



# Nottingham Trent Left Bank FAS Environmental Statement

**APPENDIX D – COLWICK**

OCTOBER 2008



**NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME  
ENVIRONMENTAL STATEMENT**

**APPENDIX D  
COLWICK**

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## **D1. INTRODUCTION**

### **D1.1 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%<sup>1</sup> (1 in 33) annual probability of occurrence. The summer of 2007 saw significant flood events elsewhere in England while on the River Trent through Nottingham flooding was not more than a 50% (1 in 2) annual probability of occurrence.

An appraisal of the flood risk in Nottingham was published by the Environment Agency in 2005. The study, known as the Fluvial River Trent Flood Risk Management Strategy (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 improve the defences and increase the standard of protection to protect against a flood event with a 1% (1 in 100) 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 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 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 D1.1.

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<sup>1</sup> 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 D1.1 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	<i>Colwick</i>	Gedling Borough Council

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

## **D1.2 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 Colwick scheme area are as follows:

- Proposed embankment in Reach 1 will be adjusted slightly, the footprint will be reduced to minimise the impact on trees.
- Several changes have been made to the design of flood defences in Reach 2, to minimise inconvenience to the industrial estate users.
- The existing embankment will be raised by a further 0.3m in Reach 3.

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

## **D1.3 The Study Area**

The study area is defined by the area of the left bank of the River Trent with a 1% annual probability of flooding. The study area is within the boundaries of Gedling Borough Council, between the council boundary at River Road and Radcliffe Viaduct; refer to Figure D1.1.

## **D1.4 Description of the Scheme Area**

The FAS proposes development to provide flood protection to the left bank of the River Trent through Nottingham against floods with a 1% annual probability of occurrence. This includes development to the flood defences through the Colwick scheme area. For the purposes of our work, these areas are split into a number of reaches, which are characterised by the type of works proposed. The scheme area is divided into three reaches as shown in Plates D1.1. to D1.4 and Figure DD1.1 in *Annex D1*.

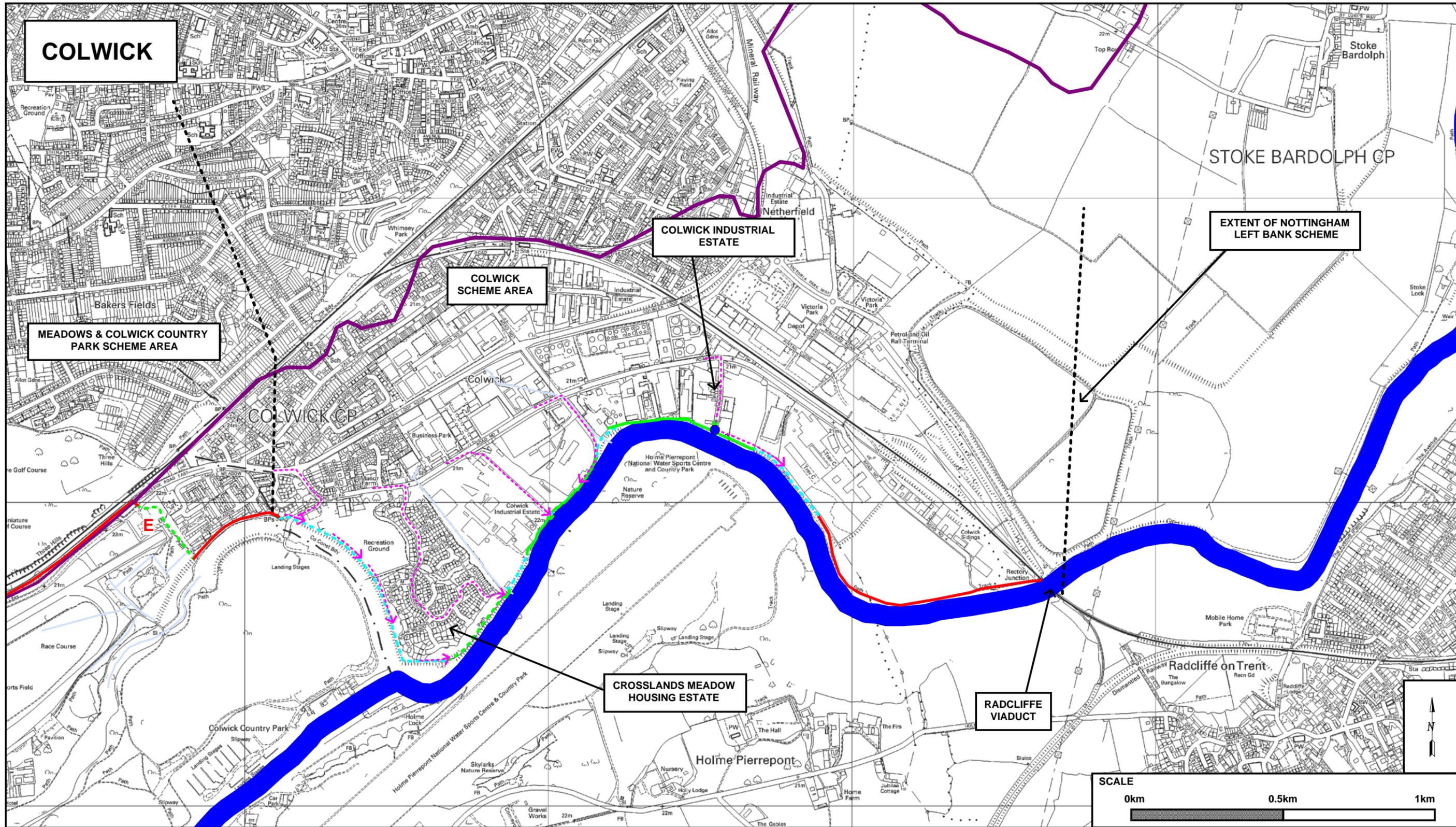
- Reach 1: River Road to Colwick Industrial Estate
- Reach 2: Colwick Industrial Estate
- Reach 3: Colwick Industrial Estate to Radcliffe Viaduct

The description of the scheme considers the following factors:

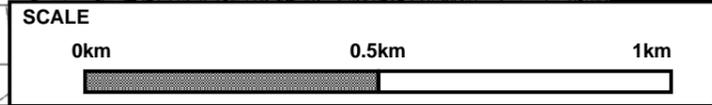
- the characteristics and land use;
- the presence or absence of existing flood defence;
- the standard of protection that the existing flood defence provides.

The Colwick scheme area is located to the east of Nottingham city centre and comprises mostly residential, industrial, commercial and recreational land uses. Earth embankments tied into areas of high ground provide much of the flood protection, with sections of flood walls present through the industrial estate. These defences typically provide protection against a flood event with a 1.3% (1 in 75) annual probability of occurrence.

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Key		
<b>PROPOSED DEFENCES</b>		
	New Wall	
	Raise Existing Wall	
	New Embankment	
	Raise Existing Embankment	



**NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME**

Colwick Study Area

Environment Agency

Scale  
1 : 10,000 @ A3

Figure  
D1.1

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**Reach 1: River Road to Colwick Industrial Estate** contains an embankment, with a public footpath along its crest that follows the old course of the River Trent as far as Riverview Pumping Station. The embankment currently protects a recreational sports ground and the Crosslands Meadow housing estate.



**Plate D1.1 Colwick Reach 1**

**Reach 2: Industrial Estate** was split into the following sub-reaches because the defence type continuously changes.

**Sub-reach 2.1: Kitchen World** is immediately adjacent to Riverview Pumping Station and contains several businesses and an Environment Agency gauging station. There are existing defences comprised of both earth embankments and short lengths of flood wall.

**Sub-reach 2.2: Biffa** is currently protected by a flood wall with riverside access provided by a sliding flood gate.

**Sub-reach 2.3: Colwick Quay Development** incorporates a number of new office blocks, access roads and car parks. Protection is provided by an existing flood wall along the riverbank.

**Sub-reach 2.4: Total Oil** is a series of industrial units with numerous pipes and support infrastructure near the flood walls and embankments protecting the site. A fire-fighting pumping station is located on the Total Oil site, flood defence improvement works are required close to it.



**Plate D1.2 Colwick Reach 2**

**Sub-reach 2.5: British Drilling** is currently protected by an earth embankment extending the full length of the sub-reach.

**Sub-reach 2.6: Armitage Pet Care** is adjacent to Private Road No.2 and is currently protected by an earth embankment extending the full length of the sub-reach.

**Sub-reach 2.7:** This contains an industrial unit with an unknown occupant. This short sub-reach is protected by a combination of flood walls and embankments.

**Sub-reach 2.8: The Lorry Depot** is adjacent to Private Road No.5 and provides parking for a number of articulated lorries. Flood protection is provided by a wall to which fencing has been secured.

