the local transport infrastructure.

Table C9.2 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*. • Avoid increasing traffic flows on the main roads during peak periods. Time the deliveries of materials to the main compounds to be between 9am and 4.30pm.	Minor adverse and short-term
Impact due to local road raising operations and construction activities requiring road closure	Moderate adverse and short-term	• Develop a TMP; refer to *Section 7.10.5, Volume 1*. • Repairs to the highway surfaces and kerb lines would be carried out after the works have been completed.	Minor adverse and short-term
Operational Impacts			
Impact of new and raised defences on local transport infrastructure	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent

C10. CULTURAL HERITAGE AND ARCHAEOLOGY

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

C10.1 Method of Assessment

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

C10.2 Baseline Conditions

C10.2.1 Archaeology

Desk Study

From the desk study, a number of sites of archaeological and palaeoenvironmental interest potentially affected by the scheme were identified. The features are discussed below and their locations marked on Figure C10.1.

Anglo Saxon find spot (Site S) (Reach 2). An Anglo Saxon brooch was found close to the Suspension Bridge, which may indicate the presence of further early medieval remains (SMR No 552).

The Old Trent Bridge (Site T) (Reach 3). This medieval stone bridge stood immediately to the south of the existing Victorian Trent Bridge (SMR No 776). Its buried remains are likely to survive in the vicinity of the proposed works. This site includes the Victorian Trent Bridge and the remains of two seventeenth century fortifications that are thought to have stood on the north bank of the River Trent (SMR Nos 5229 and 5230).

The Suspension Bridge (Site U) (Reaches 1 and 2). The Suspension Bridge is designated as a Listed Building (SMR No 770). Both its built fabric and its visual setting are of value.

Wilford Lodge (Site V) (Reach 1). This is the site of a house shown on mapping of 1609. The house is known from documentary sources to have been owned by Sir Gervase Clifton and was demolished between 1886 and 1901.

Cropmark Enclosure (Site W) (Reach 1). A cropmark has been identified on twentieth century aerial photographs, indicating a buried archaeological site (SMR No 5235). Although no dating evidence exists, the image suggests there was an enclosure at this location.

Site of Victoria Public Baths (Site X) (Reach 1). There were public baths at this site from at least 1881, which were demolished in the twentieth century. Their buried remains are likely to survive.

Wilford Toll Bridge (Site Y) (Reach 1). Wilford Toll Bridge was built in 1870 and is now a Listed Building. The Toll House, which is adjacent to the proposed works, is included in the listing.

Trent Bridge Lock gates (Site Z) (Reach 3). The Nottingham Canal, which is served by the gates, was built in 1793 and elements of the eighteenth century structures may survive. The remains of a mid nineteenth century bridge are also thought to survive on the north bank

Remains of a similar nature to those found during gravel extraction (Site AA) (Reach 4). The excavation of gravel pits in Colwick Park in the late twentieth century disturbed a large number of archaeological sites (SMR Nos 968, 969, 782, 970, 6183, 972, 973, 982, 971, 974, 975, 980, 961, 976, 952, 965, 977, 978 and 979). The sites give a good indication of the background archaeological potential in this location. Finds included prehistoric weapons and tools, an Iron Age quern and pottery, and a number of Neolithic and Bronze Age tree trunks containing environmental information. Typically, these deposits were recovered from within the gravel deposits laid down by the River Trent. It is unlikely that the proposed works will significantly impact upon buried gravel deposits.

Undated earthwork mound (Site BB) (Reach 4). An upstanding earthwork mound, about 20m in diameter and 1m high, has been identified at SK 607 400. The origins of this are uncertain and although it may be associated with modern land clearance, its general proportions are similar to those of a prehistoric barrow.

Roman and medieval artefact scatter and undated earthwork (Site CC) (east of Reach 4). Fragments of Roman and medieval pottery have been recovered during building work at SK 611 399 and there remains a strong probability that further remains survive close to this location (SMR No 983). An undated earthwork has been noted in this area, which may be associated with historic settlement.

Palaeochannel Deposits (Site EE) (Reach 4). A number of palaeochannels cross the sites. These former channels of the River Trent have the potential to include important information about past environmental conditions.

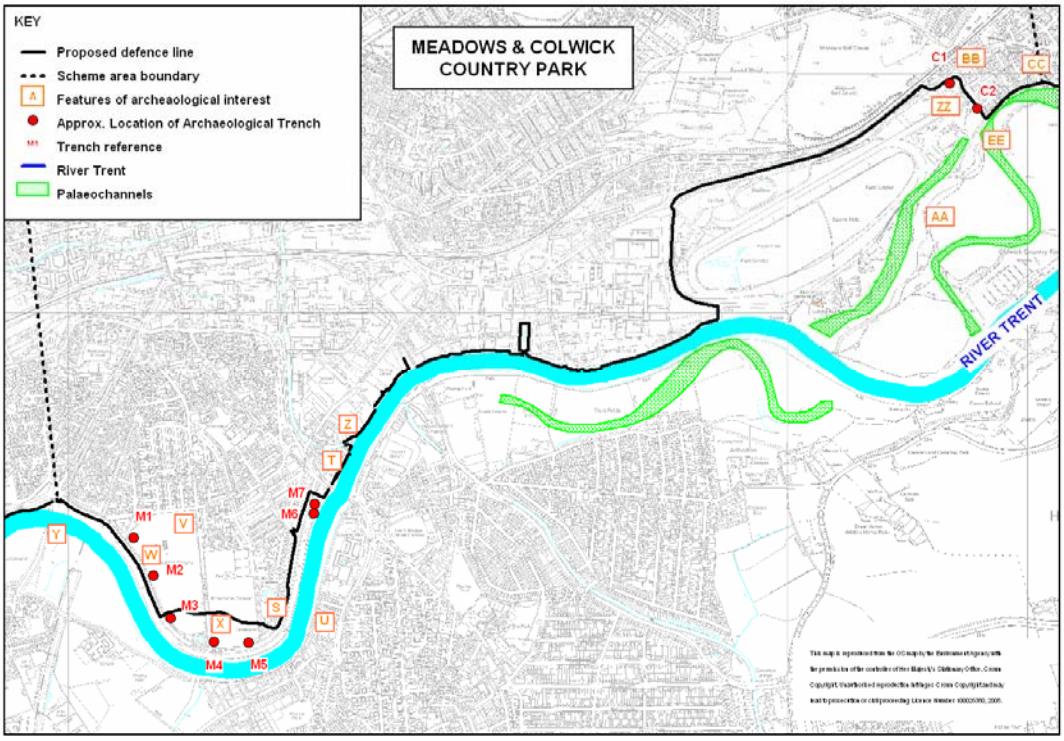

Figure C10.1 Location of Features of Archaeological Interest and Ground Investigation Trenches

Colwick Hall within Colwick Country Park is a Scheduled Monument but would be unaffected by the proposed works.

Results from Ground Investigations

Eight evaluation trenches were excavated to the north of the River Trent in the Meadows and Colwick Country Park scheme area; refer to Figure C10.1. Seven of the trenches (M1 to 7) were located along Victoria Embankment, whilst the others (C1 and 2) were in Colwick Country Park Car Park. Trench (M6) was not excavated due to its proximity to a tree. The results are summarised in Table C10.1.

Table C10.1 Results of Archaeological Ground Investigations

Trench	Results
M1	Possible post medieval river dredgings sealed beneath nineteenth century deposits. Interpreted as evidence for the creation of the Victoria Embankment.
M2	Nineteenth century deposits. Interpreted as evidence for the creation of the Victoria Embankment.
M3	Alluvium.
M4	Layers of imported Victorian material. Interpreted as evidence for the creation of the Victoria Embankment.
M5	Layers of undated dumped material.
M7	
C1	Possible palaeochannel.
C2	Deposits resembling alluvium found.

C10.2.2 Listed Structures

There are nine Grade II Listed Buildings, all along Victoria Embankment. Listed Buildings locations are shown on the figures in *Annex C2.* They are:

- gateposts at the west end of Victoria Embankment
- telephone box adjacent to gateposts
- Wilford Toll Bridge Toll House
- statue of Sir Robert Juckes Clifton
- War Memorial
- statue of Queen Victoria
- ornamental fountain
- wall along rear of memorial gardens
- gateposts at east end of Victoria Embankment

C10.3 Impact Assessment

C10.3.1 Construction Impacts

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

In addition, the insertion of 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 and some deformation of remains in the immediate area. 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.

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

Table C10.2 summarises the level of impact on the known archaeological features due to these activities.

The *significance* of these *impacts* has been assessed *prior to mitigation* as being **minor adverse** and **permanent.**

Table C10.2 Significance 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**
Anglos Saxon Find Spot (Site S)	Minor	None	Minor	None	Minor	Minor
The Old Trent Bridge and Gateposts (Site T)	Minor	None	Minor	None	Minor	Minor
The Suspension Bridge (Site U)	None	None	None	None	None	None
Wilford Lodge (Site V)	-	None	None	None	None	-
Cropmark Enclosure (Site W)	Minor	None	Minor	None	Minor	Minor
Site of Victoria Public Baths (Site X)	None	None	None	None	None	Minor
Wilford Toll Bridge (Site Y)	None	None	None	None	None	Minor
Trent Bridge Lock (Site Z)	Minor	None	None	None	None	Minor
Remains of a similar nature to those found during gravel extraction (Site AA)	Minor	Moderate	Moderate	None	Moderate	None
Undated earthwork mound (Site BB)	Minor	Major	Major	None	Major	None
Roman and medieval artefact scatter and undated earthwork (Site CC)	None	None	None	None	None	None
Findspot of Neolithic axeheads (Site DD)	Minor	None	Moderate	None	Moderate	None
Palaeochannel Deposits (Site EE)	Minor	Moderate	Moderate	None	Moderate	None
Gateposts at the eastern end of Victoria Embankment	Minor	None	Minor	None	Minor	Minor

C10.3.2 Operational Impacts

There will be a reduction in the flood risk to a number of Listed Structures.

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

C10.4 Mitigation Measures and Monitoring

There are a range of generic mitigation measures, to reduce the general disturbances and risks relating to construction activities on the 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 relevant local authority archaeological officers and English Heritage. Specific mitigation measures for the known archaeological sites will include:

- Reaches 1 to 3 – Monitoring of the piling operations, particularly in the vicinity of Listed Buildings (Sites T, U, Y and Z). Archaeological observation of ground breaking activities in areas of demonstrably significant archaeological potential, followed by recording of any deposits (Sites S, T, W, X, Z and AA).
- Reach 3 – Particular care will be taken to retain the Grade II listed gate posts at the eastern end of Victoria Embankment. The setting of the new wall adjacent to the gate posts will take into account the gate posts and be agreed with the Nottingham City Council Conservation Officer.
- Reach 4 – A programme of intrusive archaeological work, in advance of construction to mitigate any impacts on Site BB.
- Reaches 4 – A programme of geoarchaeological assessment of known palaeochannel deposits, disturbed during the construction works (Site EE).
- 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.

The results of this archaeological work will be placed in the public domain in a format agreed by the relevant local authority archaeological officers and English Heritage.

Along Victoria Embankment (Reaches 1 and 2), the flood defence will be founded upon intermittent concrete bored piles. These are established by back-filling drilled holes with concrete and steel reinforcement. This construction method eliminates the significant vibration associated with the traditional sheet piles, and minimises impact on above and below ground features.

The sheet piling proposed for the flood wall along Arla Depot (Sub-reach 3.2) is an area of no known archaeological interest.

C10.5 Residual Impacts

Residual impacts are limited to the visual impact of the defences on the historic environment, including Listed Buildings. The adverse residual impacts after mitigation are of **no** or **minor significance**.

Table C10.3 Summary of Impacts on Cultural Heritage and Archaeology

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CONSTRUCTION IMPACTS			
Impact on archaeology due to construction activities	Minor 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.* • Design to take into account setting of Listed Buildings.	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

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C11. SOIL, GEOLOGY AND HYDROGEOLOGY

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

C11.1 Method of Assessment

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

C11.2 Baseline Conditions

C11.2.1 Geology

The solid geology of the Nottingham area comprises deposits of the Mercia Mudstone and Sherwood Sandstone Groups of the Triassic Age. The Triassic deposits are underlain by Coal Measures.

The area is traversed by a number of faults, the majority with an east-southeast to west-northwest strike, although some have a stronger north-south alignment. The general bedding dip is towards the east.

Overlying the Triassic deposits, 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, sands and gravels with some organic clay. Deposits of made ground are present, due to urban and industrial development on the left bank of the River Trent.

The ground investigations have generally confirmed the underlying geology, which is variable deposits of made ground overlying alluvium with shallow depth to bedrock of either Mercia Mudstone or Sherwood Sandstone. Due to local faulting and erosion, the mudstone is absent in certain areas and the alluvium rests directly on the Sherwood Sandstone.

There is a geological SSSI near Reach 4 called Colwick Cutting. The site is a section of the Triassic Colwick Formation, a major rock unit comprising mudstones, siltstones and thin sandstone arranged in coarsening-upwards units.

C11.2.2 Soils

Made ground is typically present as a mixture of cohesive and granular soils that have been placed as fill to embankments and development works.

The alluvium consists of cohesive deposits of clays and silts overlying granular deposits of sand and gravel.

Little information is available for the made ground and cohesive alluvium at Meadows. Processing of data from the ground investigation has been carried out to assess the engineering parameters of these soils.

When present, the weathered Mercia Mudstone was recovered in boreholes as sandy clay and Sherwood Sandstone as a yellow brown fine to coarse sand.

C11.2.3 Hydrogeology

The made ground is variable and is not important as an aquifer.

The granular alluvium has a high permeability and is classed as a minor aquifer. This stratum has a hydraulic connection with the River Trent. Ground conditions indicate that seepage under the existing defences, through the granular alluvium, may be an issue. Monitoring of groundwater and river levels is ongoing to verify whether seepage will be a concern. Initial findings are that although seepage may occur, no properties are likely to be flooded from seepage water ponding in low lying areas behind the defences.

The Mercia Mudstone has a very low permeability and is classed as a non-aquifer.

The Sherwood Sandstone is a recognised aquifer, and typically it is overlain by the Mercia Mudstone which acts as barrier, restricting the interaction of water in the River Trent and the granular alluvium with that in the sandstone. In other areas, the mudstone has been eroded and the granular alluvium rests directly on the sandstone. The hydraulic connection between the river, granular alluvium and sandstone is unlikely to be significant. This is because faulting isolates this section of the sandstone from the main aquifer and although a hydraulic connection may exist between the granular alluvium, river and sandstone, it does not play a significant part in the recharge of the aquifer. The mass permeability of the sandstone is likely to be lower than that of the granular alluvium, so surface water will generally pass into the granular alluvium and then into the River Trent.

C11.2.4 Contaminated Land

Due to the industrial nature of Reach 3, it was considered that there was a high risk that contaminated land would be present.

The chemical contamination of the soils at the site was assessed by performing a suite of tests on samples obtained from the ground investigation. Comparing the test results to available industry guidelines, such as Soil Guideline Values (SGVs), the values are low.

C11.3 Impact Assessment

C11.3.1 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. This could result from the slippage of machinery on the wet ground which would have a very damaging effect on the soil structure. The excavation will be minimal for the proposed new sheet piled wall in Sub-reach 3.2. The excavation will not extend to 1m below ground level and the impacts to the immediate surrounding environment should be minimal. Driving sheet piles should not unduly disturb or affect the underlying soils. The piles will not extend into the Sherwood Sandstone.

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 or 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.

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

Impact of Disturbing Contaminated Land

Contaminated land will not be excavated throughout Sub-reach 3.1, the only disturbance to any potential contaminated land will be from the driving of sheet piles.

The *significance* of the *impact* has been assessed *prior to mitigation* as being **not significant.**

C11.3.2 Operational Impacts

No impacts were identified.