**Sub-reach 2.9: Driving Standards Agency (DSA) Development Area** is currently under consideration for development.



Plate D1.3 Colwick Reaches 2 and 3

**Reach 3: Industrial Estate to Radcliffe Viaduct**, is an earth embankment with a footpath along its crest at the downstream extent of Colwick Industrial Estate. The embankment extends from the eastern limit of the DSA development to the Radcliffe Viaduct, the majority of the existing embankment currently protects against floods with a 1% annual probability of occurrence.



**Plate D1.4 Colwick Reach 3**

## **D1.5 Future status of Colwick**

Should the proposed flood risk management improvements not proceed, there will be long-term effects of flooding on Colwick. The standard of protection currently 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 design 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 by the effects of climate change. Should the defences fail, approximately 16,000 properties on the left bank of the River Trent in Nottingham would be at risk from a flood event with a 1% annual probability of occurrence and subject to an increased frequency of flooding 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<sup>2</sup>. However, without improvements to the flood risk management through Colwick most development on the land behind the defences is unlikely to be permitted under Planning Policy Statement 25 (PPS25), which sets out Government policy on development and flood risk, as the area would be at risk from a flood event with a greater than 1% annual probability of occurrence.

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<sup>2</sup> 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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## **D2. PROJECT PROCESSES, RESIDUES AND EMISSIONS**

### **D2.1 Physical Characteristics**

18 alternative flood risk management options were considered during the scoping stage of the Fluvial Trent Strategy (Environment Agency, 2005). During the development of the FAS other alternative options have also been considered following consultations with landowners and statutory bodies. Section D2.5 describes the alternative options considered for Colwick.

A summary of the proposed construction works is shown on the General Arrangement Figures (DD1.2 to DD1.5), which are in *Annex D1* of this appendix.

#### **D2.1.1 Works at Colwick**

The main proposed works at Colwick will comprise the following:

- raising of 1,485m of existing flood embankments through all reaches;
- replacing 165m of existing embankment with a new wall through Reach 2;
- construction of 280m of new embankment in Reach 1;
- replacing 455m of wall in Reach 2;
- raising sections of existing road in Reaches 1 and 2;
- new pumping station at Holme Dyke in Reach 2.

An outline of the works in each Reach is provided in Table D2.1

**Table D2.1 Proposed works at Colwick**

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
1 – River Road to Colwick Industrial Estate	Raise existing embankment	Existing embankment is to be raised by up to 0.5m.	825m	River Road and along embankment	None considered, due to constraints from adjacent development. Refer to Section D2.5.
	Raise existing road	The existing raised section of River Road is to be raised by 0.55m. This would require a 30m ramp to comply with road safety regulations.	6m Road width		
	Construct a new embankment	A new embankment up to 0.4m high is needed near Riverview Pumping Station where currently the ground is not high enough to protect against flooding.	280m		
2 – Colwick Industrial Estate	<b>Sub-reach 2.1: Kitchen World</b>				
	Raise existing embankment	Existing embankment is to be raised by up to 0.5m and re-profiled to improve access for maintenance.	130m	Private Road No.2.	
	Construct a new flood wall	A new 1.22m high flood wall founded on sheet piles along the route of the existing kerb line is to be constructed. The existing embankment is to be reprofiled and reduced in height.	130m		
	Raise an outfall	The Riverview Pumping Station flapped outfall will be raised to above the design flood level to improve maintenance and performance.	-		
	<b>Sub-reach 2.2: Biffa</b>				
	Replace an existing flood wall	The existing wall will be removed and a new reinforced concrete one constructed at the same location. The new wall will be 1.72m high and have security fencing erected at a 1m offset on the landward side.	85m	Private Road No.2.	
	Replace an existing flood gate	Existing flood gate providing river side access will be removed and replaced with a new flood gate.	-		
	<b>Sub-reach 2.3: Colwick Quay Development</b>				
	Replace an existing flood wall	The existing wall will be removed and a new 1.12m high reinforced concrete wall constructed at a 2m offset on the landward side. Security fencing to be fixed on top of flood wall.	160m	Private Road No.2.	

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
	New pumping station	A pumping station will be required to over-pump flows in the Holme's Dyke watercourse to the River Trent, when the River Trent is in flood. The existing outfall arrangement will also be modified.	-		
<b>Sub-reach 2.4: Total Oil and Sub-reach 2.5: British Drilling</b>					
	Replace existing headwall	The headwall of the Holme Dyke outfall is to be replaced to maintain the defence line through this reach.	-	Private Road No.3.	
	Raise existing embankment	Existing embankment is to be re-profiled and raised by between 0.2 – 0.62m.	120m		
	Relocate fire fighting pumping station	Fire fighting pumping station will be relocated on the landward side of the flood defence.	-		
	Replace an existing embankment with a flood wall	To improve access to the extent of the existing property, the existing embankment is to be removed and replaced with a new 2.31m high reinforced concrete flood wall founded on sheet piles, the wall will have a smaller operational footprint than an embankment. Security fencing will be erected at a 1m offset from the wall on the landward side.	165m		
<b>Sub-reach 2.6: Armitage Pet Care and Sub-reach 2.7</b>					
	Replace an existing embankment with sheet piles	The crest level of the existing embankment is to be raised using steel sheet piles and a capping beam.	60m	Private Road No.3.	
<b>Sub-reach 2.8: Lorry Depot</b>					
	Replace an existing flood wall	The existing wall will be removed and a new reinforced concrete one constructed at the same location. The new wall will be between 1.5 and 2.07m high dependant on ground levels and conditions and have security fencing erected at a 1m offset on the landward side.	80m	Private Road No.5.	
	Raise existing road	The existing raised section of Private Road No.5 is to be raised and re-profiled. This would require a 27.5m ramp to comply with road safety regulations.	25m		

Reach	Work Summary	Description	Length/ Area	Site Access	Alternative Alignments considered
	<b>Sub-reach 2.9: Driving Standards Agency</b>				
	Replace an existing flood wall	The existing wall will be removed and a new reinforced concrete one constructed in a more linear alignment. The new wall will be 1.92m high and have security fencing erected at a 1m offset on the landward side.	130m	Private Road No.5.	
<i>3 – Colwick Industrial Estate to Railway Viaduct</i>	Raise existing embankment	Existing embankment is to be re-profiled with isolated low spots raised locally by up to 0.62m.	350m	Private Road No.5.	

## D2.2 During Construction

### D2.2.1 Timing and Sequence of Works

The works at Colwick are programmed to take twelve months to complete. The level of flood protection will not be complete until this scheme area and all of the construction work on the Nottingham Trent Left Bank FAS is completed. An outline construction programme is summarised in Table D2.2 and shows the duration of the works within each reach.

The currently proposed start date is April 2011. However the start date, duration and phasing of the works in each reach are subject to funding, planning approval and detailed design. Programming changes could also result from access restrictions, the working methods, or to realise efficiencies in the sourcing of materials. The programme should therefore be treated as indicative only.

**Table D2.2 Outline Construction Programme for Colwick**

REACH	2012								2013			
	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
Reach 1												
Reach 2												
Reach 3												

### D2.2.2 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.

#### *Sensitive Sites*

**Recreational Sports Ground (Reach 1)** A 15m wide working area along the edge of the recreation ground, from the toe of the existing embankment, will be needed for 7 months to act as a haul road to service the works through Reach 1.

**River Road (Reach 1)** will be closed for approximately 1 week during road raising.

### *Site Compounds and Delineation of Working Areas*

Two compounds will be required for the works; refer to Table D2.3 for details. Compound A will be the principal compound and will be in use for the whole duration of the works. Temporary lighting, security and parking restrictions may be required for the safe operation of site compounds.

**Table D2.3 Details of Proposed Site Compounds**

<b>Compound Reference</b>	<b>Description</b>	<b>Figure Number</b>
A	A site compound, approximately 40m x 40m, will be established adjacent to River Road (Reach 1). Utilising one of the existing car parks for the office establishment and car parking and the adjacent recreation field for the storage of material. Site will contain site offices, welfare facilities and secure storage.	Figure DD1.2
B	A satellite compound will be established within the Colwick Industrial Estate (subject to land owner agreements). This compound will be used to service the works where property boundaries abut the river frontage (Reach 2).	Figure DD1.3

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.

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

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

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

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

### D2.2.3 Outline Construction Methodology

The works in each reach will comprise establishment of the site and reinstatement on completion, together with one or more of the following activities, as outlined in Table D2.1, above:

- raise existing road;
- raise existing flood embankment;
- replace existing flood embankment with a flood wall;
- construct new flood wall;
- construct new flood embankment;
- replace flood gate and outfall;
- creation of new footpath;
- construct a new pumping station.

The construction methodologies for these activities are outlined in *Section 3.4, Volume 1*. Table D2.4, below, summarises the work activities within each reach.

**Table D2.4 Type of Works per Reach**

Works	Reach		
	1	2	3
Raise existing road	✓	✓	
Raise existing flood embankment	✓	✓	✓
Replace existing flood embankment with wall		✓	
Construct a new flood wall		✓	
Construct new flood embankment	✓		
Replace flood gate and outfall		✓	
Creation of new footpath		✓	
Construct a new pumping station		✓	

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

- **1,700 m<sup>3</sup>** of concrete for the new walls;
- **24 m<sup>3</sup>** of steel for 200m of sheet piling;
- **14,950 m<sup>3</sup>** of fill material for the earth embankments.

*Section D13* details the types of materials to be used in the proposed works.

### D2.3 **When Operational**

The scheme is designed to be low maintenance. Routine inspections of the defences will be required annually. A 1m–5m access easement will be maintained alongside all flood walls for maintenance and inspection purposes. Crests on the raised and new embankments will be a minimum of 3m wide for 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

described above. There is approximately 24 hours warning time before a large flood event on the River Trent in Nottingham and the Environment Agency will be responsible for shutting the flood gates.

## **D2.4 Residues and Emissions**

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

### **D2.4.1 Discharges to Water**

Discharges to water are possible throughout this scheme area during the construction phase, given the close proximity of the works to the River Trent, including its historic course. The main areas of works where the risk of discharges to water is higher are:

- construction near to Holme Dyke and Candle Meadow watercourse;
- along the river frontage through Colwick Industrial Estate.

*Section D8* sets out the assessment of the impacts on water quality and the proposed mitigation procedures.

### **D2.4.2 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 D6* assesses the impacts of these on the local air quality.

### **D2.4.3 Noise and Vibration**

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

*Section D5* assesses the noise and vibration impacts from the construction activities and the proposed mitigation procedures.

### **D2.4.4 Light**

Works will be carried out from 7.30am to 6pm during daylight hours although in winter temporary lights may be needed when the days are shorter for urgent/emergency works. 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.

## **D2.5 Alternative Alignment Options Considered**

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

The existing defences are positioned on the bank of the River Trent. On the landward side urban development has expanded to the boundary formed by the defences. The Scoping Report (Environment Agency 2005) identified the existing flood defence route as the only alignment option for this scheme area given the constraints of the existing development.

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### **D3. HUMAN POPULATION**

This section addresses the impacts on the local population of Colwick, 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 D5, D6 and D9*.

The results of the Health Impact Assessment are presented in *Section 7.14, Volume 1*.

#### **D3.1 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 Gedling Borough Council Development Plan. A qualitative evaluation of the impacts on the human population during construction and operation was undertaken using constraints mapping.

We define the 'local community' as that which would be directly affected by the construction works and who live within 200m of the works. This area of influence has also been considered for noise and vibration impacts. The 'local population' is defined as that which falls within the scheme area; refer to *Section D1.4. Section 7.2.2, Volume 1* sets out the methodology for assessment in more detail.

#### **D3.2 Baseline Conditions**

##### **D3.2.1 Local Population**

The urban community of Colwick forms much of the study area. The Crosslands Meadow housing estate is situated to the west of Colwick Industrial Estate. There are 1,344 residential and industrial properties presently at risk of flooding from a flood with a 1% annual probability of occurrence.

Table D3.1 shows the number of different types of property within 200m of the proposed works. For the Colwick Scheme Area there are 238 residential properties within this zone and, assuming that each property contains an average of 2.36 residents, the estimated local population is approximately 562 (source – 2001 Census).

**Table D3.1 Human Receptors within 200m of the Proposed Defences**

Distance from proposed flood defence (m)	Building Type (No. of buildings)						Total of all types
	Residential	Retail	Schools & Offices	Industrial	Leisure	Misc.	
<b>Colwick Reach 1</b>							
<50	13	0	0	0	0	0	<b>13</b>
50 - 100	64	1	0	2	0	0	<b>67</b>
100 - 150	70	0	0	2	0	0	<b>72</b>
150 - 200	64	0	0	3	0	0	<b>67</b>
<b>Total</b>	<b>211</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>219</b>
<b>Colwick Reach 2</b>							
<50	0	0	0	10	0	0	<b>10</b>
50 - 100	6	0	0	1	0	1	<b>8</b>
100 - 150	14	0	0	10	0	2	<b>26</b>
150 - 200	7	0	5	25	0	0	<b>37</b>
<b>Total</b>	<b>27</b>	<b>0</b>	<b>5</b>	<b>46</b>	<b>0</b>	<b>3</b>	<b>81</b>
<b>Colwick Reach 3</b>							
<50	0	0	0	0	0	0	<b>0</b>
50 - 100	0	0	0	5	0	1	<b>6</b>
100 - 150	0	0	0	2	0	1	<b>3</b>
150 - 200	0	0	0	14	0	0	<b>14</b>
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>21</b>	<b>0</b>	<b>2</b>	<b>23</b>

### D3.2.2 Key Local Businesses and Employment

Colwick Industrial Estate dominates the Colwick scheme area. The estate's infrastructure is owned by City Estates Ltd and the proposed defence alignment will follow the river frontage through several industrial units, including:

- Kitchen World
- Biffa
- Colwick Quay Development
- Total Oil
- British Drilling
- Armitage Pet Care
- Tarmac
- The DSA development.

### D3.2.3 Sensitive Sites

The recreational ground in Reach 1 has football pitches and a children's play area.

#### D3.2.4 Recreation

There are large recreation fields (Crosslands Meadow Recreation Ground) including a football pitch and a children's playing area adjacent to the existing embankment within Reach 1.

There is fishing along the River Trent frontage in Reach 1. At this location, the angling rights belong to Long Eaton Victoria Angling Club.

Colwick Country Park provides recreation for large numbers of people. The works through this reach do not directly affect the Country Park, but may result in access restrictions to the park. Colwick Country Park 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 included in the route of the Great Nottinghamshire Bike Ride held in June each year.

#### D3.2.5 Critical Infrastructure

There is no critical infrastructure within this scheme area.

### D3.3 **Impact Assessment**

The methodology used in the assessment for 'Human Population' is detailed in *Section 7.2, Volume 1*.

#### D3.3.1 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;
- temporary closure of local footpaths (footpath Nos. 1 & 25).

#### ***Impact on Local Properties and Key Businesses as a result of Construction Activities occurring in Close Proximity (less than 50m)***

- Reach 2: Disturbance to ten businesses (low sensitivity) due to the construction of flood defences on private property. All of these properties are situated within Colwick Industrial Estate. The duration of the disturbance is scheduled to last for up to 12 months.
- Reach 1: Indirect disturbance to 13 residential properties (low sensitivity) that are situated within 50m of the proposed works.

The magnitude of the impact will range from low (indirect disturbance) to medium (construction within boundaries) but all businesses will remain operational.

**Table D3.2 Summary of Local Properties within 50m of Construction Activity**

Reach	Disturbance within boundaries and/or to access	General disturbance
River Road to Colwick Industrial Estate (Reach 1)	-	<ul style="list-style-type: none"> <li>Indirect disturbance to 13 residential properties through construction noise as a result of raising the embankment.</li> </ul>
Industrial Estate (Reach 2)	<ul style="list-style-type: none"> <li>Direct disturbance to 10 businesses due to works occurring within their boundaries.</li> </ul>	-
Industrial Estate to Radcliffe Viaduct (Reach 3)	-	-

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

***Impact on Sensitive Sites as a result of Construction Activities occurring in Close Proximity to the sites***

- Reach 1: Children's playground (low sensitivity) will be indirectly disturbed during construction work (low magnitude impact).

The *significance* of the *impact* has been assessed *prior to mitigation* as being **none** and **short-term**.

***Impacts on Local Recreational Resources as a result of Construction Activities***

- Reach 1: Working area, site access and site compound will take up part of the football pitches.
- Reach 1: Footpath No. 1 along River Road will be temporarily closed for approximately seven days to allow for raising of the road.
- Reach 1: Children's playground will be disturbed through close proximity to the working area.
- Reach 3: Embankment raising and reprofiling will result in temporary closure and diversion of the footpath (No.25).

All these local recreational resources are of low sensitivity but impacts may be high if the recreational ground cannot be used for its current purpose.

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

### D3.3.2 Operational Impacts

#### *Impact on Local Population as a result of Reduction in Flood Risk*

The risk of flooding will be reduced for approximately 1,344 properties and businesses in Colwick. This has additional benefits to property values and future development.