C11.4 Mitigation Measures and Monitoring

The general mitigation measures outlined for the protection of surface waters will inherently protect groundwater quality; refer to *Section 7.9.5, Volume 1*. However, the work will be undertaken in accordance with the Environment Agency's 'Policy and Practice for the Protection of Groundwater'. General mitigation measures to reduce the impact of soil compaction in working areas include:

- removing the layer of topsoil from working areas, site compounds and temporary haul roads in advance of the work;
- during construction working areas, site compounds and temporary haul roads will be protected with a hard surface;

- storing the topsoil carefully during the works to be used to re-instate the ground affected;
- reseeding/replanting following the works to ensure that soils are not washed away during floods.

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

- Contractor will adopt industry standard working methods, including a controlled working area, stock piling of excavated materials, the use of drip trays for machinery etc.
- Provision of an Environmental Clerk of Works who will monitor compliance with the agreed Site Waste Management Plan (SWMP).

Other measures to be implemented are detailed in *Section 7.12.5, Volume 1*.

If the working area is found to have contaminants present, the procedures outlined in the Environment Agency's 'Guidance on Requirements for Land Contamination' will be followed. Depending on the type, source and quantity of the contamination found, one of the following options will be implemented:

- control: deal with the contamination insitu;
- remove source: remove source of contamination;
- remove pathway: typically involves the creation of an impermeable barrier to ensure contamination can no longer enter the site;
- remove sink: remove the area affected by contamination.

C11.5 Residual Impacts

The **adverse** residual impacts which will remain following the implementation of the mitigation measures are of **no significance (none)**. They are limited to soil compaction and contamination from the construction works.

Table C11.1 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).	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).	None
Disturbance of contaminated land	No significant impact	• Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005).	None
OPERATIONAL IMPACTS			
No significant impacts were identified			

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C12. LAND USE

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

C12.1 Method of Assessment

Existing land use was identified through walkover surveys and reference to Nottingham City Council's Development Plan.

C12.2 Baseline Conditions

The predominant land use types are residential, industrial, commercial and recreational.

Reaches 1 and 2 are characterised by recreational land, adjacent to which is the Meadows housing estate, with small amounts of commercial and industrial usage. Reach 3 contains further residential properties between Trent Bridge and the Nottingham and Beeston Canal. Downstream of the canal there is a predominance of industrial and commercial units, including warehousing, mechanical engineering, and transportation. The river frontage downstream of the canal is designated a Development Site.

Nottingham City Council has advised that the majority of the river frontage of Reach 3 will be developed within the next ten years as part of a Nottingham Regeneration programme. The reach is designated into four Development Zones for staged regeneration, which are highlighted on Figure C12.1 and described as follows:

Meadow Lane Development Zone

There are no immediate plans for the redevelopment of this area, which extends between the Meadow Lane Lock and Ladybay Bridge. However, Nottingham City Council is hopeful that redevelopment will take place in the medium to long-term when construction of the other zones is underway. Infrastructure works to improve access around the canal lock and towpath area are being progressed by British Waterways (see below).

Waterside Centre Development Zone

There are no immediate plans for the redevelopment of this area, which extends between Ladybay Bridge and Poultron Drive.

Trent Basin Development Zone

Developers ISIS have secured outline planning consent for a primarily residential scheme. The area is bounded by Poultron Drive, Trent Lane and Daleside Road. Engineering and transport issues were led by Bay Associates Consultants. The Environment Agency's Development Control team has been in contact with Bay Associates regarding the requirement for flood risk management.

Park Yacht Club Area Development Zone

The Park Yacht Club Area extends between Trent Lane and Racecourse Road, and it is likely that the development will take place over two phases; however, at present there are no immediate plans for Phase 2.

Phase 1 has commenced and focuses on the construction of a block of riverside flats at the downstream end of the zone. As part of planning approval, the developers are obliged to construct a new access road embankment immediately north of the flats, which will protect against flooding with a 1% annual probability of occurrence. The embankment will link Phase 2 with Racecourse Road.

To ensure best use of public money and compliance with planning guidance, Nottingham Trent Left Bank FAS only addresses flood protection through Reach 3 for those areas not being considered for regeneration. It will be the developer's responsibility to ensure that their development is adequately protected in compliance with Planning Policy Statement 25: 'Development and Flood Risk'. Such an approach is only possible because a breach in the defence through Reach 3 would only result in localised flooding.

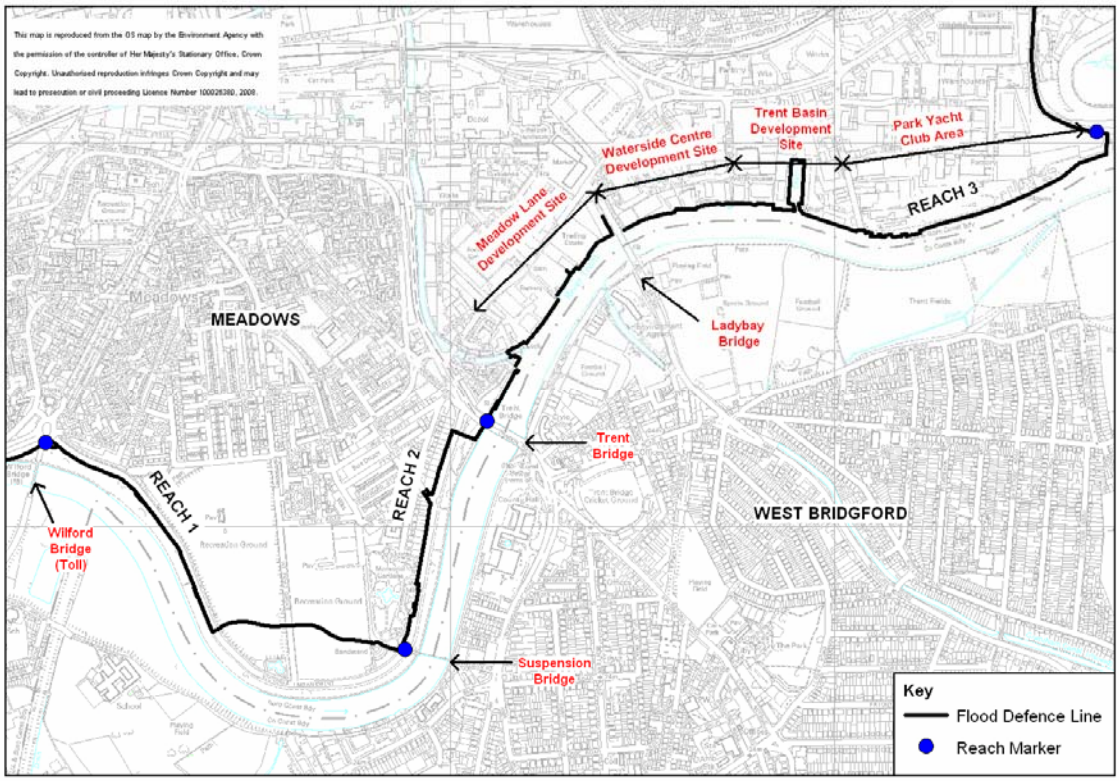

Figure C12.1 Development Zones for the Nottingham Regeneration Programme at Meadows

British Waterways are working with Nottingham City Council to redevelop the Meadow Lane Lock area to include a new suspended walkway, as part of the 'Trent River Park' cycle and pedestrian route, and tourist amenities. It is unlikely that this work will commence before the planned flood defence works. However, British Waterways are going to undertake infrastructure works to improve access around the towpath and lock in January 2009. The works are programmed to take 26 weeks and will not coincide with works around the Meadow Lane Lock (Sub-reach 3.1).

Reach 4 is adjacent to the edge of Colwick Country Park, partly through a car park. The area around Colwick Country Park and Nottingham Racecourse is designated as greenbelt land in the Nottingham City Local Plan. There is no agricultural land within the Meadows and Colwick Country Park scheme area.

Impacts on residential property and recreation are further discussed in *Section C3* and *C7*. Areas managed for nature conservation are discussed in *Section C4*.