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

#### *Impact on Villages Outside the Scheme Area*

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

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

### D3.4 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 D5, D7 and D9*. Other mitigation measures for the potential impacts on the human population are listed in Table D3.3 and include scheduling of works to minimise impact on important local events, prior notification and agreement of nature and programme of the construction and full reinstatement of any properties affected. In addition, an Environmental Clerk of Works will be appointed to monitor the environmental impacts.

### D3.5 Residual Impacts

Table D3.2 summarises the residual impacts on the human population. The **adverse** impacts to local residents and businesses caused by construction related activities will be **short-term**. Some direct impacts on the industrial units at Colwick Industrial Park cannot be avoided. However, we will take measures to minimise both direct and indirect impacts. The overall impact through Colwick scheme area will be **minor adverse**.

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

**Table D3.3 Summary of Impacts on Human Population**

<b>Effect</b>	<b>Magnitude and Significance of Impact before Mitigation</b>	<b>Mitigation Measures</b>	<b>Residual Impact</b>
<b>Construction Impacts</b>			
Impact on local properties and businesses as a result of construction activities in close proximity	Minor to moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Liaison with residents and local businesses.</li> <li>• Access and storage areas will be agreed with landowners prior to works commencing.</li> <li>• Minimise working areas within private properties.</li> <li>• Full re-instatement of working areas within businesses in Reach 2.</li> </ul>	Minor adverse and short-term
Impact on sensitive sites	Not significant	<ul style="list-style-type: none"> <li>• Protection and screening of playground.</li> </ul>	None
Impacts on local recreational resources as a result of construction activities	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Formal closure and temporary diversion where possible of footpaths with clear signage provided.</li> <li>• Liaison with Gedling Borough Council over works within recreation area.</li> <li>• Minimise working area in Reach 1 to allow the continued use of football pitches and playground.</li> <li>• Maintain access to Colwick Country Park.</li> <li>• Maintain unrestricted access for Greater Nottinghamshire Bike Ride.</li> </ul>	Minor adverse and short-term
<b>Operational Impacts</b>			
Impacts on local population as a result of reduction in flood risk	Moderate beneficial and permanent	No mitigation required	Moderate beneficial and permanent
Impact on villages outside of scheme area	Moderate adverse and permanent	See <i>Section 8, Volume 1</i>	

## **D4. FLORA AND FAUNA**

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

### **D4.1 Method of Assessment**

The impacts are assessed using the Institute of Ecology and Environmental Management (IEEM) Ecological Impact Assessment (EcIA) methodology (IEEM, June 2006) outlined in *Annex 2, Volume 1*. The baseline was established through 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*.

### **D4.2 Baseline Conditions**

#### **D4.2.1 Statutory Sites of Nature Conservation Interest**

The closest statutory site is **Colwick Cutting Site of Special Scientific Interest (SSSI)**, which is designated for its geological interest and lies within 0.75 km of this scheme area. There are no other statutory sites of nature conservation within 2km of the Colwick scheme area. The nearest biological statutory site is Wilford Claypits SSSI. It is located on the right bank of the River Trent and is designated for its marsh community. It is approximately 6 km from the proposed scheme.

#### **D4.2.2 Non-statutory Nature Conservation Designations**

There are 20 designated non-statutory Sites of Interest for Nature Conservation (SINCs) within 2km of the proposed flood defences. However, 17 of these are on the opposite bank of the Trent. Only one has the potential to be affected by the scheme, namely Colwick Country Park SINC.

**Colwick Country Park SINC:** This 87ha site includes landscaped areas of former sand and gravel workings, and an old course of the River Trent; refer to Figure DD1.1. 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 at the site.

#### **D4.2.3 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 Figures DD1.2 to DD1.5, *Annex 1*.

##### ***Terrestrial habitat***

Much of the habitat outside of the SINC is either urban or improved recreational grassland. Trees provide the main interest and mainly border the river.

##### ***Watercourses***

The margins of the left bank of the River Trent, between Colwick Country Park and Radcliffe Viaduct are of varying nature. There are no hard defences

immediately on the river edge and, as a result, the riparian zone retains a natural appearance. The old route of the River Trent runs parallel to the works through Reach 1.

A small flood channel runs along the recreation ground (Reach 1). This is dry for most of the year.

### ***Ponds***

The balancing pond within Colwick Industrial Estate (Figure DD1.1) is within a car park and appears heavily polluted by industrial traffic. There is no boundary between the pond edge and the car park and the waterbody is isolated from other semi-natural areas. There are no other ponds within 250m of the works.

## D4.2.4 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 will provide habitat for a range of passerine birds. The data sheet for Colwick Country Park SINC states that it is good for waterfowl and the usual ducks, geese and grebes. These more common species are complimented by winter visits from goldeneye *Bucephala clangula*, ruddy duck *Oxyura jamaicensis* and smew *Mergellus albellus*. It also supports approximately 64 breeding species.

### ***Bats***

No potential bat roosts were identified within the area of the proposed works.

### ***Badgers***

No badger *Meles meles* setts or other field signs were recorded during the survey.

### ***Otter***

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 and industrial nature of much of the Colwick scheme area.

### ***Water Vole***

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.

### ***Invertebrates***

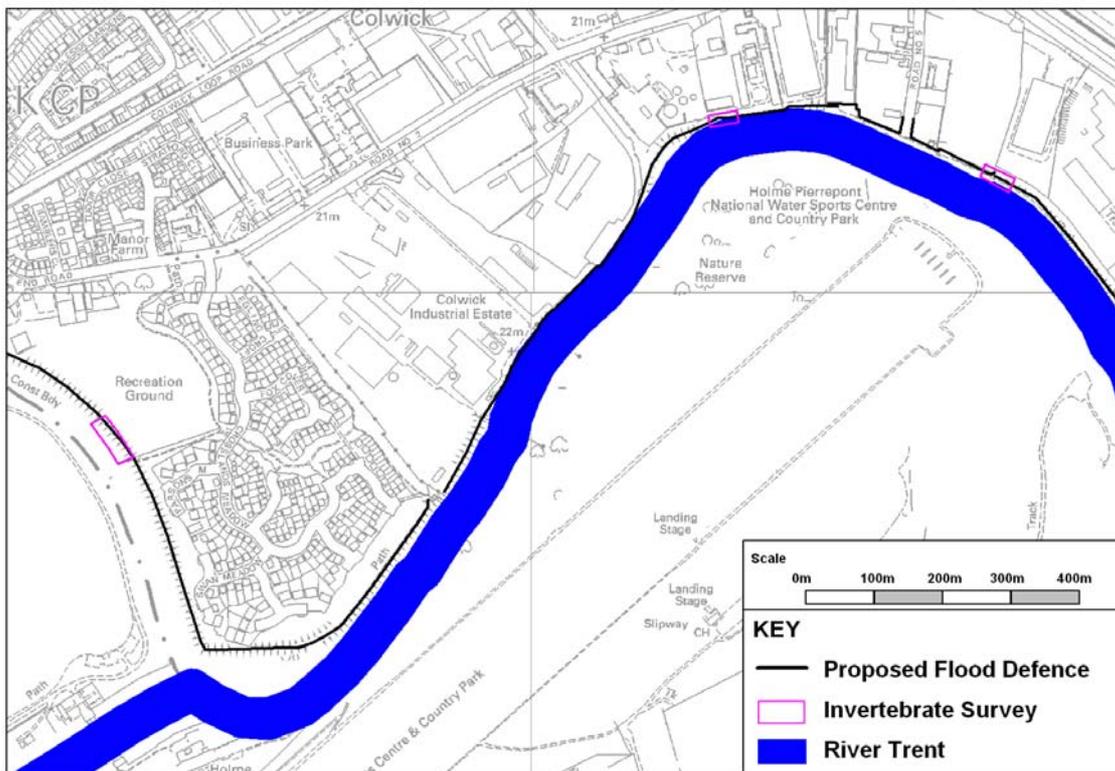
Table D4.1 presents the three areas that were considered to be of the greatest invertebrate potential through the Colwick scheme area when assessed by a qualified entomologist in the summer of 2006; refer to Figure D4.1 for survey locations.

### ***Invasive species***

Phase 1 habitat surveys highlighted the presence of Himalayan balsam *Impatiens glandulifera* along the riverbank through much of Reach 2 (Colwick Industrial Estate). Japanese knotweed *Fallopia japonica* has also been located in Sub-reach 2.1, in the vicinity of Kitchen World.