C12.3 Impact Assessment

C12.3.1 Construction Impacts

Impact of Loss of Available Land

The majority of the potential impacts will be short-term. The potential impacts are as follows:

- some disruption of access to the land across the construction area including recreation;
- loss of a parking area for Colwick Country Park;
- damage to the soils during the construction process; no agricultural soils affected;
- reduction in storage areas in industrial areas of Reach 3.

There will be some permanent loss of land as a result of an increased footprint of raised flood embankments. Land take will primarily be in recreational, private residential and industrial areas. Although the land use along the easement will be restricted to protect the defences, the current land use practices will continue. The construction of access ramps over the walls in Reaches 1 and 2 will mean that the existing access and land use to the river frontage will be unaffected.

Temporary and permanent land take due to the proposed works are listed in Table C12.1.

Table C12.1 Existing and Increased Footprints of New and Raised defences

	Existing Footprint (m^2)	Increased/New Footprint (m^2)	
Reach	**Permanent**[(1)]	**Temporary**[(2)]	**Permanent**[(1)]
1	4,250	36,360	18,430
2	No Existing Defence	8,700	5,010
3.1	215	4,545	215
3.2	No Existing Defence	2,800	135
3.3	No Existing Defence	1,385	40
4	No Existing Defence	12,670	7,380
TOTAL	**4,465**	**66,460**	**31,210**

(1) Flood defence footprint
(2) Working area during construction (not including storage or access areas)

Following reinstatement, the potential impacts are as follows:

- it may take one full growing season for grassland to fully re-establish in the recreational areas;
- a permanent easement of 1-5m will be created adjacent to the defence, along which the Environment Agency will have the right to carry out maintenance and monitoring operations. This should not affect existing land use.

In addition to any direct temporary loss of land, construction work may also generate dust that could impact on land beyond the physical boundaries of the construction site; this issue is dealt with separately in *Section C6*. Impacts on access rights are outlined in *Section C3*.

The *significance* of this *impact* on land use has been assessed *prior to mitigation* as being **minor adverse** (disruption of land use) to **moderate adverse** (impacts from land take) and **short-term to permanent** (permanent lake take).

C12.3.2 Operational Impacts

Impacts 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.

C12.4 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 C2;* refer also to Table C12.2.

C12.5 Residual Impacts

The only long-term, permanent **adverse** impact is the loss of approximately 2.7ha of additional land under the new/increased footprint of the defence and the creation of 1-5m wide easement. The significance of this impact is considered to be **minor**.

Table C12.2 Summary of Impacts on Land Use

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
Construction Impacts			
Impact of land loss	Minor to moderate adverse and short-term to permanent	• Liaison with local industry/business to minimise impacts on their works areas. • Liaison with Nottingham City Council over impacts on recreational areas. • Full reinstatement of temporary working areas. • Best practice construction methodology. • Full reinstatement and protection while vegetation re-establishes.	Minor adverse and short-term to permanent
Operational Impacts			
Impacts on land use as a result of the reduction in flood risk	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
Impacts of decrease in available floodplain	See *Section 8, Volume 1*		

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C13. USE OF NATURAL RESOURCES AND WASTE GENERATION

C13.1 Main Materials Used and Sources

C13.1.1 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 will be built up in layers using suitable fill materials.

Potential local sources of secondary fill have been identified for the embankment raising works. Approximately 28,200 m^3 of fill material will be required for the embankments. Investigations to determine sources of material are continuing.

C13.1.2 Ready mixed concrete

Approximately 1,440 m^3 of concrete is required for the construction of new flood walls and foundations in Reaches 1-3.

In the Trent Valley it is difficult to source ready mixed concrete which contains recycled aggregates. This is largely due to the abundance of cheap natural aggregates. All efforts will be made to incorporate mixes containing recycled aggregates but few suppliers are willing to offer full recycled and accredited mixes.

C13.1.3 Steel sheet piles and reinforcement

Approximately 25 m^3 of steel will be required for the 210m of sheet piling works. The contractor currently sources most of their steel reinforcement from suppliers who produces their steel from entirely recycled materials using Electric Arc Furnaces.

C13.1.4 Other materials

Primary sources of materials will be avoided and, wherever possible, 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.

C13.1.5 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 plantation clearance;
- general construction waste including packaging and concreting formwork;
- general municipal waste from site offices/compounds.

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

The Environment Agency sets specific waste targets for construction works which are outlined 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.

C13.1.6 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 in to 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
- reuse surplus materials
- recycle waste.

C14. IMPACTS IN-COMBINATION WITH OTHER KNOWN PLANS OR PROJECTS

The Meadows and Colwick Country Park scheme area forms part of the wider Nottingham Trent Left Bank Scheme. The cumulative impacts of the entire scheme are described in *Section 8, Volume 1*, and include the impacts of increased peak river levels in the outlying villages.

The following projects may impact on the scheme in the Meadows and Colwick Country Park scheme area:

Nottingham Regeneration Scheme

Nottingham City Council has advised that the majority of this river frontage of Reach 3 will be developed within the next ten years as part of a Nottingham Regeneration programme. The reach is designated into four Development Zones for staged regeneration, which are described in *Section C12*. To ensure best use of public money and compliance with planning guidance, this scheme only addresses flood risk management through Reach 3 for those areas not being considered for regeneration. It will be the developer's responsibility to ensure that their development is adequately protected in compliance with Planning Policy Statement 25: 'Development and Flood Risk'. Park Yacht Club Area (Phase 1) is the only scheme currently under construction and will be completed before construction of Meadows begins.

Meadow Lane Lock

British Waterways are working with Nottingham City Council to redevelop the Meadow Lane Lock area. The proposed redevelopment includes a new suspended walkway and tourist amenities. It is unlikely that this work will commence before the flood defence works are completed. The flood defence scheme would not affect the implementation of the redevelopment. Infrastructure works to improve access around the canal towpath and lock area are programmed to commence in January 2009 and will be completed before the flood defence scheme works begin.

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C15. ENVIRONMENTAL ENHANCEMENT

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 Meadows and Colwick Country Park scheme area. *Figure FF3.3 in Appendix F* indicates that the enhancements are focused on Victoria Embankment and Colwick Country Park. The potential opportunities are as follows:

Victoria Embankment

- install interpretation boards on areas of archaeological and historic interest;
- install new public shelters;
- upgrade the lighting;
- improved the cycleway and footpath links;
- enhancements to the frontage of the War Memorial.

The potential enhancement works along Victoria Embankment will be developed with Nottingham City Council.

Colwick Country Park

- install interpretation boards;
- install fishing pegs;
- install a dipping platform for education;
- fencing to reduce geese grazing;
- vegetation management for amphibians;
- create shallows and reedbed planting;
- improvements to lakes and channels for fish movements;
- potentially install a footbridge over the eastern end of the Trent backwater channel;
- potentially enhancing the footpath over the old route of the River Trent from River Road to the Marina,

The potential enhancement works within Colwick Country Park are being developed with Nottingham City Council.

Other Enhancements

As well as the above enhancements planned within the scheme area, there are proposals for additional ecological and recreational improvements within the wider River Trent floodplain; refer to *Appendix F*.

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C16. SUMMARY AND CONCLUSIONS

The environmental effects and the corresponding mitigation measures are summarised overleaf in Table C16.1 and set out in the EAP in *Section 13, Volume 1*. The residual impacts of the proposed scheme are summarised below.

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 probability of occurrence. This will include an improved standard of flood protection to approximately 4,500 properties and businesses in the Meadows and Colwick Country Park scheme area.

Nottingham City Council have confirmed that the proposals within the Meadows and Colwick Country Park scheme area constitute 'permitted development'. This means that we do not require planning permission for this section.

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 original ES in April 2007. The change of alignment across Wilford Grove Recreation Ground has been agreed with Nottingham City Council and will form part of the future vision to improve the amenity value of the area.

We plan to commence construction of the Meadows and Colwick Country Park scheme area in 2011 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 an 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 adverse impacts from the scheme will occur during the construction period and will therefore be temporary and short-term. This will include 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, including the temporary closure of the Nottingham and Beeston Canal and reduced use of Wilford Grove Recreation

Ground, Victoria Embankment and Colwick Country Park. The impacts will be of most significance in the 24 residential properties including a block of flats where construction is within their property boundary, and the 116 properties/businesses which are within 50m of the proposed works. These include several sensitive sites such as King's School and the War Memorial. Various mitigation measures will be implemented to reduce and manage these adverse impacts. These will include timing of 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 works.