**Table D4.1 Invertebrate Survey Results**

Site Name	Site Description	Importance	Survey Results
Colwick near playing fields (Reach 1)	A strip of land at the foot of an embankment with its limit formed by a wide ditch. The vegetation during the walkover survey comprised tall herb grassland with abundant herbs (not flowering).	Local	The terrestrial fauna largely comprised widespread species without marked wetland affinities, such as the spiders <i>Meta segmentata</i> and <i>Enoplagantha ovata</i> . The aquatic fauna of the ditch comprised widespread species with wide habitat associations.
Colwick near Armitage Pet Care (Reach 2)	A sloping riverbank vegetated with rough herbage and a small area of exposed fine sediment at the river margin.	Local	No species typically with strong associations to exposed riverine sediments were encountered, although species did include those found in open areas such as the spiders <i>Drassodes cupreus</i> and <i>Xysticus cristatus</i> . Species of herbage such as the ground beetle <i>Pterostichus madidus</i> were also identified.
Colwick end of works (Reach 3)	This survey area straddled the footpath along the riverbank. The edge of the river at this location was reinforced with small boulders creating a sharp boundary without a marginal habitat.	Local	There was a distinct dry-habitat fauna, including the snail-killing fly <i>Coramacera marginata</i> . Few of the other species identified showed distinct habitat affinities but typically they were open habitat species such as <i>Zelotes latreillei</i> and <i>Xysticus cristatus</i> .



**Figure D4.1 Invertebrate Survey Locations at Colwick**

### D4.3 Summary of Ecological Interest

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

- Colwick Country Park SINC
- trees
- birds

Invasive species are also discussed.

Each of these is valued on a geographical scale and the definition of the values is given in *Annex 2, Volume 1*.

### D4.4 Impact Assessment

Table D4.2 summarises the impact, mitigation and significance for all the ecological receptors. The assessment of significance in brackets given throughout this section moderates the ecological impact assessment (EcIA) to the standard determination of Impact Assessment given in *Table 6.1, Volume 1*, for comparative purposes across all of the environmental receptors.

#### D4.4.1 Construction Impacts

##### *Sites of Interest for Nature Conservation Interest (SINCs)*

A 30m section of embankment within Colwick Country Park SINC is to be raised. This is directly upstream of River Road. The raising of this length of embankment will increase the footprint of the embankment by approximately 60m<sup>2</sup>. The existing embankment is managed by the Environment Agency and has an easement where tree growth is restricted, defined by a fenceline. The required maintenance easement will remain effectively the same so there will be no additional land take. Less than 1% of the SINC will be directly disturbed, all of which is an existing flood defence or its managed easement.

All habitat affected is mown grassland, which is of low conservation value. The SINC may be subject to impacts from construction related activities throughout Reach 1, such as dust, run-off, etc.

The proposed works in the remainder of Reach 1, will adversely affect the surrounding area due to construction noise and vibration, however, no piling is required within this reach, therefore further disturbance will be minimal.

The <i>impact</i> has been assessed <i>prior to mitigation</i> as being <b>not significant</b> and <b>short-term</b> at a <b>County Level (Minor adverse)</b> .
---

##### *Trees*

Eleven trees, T347-351, T353, T355-357, and T373 - 374, and six groups of trees G140-142, G144, G147 and G151 will be removed or partially removed for the construction of the defences. The trees and groups are shown on Figure DD1.2.

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

### ***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 would 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. Species likely to be affected are abundant and widespread, both locally and nationally. The impact on the local breeding bird populations is therefore likely to be minimal.

The raising works in Reach 1 are in close proximity to Colwick Country Park SINC and thus, there is the potential to disturb waterfowl on the adjacent lagoons. However, the lagoons are screened by vegetation, therefore reducing the potential disturbance to waterfowl.

The *impact* has been assessed *prior to mitigation* as being **not significant** and **short-term** at a **Local to County** level (**None** to **Minor** for works affecting the SINC).

### ***Invasive plant species***

Himalayan balsam is present along the riverbank through much of Reach 2 (Colwick Industrial Estate). Japanese knotweed has also been located in Sub-reach 2.1, in the vicinity of Kitchen World. Without mitigation measures there is potential for the spread of these invasive species.

## D4.4.2 Operational Impacts

### ***Impacts of Maintenance***

It is not expected that operational activities of the flood defence will have residual significant adverse impacts on protected species or habitats. There may be requirements for vegetation clearance, such as regular grass cutting and removal of scrub vegetation, in order to maintain the integrity of the structures.

### ***Impacts of Raised Defences on Sites of Nature Conservation Interest***

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. The increase will be up to 0.07m during a flood event with a 1% annual probability of occurrence and will affect all areas in front of the defence and the unprotected areas on the opposite bank of the river Trent. It is not considered that this will have an adverse impact on the nature conservation interest of the area, because all species and habitat are already subject to periodic flooding.

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

## **D4.5 Mitigation Measures and Monitoring**

### ***Designated Nature Conservation Sites***

Prior to the site clearance, a detailed mitigation method statement will be agreed with Nottingham City Council's Ecologist for the work in the Colwick Country Park SINC. This will include information on:

- site clearance;
- access;
- pollution control;
- reinstatement;
- biodiversity enhancements. These 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*;
- protected species mitigation.

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

### ***Trees***

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 of trees and scrub will be undertaken to ensure the ecological value of the area is retained and there will be no net loss of trees. All species will be native and appropriate to the local area.

### ***Birds***

The removal of potential nesting habitat should 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 whilst actively nesting.

### ***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.

A working methodology will also be established to prevent the further spread of Himalayan balsam, in accordance with Environment Agency current best practice guidelines.

### *Further Surveys*

Pre-construction surveys will be undertaken for water vole and otter and, if they are found, mitigation will be agreed with Natural England (NE) and licences obtained as required.

#### **D4.6 Residual Impacts**

With the above mitigation measures, any adverse impacts on the majority of habitats and species will be avoided or reduced to an acceptable level. The overall residual impact on flora and fauna is considered **not significant**. Biodiversity enhancements within Colwick Country Park will be discussed with Nottingham City Council; refer to Table D4.2. These have the potential to have significant beneficial impacts to the SINC.

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**Table D4.2 Summary of Impacts on Flora and Fauna**

Ecological receptor & value (in brackets)	Proposed activity	Characterisation of unmitigated impact	Significance without mitigation	Mitigation, compensatory habitat & enhancement	Residual significance and confidence
<b>Construction Impacts</b>					
Colwick Country Park (County)	Site clearance and construction	<1% of SINC will be directly disturbed, all of which is an existing flood defence or its managed easement. The grassland which will be affected is of low botanical interest. No sheet piling is required, therefore, no impacts on hydrology. Indirect disturbance to birds.	Adverse effect on conservation status; unlikely. Therefore, no significant impact at the County level: probable. <b>(Minor adverse)</b>	Mitigation Method Statement to be agreed with Nottingham City Council. Likely to include: <ul style="list-style-type: none"> <li>• Resowing with wildflower seed.</li> <li>• Pollution control.</li> <li>• Sensitive timing of works.</li> </ul> See also <i>Appendix F</i> .	Probable adverse effect at the County level in short-term; not significant. <b>(Minor adverse)</b>  Certain effect at the County level in medium term; not significant. <b>(None)</b>  Probable that compensatory habitat measures within Colwick Country Park would have a significant beneficial impact in the long-term, <b>(Minor beneficial)</b>
	Overall significance		Adverse effect at the County level: unlikely. <b>(Minor adverse)</b>		Adverse effect at the County level; not significant. <b>(None)</b>
Trees (Local)	Site clearance and construction	Eleven trees will be lost (T347-351, T353-357, T367 and T373 – 374) and six groups of trees (G140-142, G144 and G147-148)	Adverse effect on conservation status; extremely unlikely. Therefore, no significant adverse effect at the Local level: certain. <b>(None)</b>	Retained trees to be fenced off: No works within tree canopy. BS 5837:2005 to be followed. Replacement and supplementary planting of trees and scrub.	Certain adverse effect at the Local level in short-term; not significant. <b>(None)</b>
Birds (Local)	Site clearance and construction	Clearance of hedgerow/trees and disturbance to working area and wider zone will cause an overall loss of potential breeding bird habitat.	Adverse effect on conservation status; unlikely. Therefore, no significant adverse impact at the Local level: probable. <b>(None to minor adverse)</b>	Vegetation clearance to be undertaken outside the breeding bird season. All vegetation in the temporary working areas to be reinstated.	Certain adverse impact at the Local level in short-term; not significant. <b>(None)</b>

Ecological receptor & value (in brackets)	Proposed activity	Characterisation of unmitigated impact	Significance without mitigation	Mitigation, compensatory habitat & enhancement	Residual significance and confidence
<b>Operational Impacts</b>					
SINC (County)	Flood protection to left bank	Very slight increase in the depth and duration of flooding for SINC 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; very unlikely. Therefore, no significant adverse impact at the County level: certain. <b>(None)</b>	None required.	Certain no significant adverse impact at the County level. <b>(None)</b>
	Maintenance of an easement/ access adjacent to the defence.	Restriction on the growth of woody species on defence or easement.	Impacts are incorporated into construction impacts for each site.	None required.	Certain no significant adverse impact at the County level. <b>(None)</b>
	Overall significance of effect		Adverse effect at the County level: extremely unlikely. <b>(None)</b>		Certain no significant adverse impact at the County level. <b>(None)</b>

## **D5. NOISE AND VIBRATION**

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

### **D5.1 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. *Section 7.4.2, Volume 1* sets out the methodology in more detail.