Due to the mainly urban nature of the scheme area impacts on flora and fauna will be limited. The highest impacts will be the clearance of trees within Colwick Country Park. Careful timing of construction and replanting will ensure there will be no significant residual impact on birds, bats or other fauna.

The main area subject to a significant adverse landscape and visual amenity impact will be Wilford Grove Recreation Ground. The impacts of the new embankment will be minimised through sensitive detailed design and the use of appropriate planting. The embankment and terrace will form part of a longer term plan by Nottingham City Council to improve the amenity value of the area. Improvements to the public open space in front of the War Memorial will have a beneficial impact. Wherever the works impact on private properties the gardens will be fully reinstated.

There are no significant residual impacts on air quality, water, land use and cultural heritage and archaeology. The impacts and the corresponding mitigation measures are summarised in more detail in Table C16.1 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 ongoing consultation with landowners/managers and local communities. Potential enhancement at the Meadows and Colwick Country Park scheme area include:

- amenity improvements at Victoria Embankment;
- improvements at Colwick Country Park such as installing fishing pegs, creation of shallows and reedbeds, or habitat improvement for fisheries and amphibians.

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 C16.1 Summary of Environmental Impacts for Meadows

Receptor	Impact Description	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	• Ongoing liaison with residents. • Minimise working area in private properties. • Full reinstatement of gardens.	Minor to moderate adverse and short-term
	Impact on key businesses as a result of construction activities in close proximity	Minor adverse and short-term	• Ongoing liaison with local businesses. • Minimise working areas in private properties, notably Arla Depot and Personal Storage.	Minor adverse and short-term
	Impact on sensitive sites as a result of construction activities in close proximity	Minor to moderate adverse and short term	• Liaise with the King's School and Ladybay Youth Centre. • Maintain access to the river for the Ladybay Youth Centre. • No construction activity along Victoria Embankment during the Remembrance services. • Ensure works do not affect the Riverside Festival. • Use concrete bored piles along Victoria Embankment to reduce noise and vibration.	Minor adverse and short-term
	Impacts on local recreational resources as result of construction activities	Moderate to major adverse and short-term	• Canal works undertaken in winter. • Widely publicised notification of canal closure. • Maintain pedestrian access to "The Nottingham Princess". • Sequential working along Victoria Embankment to minimise length of disruption and land take in each area. Works will be timed to avoid disruption to main public events along Victoria Embankment. • Maintain access at all times along the tow path at the bottom of Victoria Embankment. • Formal closure and temporary diversion of footpaths in Colwick Country Park with clear signage. • Maintain pedestrian access into Colwick Country Park through car park. • Re-instate footpaths/cycleways/bridleways to the existing or improved standard. • Ensure no access restrictions during the Great Nottinghamshire Bike Ride.	Moderate adverse and short-term

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
HUMAN POPULATION	**OPERATIONAL IMPACTS**			
	Impacts on local population as a result of the reduction in flood risk	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent
	Impact of flood regime on recreational resources as a result of improvements to Wilford Grove Recreational Ground	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent
	Impact of flood regime on recreational resources and sensitive sites outside new flood defences	No significant impact	No mitigation required.	None
	Impact on villages outside of scheme area	Moderate adverse and permanent	See *Section 8, Volume 1*.	
FLORA AND FAUNA	**CONSTRUCTION IMPACTS**			
	Construction impacts on Colwick Country Park SINC	Minor adverse and short-term	• Pollution control. • Enhancement measures; refer to *Section 9, Volume 1*.	None
	Loss of trees	Minor adverse and permanent	• Detailed 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. BS 5837 to be followed. • Replacement and supplementary planting. • Arboricultural watching brief of works to Victoria Embankment.	Minor adverse in long term. No permanent significant residual impact
	Impact on bat habitat	Minor adverse and permanent	Replacement planting and erection of bat boxes in the local area.	None in medium to long-term
	Disturbance to birds	None to minor adverse and short-term.	Vegetation clearance to be undertaken outside the breeding bird season. All vegetation in the temporary working areas to be reinstated to ensure no loss of habitat value.	None
	OPERATIONAL IMPACTS			
	Impact on SINCs due to: • Increased flood protection to Left Bank • Impact on undefended SINCs including Colwick Country Park and Nottingham Racecourse Wetland (Pond)	No significant impact	None required.	None

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual 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 avoid noise emissions. • Liaison with residents and local businesses. • Generic mitigations measures; refer to *Section 7.6.5, 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 considered at risk within 200m of sheet piling. • Piling plant will be well maintained to ensure unnecessary vibrations from exhaust systems or loose panels are eliminated.	Moderate to major adverse and short-term
	OPERATIONAL IMPACTS			
	No significant impacts identified			
AIR QUALITY	**CONSTRUCTION IMPACTS**			
	Impact on the local environment from dust generating activities and vehicle emissions	Minor to moderate adverse and short term	• Generic mitigations measures; refer to *Section 7.7, Volume 1*. • Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.7.5, Volume 1*. • Refer also to *Section C9.* • Use of alternate methods e.g. use of mains power rather than generator.	Minor adverse and short term
	OPERATIONAL IMPACTS			
	No significant impact 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 an appropriate concrete finish. • Planting to screen new floodwalls where appropriate.	Slight (minor)/ moderate adverse
	An increase in the height of existing floodwalls and associated structures such as access ramps	Moderate adverse	• Ensure new sections of raised floodwalls blend into the existing structure.	Moderate adverse

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
LANDSCAPE AND VISUAL AMENITY	The introduction of a new landform element within the existing landscape	Moderate/major adverse	• Tree, scrub and hedgerow planting to screen views of proposed embankment. • Where appropriate introduce footpath to crest of embankment. • Where possible introduce varying slope gradients and profile.	Moderate/major adverse
	Slight foreshortening of views over existing defences to be raised and/or over new defences	Moderate/major adverse	• New footpath on crest of embankment, to allow views across Wilford Grove Recreation Ground.	Moderate/major adverse
	Increased road and footpath levels that must be graded into the surrounding pavement surface	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.	Minor negligible adverse
	Impact on existing mature trees	Minor adverse	• Where proposed works are in close proximity to trees of high landscape value the construction process will avoid or minimise damage to root system.	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.	Minor 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.	Negligible
	OPERATIONAL IMPACTS			
	Closure of floodgates in advance of a flood. This is a short-term temporary impact	Minor adverse	No mitigation required.	Minor adverse

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
WATER	**CONSTRUCTION IMPACTS**			
	Impact on watercourses and waterbodies due to pollution from construction activities	Moderate to major adverse and short-term	• Adhere to the Environment Agency's Pollution Prevention Guidelines.	None
	OPERATIONAL IMPACTS			
	Impact on surrounding villages	*Refer to Section 8, Volume 1*		
	Impact on surface water drainage behind the new and raised defences	No significant impact	None required.	None
	Impact on River Trent and its floodplain	No significant impact	None required.	None
	Impacts from maintenance activities	No significant impact	None required.	None
TRAFFIC AND TRANSPORT	**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*. • Avoid increasing traffic flows on the main roads during peak periods. Time the deliveries of materials to the main compounds to be between 9am and 4:30pm.	Minor adverse and short-term
	Impact due to local road raising operations and construction activities requiring road closure	Moderate adverse and short-term	• Develop a TMP; refer to *Section 7.10.5, Volume 1*. • Repairs to the highway surfaces and kerb lines will be carried out after the works have been completed.	Minor adverse and short-term
	OPERATIONAL IMPACTS			
	Impact of new and raised defences on local transport infrastructure	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
CULTURAL HERITAGE AND ARCHAEOLOGY	**CONSTRUCTION IMPACTS**			
	Impact on archaeology due to construction activities	Minor adverse and permanent	• A detailed mitigation strategy agreed with archaeological officers and English Heritage. • Adhere to CIRIA's Guidelines 'Environmental Good Practice on Site' (2005); refer to *Section 7.11.5, Volume 1.* • Design to take into account setting of Listed Buildings.	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
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. stripping the topsoil in advance of the works, careful storage during the works and reinstatement on completion. • Adhere to the CIRIA's Guidelines 'Environmental Good Practice on Site' (2005).	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 CIRIA's Guidelines 'Environmental Good Practice on Site' (2005).	None
	Disturbance of contaminated land	No significant impact	• Adhere to CIRIA's Guidelines 'Environmental Good Practice on Site' (2005).	None
	OPERATIONAL IMPACTS			
	No significant impacts were identified			

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
LAND USE	**CONSTRUCTION IMPACTS**			
	Impact of loss of land	Minor to moderate adverse and short-term to permanent	• Liaison with local industry/business to minimise impacts on their works areas. • Liaison with Nottingham City Council over impacts in recreational areas. • Full re-instatement of temporary working areas. • Best practice construction practices. • Full reinstatement and protection of vegetation while establishes.	Minor adverse and short-term to permanent
	OPERATIONAL IMPACTS			
	Impact on land use as a result of reduction in flood risk	Moderate beneficial and permanent	No mitigation required.	Moderate beneficial and permanent.
	Impacts of decrease in available floodplain.	Refer to *Section 8, Volume1* .		

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ANNEX C1
Options Assessment

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Annex C1 –Alignment Options Matrix Meadows and Colwick Country Park

Matrix 1 – Flood Defence Alignments considered at Scoping Stage

FLOOD ALLEVIATION ALIGNMENT (options sourced from the Fluvial Trent Strategy Scoping Report (Environment Agency, 2005)	TECHNICAL			IMPACTS ON RECEPTORS										OTHER CONSIDERATIONS			
				LANDSCAPE	HUMAN POPULATION			TRAFFIC & TRANSPORT		ARCHAEOLOGY & CULTURAL HERITAGE		FLORA & FAUINA	WATER				
	RAISING/ REFURBISHMENT OF EXISTING DEFENCE?	REQUIREMENT FOR FLOODGATES/ DEMOUNTABLE ACCESS?	IMPACT ON EXISTING SERVICES	ADVERSE IMPACT ON EXISTING TREES	DISTURBANCE TO RESIDENTIAL/ COMMERCIAL PROPERTIES	DISRUPTION TO RECREATION/ PUBLIC AMENITY AREAS	IMPACT ON EXISTING PUBLIC RIGHTS OF WAY	IMPACT ON EXISTING HIGHWAYS	IMPACTS ON TRAFFIC/ TRANSPORT	DISTURBANCE TO ARCHAEOLOGICAL INTEREST, SCHEDULED MONUMENTS	IMPACT TO CULTURAL HERITAGE, INCLUDING LISTED BUILDINGS, CONSERVATION AREAS	IMPACT ON ECOLOGICAL SITES (SSSI, SINCS) AND PROTECTED SPECIES	POLLUTION RISK TO WATER BODIES DURING CONSTRUCTION	OPPORTUNITY OF ENVIRONMENTAL ENHANCEMENT	IMPACT ON EXISTING STRUCTURES	USE OF NATURAL RESOURCES	OPTION TAKEN FORWARD
Victoria Embankment (Reaches 1 & 2)																	
Alignment A – Defence along Victoria Embankment	Yes	Yes	✘✘	✘	✘	✘✘	✘	✘	✘	✘✘	✘✘	N/S	✘✘	✓	✘	N/S	Yes
Alignment B – Defence along Bathley Street, along Relton Road before running south to join Victoria Embankment	Yes	Yes	✘✘✘	✘✘✘	✘✘✘	✘✘✘	✘	✘✘✘	✘✘	✘✘	✘✘	N/S	✘	✘	✘✘	N/S	No
Alignment C – As Alignment B but runs past sports pavilion rather than along Felton Road	Yes	Yes	✘✘✘	✘✘✘	✘✘✘	✘✘✘	✘	✘✘✘	✘✘	✘✘	✘✘	N/S	✘	✘	✘✘	N/S	No
Nottingham Racecourse & Colwick Country Park (Reach4,)																	
Alignment A – Defence to run to the rear of Nottingham Racecourse along Daleside Road East	No	No	✘	✘✘	N/S	✘	✘	N/S	N/S	N/S	N/S	✘	N/S	✓	N/S	N/S	Yes
Alignment B – Defence to run through Colwick Country Park	Yes	No	N/S	✘✘✘	N/S	✘✘	✘✘	N/S	✘	N/S	N/S	✘	N/S	✓	N/S	N/S	No

Notes

1. For further details of the Scoping Report and alignments refer to *Section C2.5*.
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. There were no further options considered for Reach 3 past the Scoping Stage.

Key

Significant of Impact

✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	**N/S**	No Significant Impact
✘	Minor Negative	✘✘	Moderate Negative	✘✘✘	Major Negative		

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ANNEX C2
Figures

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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

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N

PERSONAL STORAGE

YOUTH CLUB

PARK YACHT CLUB AREA DEVELOPMENT

5/7 Racecourse Wetland (Pond) SINC

SUB-REACH 3.3

ARLA DEPOT

SUB-REACH 3.2

TINKERS LEEN

LADYBAY BRIDGE

LOCK KEEPER'S COTTAGE

NOTTINGHAM AND BEESTON CANAL

SUB-REACH 3.1

REACH 1

VICTORIA EMBANKMENT

BUNBURY STREET

REACH 3

TRENT BRIDGE

FRASER ROAD

REACH 2

WILFORD TOLL BRIDGE

KING'S SCHOOL

MEMORIAL GARDENS

RECREATION GROUND

WAR MEMORIAL

WEST BRIDGFORD

REACH 2

SUSPENSION BRIDGE

REACH 1

EMMANUEL SCHOOL

Drawing No. 108785-3500-0002 | 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 NATURE CONSERVATION INTEREST (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
- MAIN RIVER
- 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
- STUDY AREA (FLOOD PLAIN WITH 1% ANNUAL FLOODING PROBABILITY)

* ONLY SITES POTENTIALLY AFFECTED BY THE SCHEME SHOWN

100m 0m 100m 200m 300m

Scale 1:5000

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	AJB	EAS	SEP.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

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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 CC2.1 MEADOWS AND COLWICK COUNTRY PARK OVERVIEW - SHEET 1 OF 2

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:5000	Sheet size:	A1

Drawing No. 108785 — 3500 — 0002 | Revision PD

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N

COLWICK COUNTRY PARK CAR PARK

RIVER ROAD

CANDLE MEADOW

REACH 4

DALESIDE ROAD EAST

Colwick Cutting Geological SSSI

ENTRANCE TO RACECOURSE AND PARK AND RIDE

PARK AND RIDE

NOTTINGHAM RACECOURSE

2/901 Colwick Country Park SINC

5/7 Racecourse Wetland (Pond) SINC

RACECOURSE ROAD

COLWICK HALL HOTEL

YOUTH CLUB

PARK YACHT CLUB AREA DEVELOPMENT

SUB-REACH 3.3

LADYBAY BRIDGE

TRENT BRIDGE

WEST BRIDGFORD

Drawing No. 108785-3500-0003 | 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 NATURE CONSERVATION INTEREST (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
- MAIN RIVER
- 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
- STUDY AREA (FLOOD PLAIN WITH 1% ANNUAL FLOODING PROBABILITY)

* ONLY SITES POTENTIALLY AFFECTED BY THE SCHEME SHOWN

100m 0m 100m 200m 300m
Scale 1:5000

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	AJB	EAS	SEP.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

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Project
NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title
FIGURE CC2.2
MEADOWS AND COLWICK COUNTRY PARK OVERVIEW - SHEET 2 OF 2