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

### **D5.2 Baseline Conditions**

Colwick contains a mixture of baseline noise sources, the most predominant emanating from the industrial estate and associated traffic movements. Industrial practices within this area will produce noise during standard working hours.

Daleside Road East and Colwick Loop Road are major highways through Colwick that carry large volumes of traffic and will provide significant amounts of background noise during peak times.

There are 323 buildings within 200m of the defence route; refer to Table D3.1.

### **D5.3 Impact Assessment**

#### **D5.3.1 Construction Impacts**

##### ***Impacts from Construction Site Noise***

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

Table D3.1, shows that there are **13** properties (all residential) within 50m of the works that are at risk of a high level of noise disturbance. There is no construction within residential boundaries. The scheme runs through the operational sites of 10 businesses which use the land up to the flood defence alignment on a day to day basis, although there may be no permanent buildings within 50m. There are a further **81** property buildings within 50 to 100m and **101** within 100 to 150m of the working area. These may experience a medium to low level of noise disturbance. This disturbance is scheduled to last for

approximately seven months throughout Reach 1, 12 months through Reach 2 and four months through Reach 3.

These findings do not take account of variables, such as the screening of fences and other buildings, and the presence of existing ambient noise influences. The temporary and daytime nature of the works, coupled with advance notification and ongoing liaison concerning any noisy activities, will reduce the impact on the local population and businesses.

The users of Colwick Country Park will experience an increase in noise pollution during the construction of Reach 1 only. This will be short-term and only affect part of the Country Park. Upon completion the noise will return to the previous background level.

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

#### ***Impacts from Construction Traffic Noise***

Construction of the defences will require the movement of labour, plant and materials, and this will generate extra traffic and an increase in the proportion of heavy vehicles on the public highways. This impact is discussed in more detail in *Section D9*.

#### ***Impacts from Sheet Piling on Noise and Vibration***

Sheet pile foundations are required for most of the new flood walls through Reach 2. Piling will be carried out using high frequency vibratory hammers and impact driving. The piling is in an industrial park and several buildings are within 50m of piling activity and will be subject to a high level of disturbance. There are no residential properties within 50m of the works.

Figure D5.1 shows the zones of potential disturbance from piling activity.

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

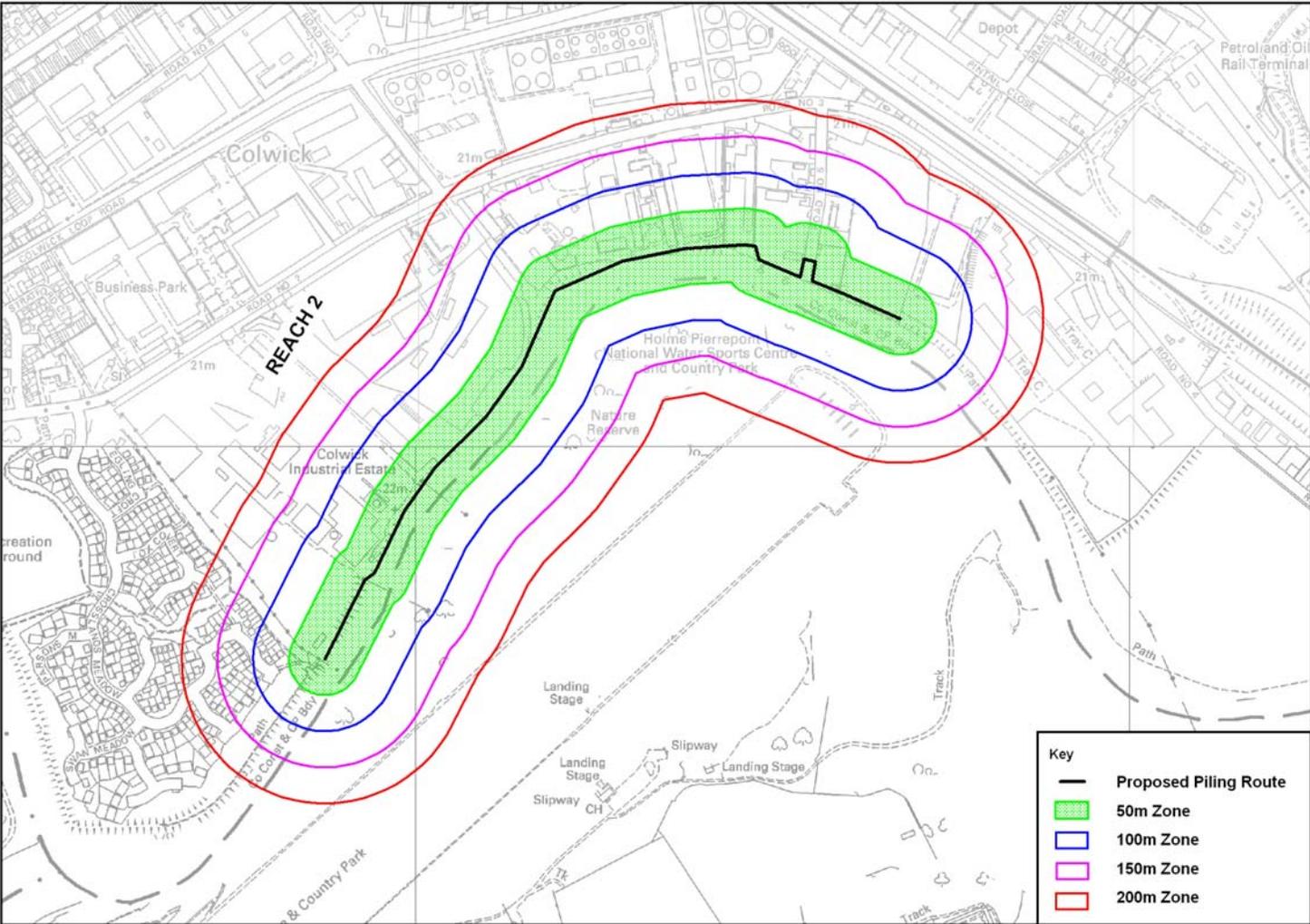


Figure D5.1 Zones of Potential Disturbance from Piling Activity

### D5.3.2 Operational Impacts

No significant impacts have been identified.

## D5.4 **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 7.4.5, 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 as practically possible away from residential properties and screened to reduce noise emissions.
- The contractor will use the smallest construction plant that is practical.
- In addition to specific measures, adequate warning and written notice of construction works will be provided to all affected landowners. Health and Safety issues will be addressed through the Contractor's Health and Safety Plan.

### *Sheet Piling Noise and Vibration*

The result of test piling has ruled out the noisiest method of piling which is the drop hammer method. Additional mitigation measures will be in place including:

- 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 and to allow the construction team to select appropriate construction methods or additional control measures.
- These limits will be stringently adhered to and continuous monitoring undertaken. This monitoring will inform the construction team during the works of when to switch to alternative piling method. 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.

### **D5.5 Residual Impacts**

Taking the above into account, the majority of properties will continue to experience **minor adverse** noise impacts. Due to the urban nature of the scheme area, a number of industrial/business units may experience **major adverse** impacts from piling noise and vibration. However, these impacts are **short-term** and there should be no noise impacts after construction; refer to Table D5.1.

**Table D5.1 Summary of Impacts from Noise and Vibration**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>Construction Impacts</b>			
Construction Site Noise	Minor to Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Temporary fixed plant to be positioned as far as practically possible away from residential properties and screened to reduce noise emissions.</li> <li>• Liaison with residents and local businesses.</li> <li>• Site specific measures detailed in the EAP; refer to <i>Section 13, Volume 1</i>.</li> </ul>	Minor to major adverse and short-term
Sheet Piling Noise and Vibrations	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Liaison with residents and local businesses.</li> <li>• Pre-works condition survey of all properties that are within 200m of sheet piling.</li> <li>• A structural engineer to assess what the maximum tolerance level of vibration is for these buildings.</li> <li>• Continuous vibration monitoring during sheet piling.</li> <li>• 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.</li> <li>• Piling plant will be well maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated.</li> <li>• Limits on noise and vibrations will be discussed and agreed with the EHO.</li> <li>• 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.</li> </ul>	Moderate to major adverse and short-term
Construction Traffic Noise	<i>See Section D9</i>		
<b>Operational Impacts</b>			
<i>No significant impacts have been identified</i>			

## **D6. AIR QUALITY**

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

### **D6.1 Method of Assessment**

Identification of the ambient conditions was undertaken through a desk study of Gedling Borough 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. Soft friable materials, such as soil, break easily and produce a greater number of dust particles for a given degree of handling. Conversely, concrete and other flood 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 dust 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).

### **D6.2 Baseline Conditions**

Colwick has the potential for poor air quality due to its urban setting and close proximity to the following busy roads:-

- Daleside Road East (A612) - Reach 1
- Colwick Loop Road (A612) - Reaches 2 and 3
- Mile End Road - Reaches 1, 2 and 3
- Private Road Nos 2, 3 and 4 - Reach 2

The roads are identified in Gedling Borough Council's Local Air Quality Management Plan for their potential for nitrous oxide (NO<sub>x</sub>) pollution. Areas within Gedling have previously not met the standards set by Defra on NO<sub>x</sub> emissions.

There are no designated Air Quality Management Areas (AQMAs) in the Colwick area; the closest is situated approximately 5km to the north-west.

## D6.3 Impact Assessment

### D6.3.1 Construction Impacts

#### *Impacts on the Local Environment from Dust Generating Activities*

Dust emissions will arise from the operation of machinery/vehicles over dry ground, and from general construction activities. The latter includes the embankment works in all reaches. The period of time required for those works which are likely to generate most dust, is approximately three months at each location; refer to Table D.2.2.

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 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<sub>x</sub>), volatile organic compounds (VOCs) and particulates (PM<sub>10</sub>).

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 and disperse.

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

### D6.3.2 Operational Impacts

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

## D6.4 Mitigation Measures and Monitoring

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 measures are outlined in *Section 7.7.5, Volume 1* but their application will depend on local circumstances and the methods of working detailed in the EAP; refer to *Section 13, Volume 1*). 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 manufacturer's 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.

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

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

#### **D6.5 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 an assessment does not appear warranted. Table D6.1 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 to no significance** and **short-term**.

**Table D6.1 Summary of Impacts on Air Quality**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>Construction Impacts</b>			
Impact on the local environment from dust generating activities	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Refer to the EAP <i>Section 13, Volume 1</i>.</li> <li>• Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.5.5, Volume 1</i>.</li> <li>• Refer also to <i>Section D9</i>.</li> </ul>	Minor adverse and short-term
Impact on the local environment from construction plant and vehicle emissions	Minor adverse and short-term	As above plus: <ul style="list-style-type: none"> <li>• 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.</li> </ul>	None
<b>Operational Impacts</b>			
<i>No significant impacts identified</i>			

## D7. LANDSCAPE & VISUAL AMENITY IMPACT ASSESSMENT

This section addresses the impacts on the local landscape and visual amenity of the Colwick scheme area.

### D7.1 Method of Assessment

The landscape and visual impact assessment of the proposed works at Colwick 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*.

### D7.2 Baseline Conditions

The Colwick scheme area is dominated by areas of residential housing and industrial estates but also contains Colwick Country Park. Colwick Country Park SINC is home to a variety of habitats including swamp areas, lakes, planted woodland and open grassland. The lakes in the Colwick Country Park were created following gravel extraction and now provide an attractive public amenity.

The main channel of the River Trent is to the south of the Colwick Country Park. There is a former route of the river in this location and this now forms the boundary between the Country Park and the residential areas of Colwick. Reach 1 is dominated by the Crosslands Meadows Recreation Ground; refer to Plate D7.1. To the south of the Crosslands Meadow housing estate views out to the main channel of the Trent are dominated by the Holme Sluice.

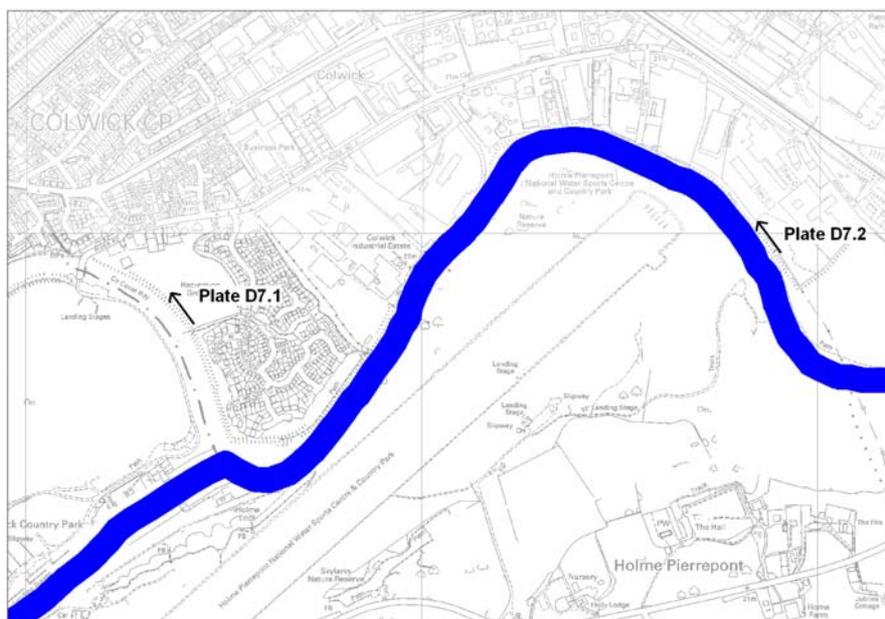


Figure D7.1 Location Plan of Plates

The Colwick Industrial Estate dominates the land use downstream of the Country Park; refer to Plate D7.2. The estate is comprised of large industrial units along the banks of the River Trent. Some of these industrial units contain disused mooring points on the riverbank.



**Plate D7.1 Existing Defences through Crosslands Meadows Recreation Ground adjacent to Colwick Country Park in Reach 1**



**Plate D7.2 Colwick Industrial Estate Reach 3**

## D7.3 Impact Assessment

### D7.3.1 During Construction

#### *Impacts of Construction Works on Local Landscape and Visual Amenity*

During the construction period machinery, storage of materials and site 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 *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 within Crosslands Meadows (Reach 1)*

- Any adverse impacts associated with the raised levels of the River Road ramp will be mitigated by sensitive design proposals that ensure a smooth road surface and continued vehicular access. There will be a **negligible** change to the landscape character.
- The raising of the Crosslands Meadow Embankment will have a **slight (minor) adverse** visual impact on views from the adjacent residential housing out to the River Trent and the Colwick Country Park.
- There will be a minor loss of tree and shrub vegetation at the toe of the existing embankment in Crosslands Meadow. However the plants to be removed are on the edge of larger blocks of planting, and as such the remaining planting will retain the existing landscape character and visual amenity of the immediate area.
- The proposed gravel surfaced footpath on the crest of the embankment will provide a formal link with the existing footpath network. This will have a positive impact for walkers.

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

#### *Impacts of New and Raised Defences in Local Landscape and Visual Amenity within Colwick Industrial Estate (Reaches 2 & 3)*

- The raising of the existing outfalls to the Riverview Pumping Station will have a **negligible** impact on the landscape character, and will be barely discernible to the casual observer.
- Holme Dyke Pumping Station will have a **moderate adverse** impact on the landscape character, and may result in a loss of car parking for the business unit. The visual impact of the pumping station will be mitigated through design suitable to its setting.

- The construction of new floodwalls, the raising and reprofiling of existing embankments and the construction of new maintenance and inspection accesses within the various sites of the Colwick Industrial Estate will have a **slight (minor) adverse** visual impact on the area. The proposed flood defence structures will be viewed as small-scale features against the existing setting of large industrial buildings.
- Subject to the agreement of landowners there is the potential to enhance the local footpath network with new paths adjacent to the new flood walls and embankments alongside the river.
- The proposed localised raising and re-profiling works to the Colwick Industrial Estate Embankment will have a **slight (minor) adverse** visual impact for users of the riverside footpath.

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

#### D7.3.2 Operational Impacts

No significant impacts were identified.

#### D7.4 **Mitigation Measures and Monitoring**

The mitigation measures given in Table D7.1 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. All embankments will be grass seeded as part of their design specification.