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:5000	Sheet size:	A1

Drawing No. 108785 — 3500 — 0003 | Revision PD

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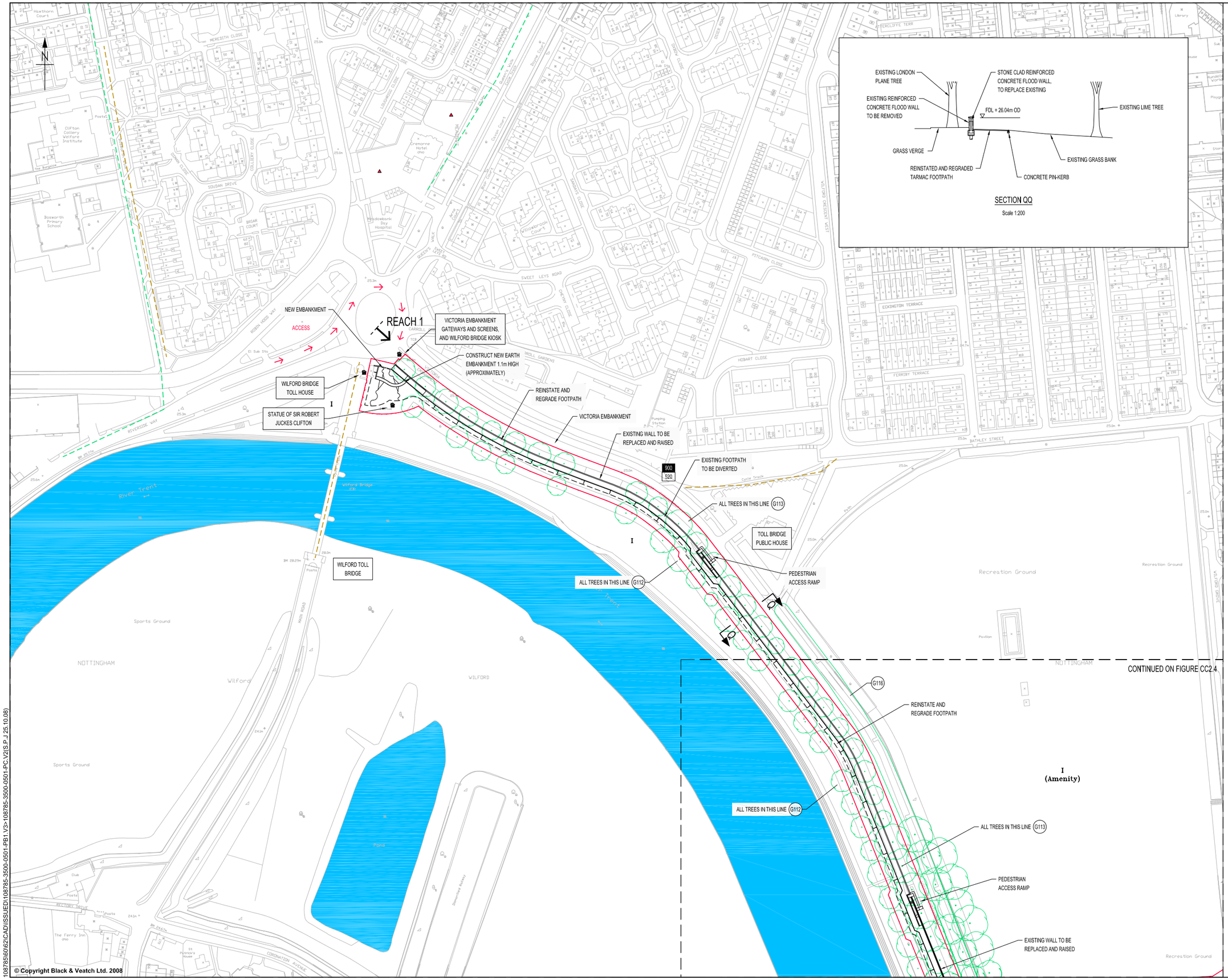

SECTION QQ

Scale 1:200

Drawing No.	Cad Ref	Rev.
108785-3500-0501		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	AJB	EAS	SEP.08	UPDATED ENVIRONMENTAL STATEMENT

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Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

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Client drawing No. | Revision

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Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE CC2.3
MEADOWS
GENERAL ARRANGEMENT - SHEET 1 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No. 108785 — 3500 — 0501 | Revision PC

108785\60\62\CAD\ISSUED\108785-3500-0501-PB1.V3>108785-3500-0501-PC.V2(S.P.J 25.10.08)

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Drawing No.	Cad Ref	Rev.
108785-3500-0502		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.

N

Scale 1:200

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
PB	SPJ	AJB	EAS	SEP.08	UPDATED ENVIRONMENTAL STATEMENT

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Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	PSm	Date:	MAR.07

Client

Environment Agency

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Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE CC2.4
MEADOWS
GENERAL ARRANGEMENT - SHEET 2 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No.	Revision
108785 — 3500 — 0502	PC

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ACCESS

EXISTING KERB TO BE RAISED

RAISE EXISTING WALL BY 0.1m

NEW 1.2m - 1.5m HIGH FLOOD WALL

LOCK KEEPER'S COTTAGE

EXISTING PENSTOCK TO BE REPLACED

REMAINS OF OLD BRIDGE

SUB-REACH 3.1

NOTTINGHAM AND BEESTON CANAL

CONTINUED ON FIGURE CC2.6

EXISTING FLOOD WALL RAISED BY 100mm

RAISE EXISTING PEDESTRIAN ACCESS RAMP BY 200mm

ACCESS

REACH 3

TREE TO BE PROTECTED DURING WORKS. LONG TERM HEALTH TO BE MONITORED

CASA PUBLIC HOUSE

TRENT BRIDGE (LONDON ROAD)

REACH 2

VICTORIA EMBANKMENT GATEWAYS AND SCREENS

ALL TREES IN THIS LINE G115

ALL TREES IN THIS LINE G116

BUNBURY STREET

FRASER ROAD

ALL TREES IN THIS LINE G112

0.5m HIGH FLOOD GATE

ROAD RAISED BY 0.5m

BORED PILE FLOOD WALL ON ALIGNMENT OF EXISTING GARDEN BOUNDARIES

NOTTINGHAM PRINCESS MOORING

CONTINUED ON FIGURE CC2.4

KING'S SCHOOL

ALL TREES IN THIS LINE G115

ALL TREES IN THIS LINE G112

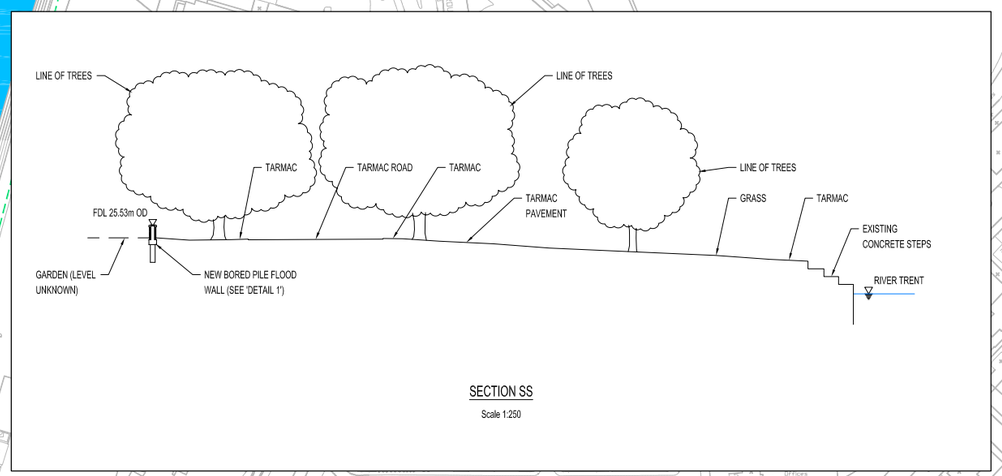
MEMORIAL GARDENS

T335

T333

S

S



SECTION SS

Scale 1:250

N

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

5m 0m 5m 10m 15m
Scale 1:250

10m 0m 10m 50m 100m
Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PC	SPJ	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
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Designed by:	EAS	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

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Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE CC2.5
MEADOWS
GENERAL ARRANGEMENT - SHEET 3 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:250 1:1250	Sheet size:	A1

Drawing No. 108785 — 3500 — 0503 | Revision PC

Drawing No. 108785-3500-0503 | Cad Ref | Rev. PC

108785\60\622\CAD\ISSUED\108785-3500-0503-PB1.V5>108785-3500-0503-PC.V2(S.P.J 25.10.08)

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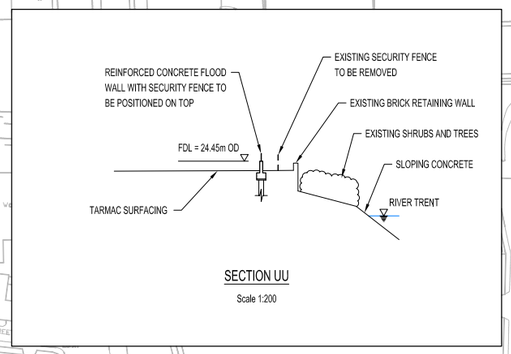
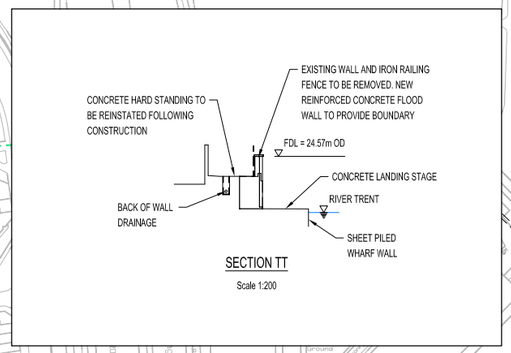


SECTION UU

Scale 1:200



SECTION TT

Scale 1:200

PERSONAL STORAGE

YOUTH CENTRE

FLOOD WALL MEETS HIGH GROUND

SITE COMPOUND D

NEW FLOOD WALL, 1.1m IN HEIGHT

NEW FLOOD WALL CONNECTS TO EXISTING BUILDING

LADYBAY BRIDGE

SUB-REACH 3.3

FLOOD WALL MEETS HIGH GROUND

ARLA DEPOT

NEW FLOOD WALL, 0.6m IN HEIGHT

SITE COMPOUND C

ACCESS

NEW PUMPING STATION

SUB-REACH 3.2

TINKERS LEEN

SITE COMPOUND B

ACCESS

EXISTING KERB TO BE RAISED

RAISE EXISTING WALL BY 0.1m

NEW 1.2m - 1.5m HIGH FLOOD WALL

LOCK KEEPER'S COTTAGE

EXISTING PENSTOCK TO BE REPLACED

REMAINS OF OLD BRIDGE

SUB-REACH 3.1

NOTTINGHAM AND BEESTON CANAL

CONTINUED ON FIGURE CC2.5

Drawing No.	Cad Ref	Rev.
108785-3500-0504		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.

5m 0m 5m 10m

Scale 1:200

10m 0m 10m 50m 100m

Scale 1:1250

Rev	Drawn	Checked	Reviewed	Date	Description
PB	SPJ	AJB	EAS	SEP.08	UPDATED ENVIRONMENTAL STATEMENT

Designed by:	EAS	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

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Tel: +44(0)1244 304100 E-mail: bvcs@bv.com

Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE CC2.6
MEADOWS
GENERAL ARRANGEMENT - SHEET 4 OF 4

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1

Drawing No.	Revision
108785 — 3500 — 0504	PB

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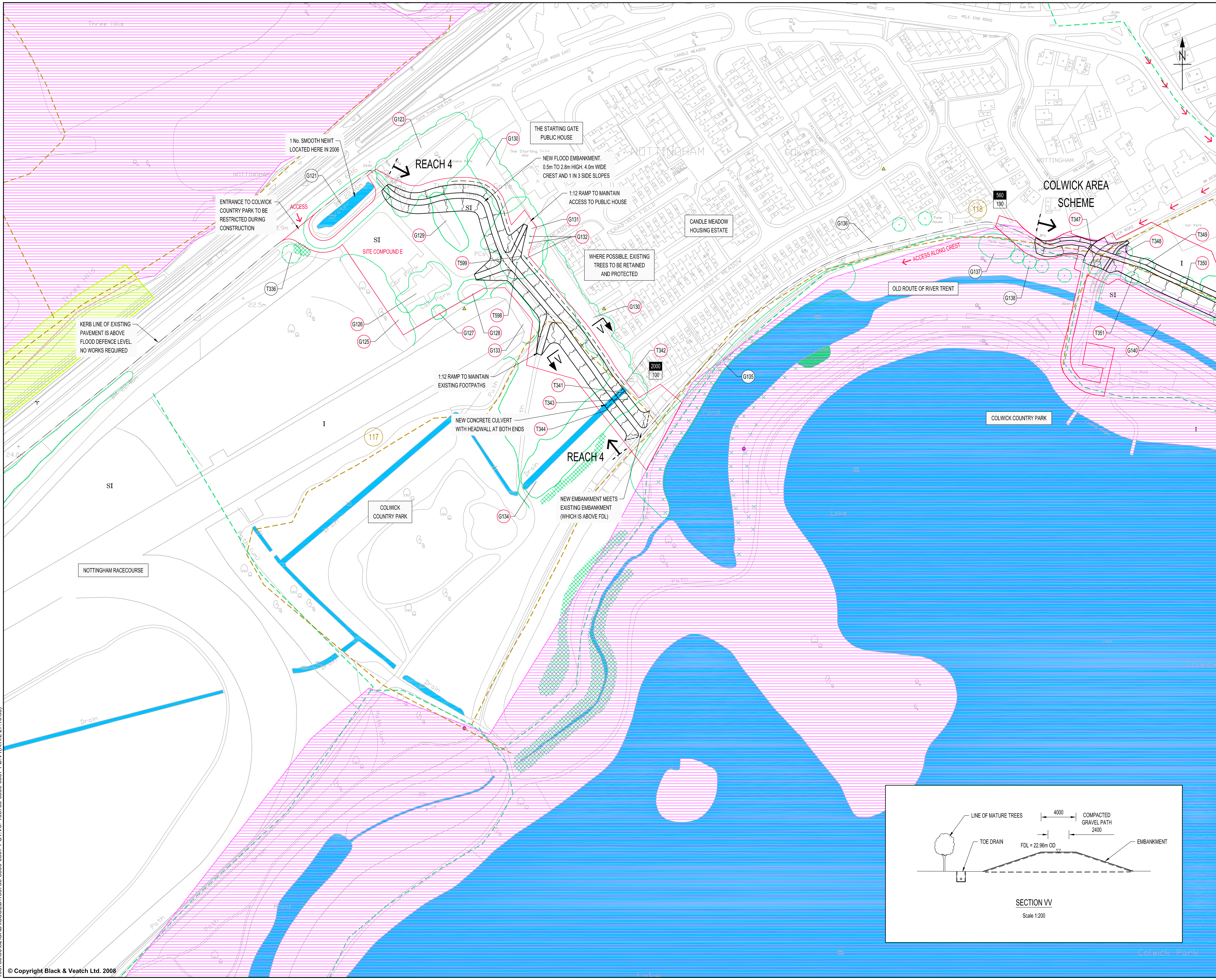

Scale 1:200

Scale 1:1250

Drawing No. 108785-3500-0507 | **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.

NOTE

1. REFER TO Drg. No. 108785-3000-0001 FOR LEGEND.

Rev	Drawn	Checked	Reviewed	Date	Description
PD	KRL	EAS	SGB	OCT.08	UPDATED ENVIRONMENTAL STATEMENT
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PB	SPJ	AJB	EAS	SEP.08	UPDATED ENVIRONMENTAL STATEMENT

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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

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Project

NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title

FIGURE CC2.7 COLWICK COUNTRY PARK GENERAL ARRANGEMENT

Approved by:	EAST	Date:	OCT.08
Drawing scale:	1:200 1:1250	Sheet size:	A1
Drawing No.	108785 — 3500 — 0507	Revision	PD

108785\60\62\CAD\ISSUED\108785-3500-0507-PC1.V3>108785-3500-0507-PD.V1(KRL 27.10.08)

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