**Table D7.1 Mitigation Measures and Wall Treatments**

<b>Impacts Associated with Proposed Works:</b>	<b>Mitigation Measures and Wall Treatments:</b>
<ul style="list-style-type: none"> <li>• Visual appearance of new floodwalls</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure good concrete finish to flood wall.</li> </ul>
<ul style="list-style-type: none"> <li>• Foreshortening of views</li> </ul>	<ul style="list-style-type: none"> <li>• No mitigation possible.</li> </ul>
<ul style="list-style-type: none"> <li>• Impacts on existing mature trees</li> </ul>	<ul style="list-style-type: none"> <li>• Where proposed works are in close proximity to trees of high landscape value ensure the construction process minimises any potential damage to root systems.</li> </ul>
<ul style="list-style-type: none"> <li>• Raised road levels</li> </ul>	<ul style="list-style-type: none"> <li>• Grade road ramps so that a smooth road surface is achieved.</li> </ul>
<ul style="list-style-type: none"> <li>• Minor adverse visual impact of raised embankments</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure they blend into their landscape setting through landform design and reinstatement grass seeding. Where it does not compromise operational requirements appropriate planting may be utilised to reduce the visual impact.</li> <li>• The gradient of the raised embankments has been considered to minimise the visual impact.</li> </ul>
<ul style="list-style-type: none"> <li>• Temporary adverse visual impact of construction activities and site compounds.</li> </ul>	<ul style="list-style-type: none"> <li>• Where possible locate construction compounds and storage areas away from sensitive residential receptors and adjacent to suitable vehicle access points.</li> <li>• Reinstatement all areas affected by the works to their former land use.</li> </ul>

## D7.5 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 D7.2 and D7.3 outline the residual impacts.

The overall scheme will result in **slight adverse (not significant)** landscape and visual impacts.

Once re-seeding has successfully established the embankment in Crosslands Meadow will have a **negligible** residual impact on the landscape character of the meadow. The proposed footpath will offset the minor loss of existing vegetation.

The Holme Dyke Pumping Station will be designed to ensure the building is suitable to its location in materials and style. This will reduce the landscape and visual residual impact to **slight adverse (not significant)**.

The construction of a network of new floodwalls and embankments to the riverbank of the Colwick Industrial Estate will have a **slight adverse** residual visual impact on the area. The proposed flood embankments and floodwalls will be viewed as small-scale elements within the larger industrial landscape and replace existing defences that are comparable elements within the landscape.

Subject to the agreement of landowners the incorporation of 2.0m wide gravel surfaced footpath to the crest of raised embankments and alongside new floodwalls through Colwick Industrial Estate will have a **significant beneficial** impact on the landscape character of the area by allowing improved access to the riverbank for walkers and cyclists.

## D7.6 Summary

Overall the proposed flood protection works will have a **slight (minor) adverse** impact on Crosslands Meadow and the Colwick Industrial Estate. The impacts are considered **not significant** and will be permanent.

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**Table D7.2 Summary of Landscape Impacts<sup>3</sup>**

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
<b>CROSSLANDS MEADOW</b>							
<b>Reach 1 River Road Ramp</b>	Low	Low	Slight (minor) Not Significant	<ul style="list-style-type: none"> <li>Full re-grading works to ensure a smooth road surface.</li> </ul>	Negligible	Negligible Not Significant	
<b>Crosslands Meadow Embankment</b>	Low	Low	Slight (minor) Not Significant	<ul style="list-style-type: none"> <li>Where possible trees will be retained and protected.</li> <li>Re-instatement of any trees removed.</li> <li>Proposed footpath to crest of embankment.</li> </ul>	Negligible	Negligible Not Significant	New footpath will improve access through Crosslands Meadow. 10+ years for establishment of planting.
<b>COLWICK INDUSTRIAL ESTATE</b>							
<b>Reach 2 Riverview Pumping Station</b>	Low	Negligible	Negligible Not Significant	Mitigation measures not required.	N/A	Negligible Not Significant	
<b>Kitchen World Floodwall</b>	Low	Low	Slight (minor) Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwalls.</li> </ul>	Low	Slight (minor) Not Significant	
<b>Biffa Waste Floodwall</b>	Low	Low	Slight (minor) Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwall.</li> </ul>	Low	Slight (minor) Not Significant	

<sup>3</sup> Unless otherwise stated the residual impacts are adverse. The duration of effects unless otherwise stated is permanent.

<b>SUMMARY OF LANDSCAPE IMPACTS</b>							
<b>Prior to Mitigation Works</b>				<b>Post Mitigation Works</b>			
<b>Identified Area of Works</b>	<b>Sensitivity</b>	<b>Magnitude of Change prior to mitigation</b>	<b>Level of Potential Landscape Effect</b>  <b>Potential Significance</b>	<b>Mitigation and Reinstatement Measures</b>	<b>Magnitude of Change with Mitigation</b>	<b>Level of Residual Landscape Impact</b>  <b>Residual Significance</b>	<b>Comments</b>
<b>Colwick Quays Floodwall</b>	Low	Low	Slight (minor)  Not Significant	No mitigation possible	N/A	Slight (minor)  Not Significant	
<b>Holme Dyke Pumping Station</b>	Low	High	Moderate  Not Significant	<ul style="list-style-type: none"> <li>Ensure design of building is suitable to location.</li> </ul>	Medium	Slight (minor)/ Moderate	
<b>Total Oil Embankment</b>	Low	Low	Slight (minor)  Not Significant	No mitigation possible	N/A	Slight (minor)  Not Significant	
<b>Total Oil Floodwall</b>	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwall.</li> </ul>	Low	Slight (minor)  Not Significant	
<b>British Drilling Floodwall</b>	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwall.</li> </ul>	Low	Slight (minor)  Not Significant	
<b>Armitage Pet Centre Embankment</b>	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Full reinstatement of grassed slopes.</li> </ul>	Low	Slight (minor)  Not Significant	12 – 18 months for establishment of grass seeding.
<b>Reach 3 Holme Floodwall</b>	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the proposed floodwall.</li> </ul>	Low	Slight (minor)  Not Significant	

<b>SUMMARY OF LANDSCAPE IMPACTS</b>							
<b>Prior to Mitigation Works</b>				<b>Post Mitigation Works</b>			
<b>Identified Area of Works</b>	<b>Sensitivity</b>	<b>Magnitude of Change prior to mitigation</b>	<b>Level of Potential Landscape Effect</b>	<b>Mitigation and Reinstatement Measures</b>	<b>Magnitude of Change with Mitigation</b>	<b>Level of Residual Landscape Impact</b>	<b>Comments</b>
			<b>Potential Significance</b>			<b>Residual Significance</b>	
<b>Colwick Industrial Estate Embankment</b>	Low	Low	Slight (minor)	<ul style="list-style-type: none"> <li>Full reinstatement of all grass slopes and associated gravel surfaced footpath.</li> </ul>	Low	Slight (minor)	
			Not Significant			Not Significant	

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**Table D7.2 Summary of Visual Impacts <sup>4</sup>**

<b>SUMMARY OF VISUAL IMPACTS</b>							
<b>Prior to Mitigation Works</b>				<b>Post Mitigation Works</b>			
<b>Identified Area of Works</b>	<b>Sensitivity</b>	<b>Magnitude of Change prior to mitigation</b>	<b>Level of Potential Visual Effect</b>  <b>Potential Significance</b>	<b>Mitigation and Reinstatement Measures</b>	<b>Magnitude of Change with Mitigation</b>	<b>Level of Residual Visual Impact</b>  <b>Residual Significance</b>	<b>Comments</b>
<b>CROSSLANDS MEADOW</b>							
<b>Reach 1</b> Visitors to the Colwick Country Park Entering via River Road	Medium	Low	Slight (minor)/moderate  Not Significant	<ul style="list-style-type: none"> <li>Full re-grading works to ensure a smooth road surface.</li> </ul>	Negligible	Slight (minor)/negligible  Not Significant	
Users of the Crosslands Meadow Recreation Ground	Medium	Negligible	Slight(minor)/negligible  Not Significant	<ul style="list-style-type: none"> <li>Full reinstatement of grassed slopes.</li> <li>Where possible, trees will be retained and protected.</li> </ul>	Negligible	Slight(minor)/negligible  Not Significant	12 – 18 months for establishment of grass seeding.
Residents of Crosslands Meadow	High	Negligible	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Full reinstatement of grassed slopes.</li> </ul>	Negligible	Slight (minor)  Not Significant	
<b>COLWICK INDUSTRIAL ESTATE</b>							
<b>Reach 2</b> Employees of Kitchen World	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Full reinstatement of grassed slopes.</li> <li>Ensure a good concrete finish to associated floodwalls.</li> </ul>	Low	Slight (minor)  Not Significant	12 – 18 months for establishment of grass seeding.
Employees of British Drilling	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwall.</li> </ul>	Low	Slight (minor)  Not Significant	

<sup>4</sup> Unless otherwise stated the residual impacts are adverse. The duration of effects unless otherwise stated is permanent.

<b>SUMMARY OF VISUAL IMPACTS</b>							
<b>Prior to Mitigation Works</b>				<b>Post Mitigation Works</b>			
<b>Identified Area of Works</b>	<b>Sensitivity</b>	<b>Magnitude of Change prior to mitigation</b>	<b>Level of Potential Visual Effect</b>  <b>Potential Significance</b>	<b>Mitigation and Reinstatement Measures</b>	<b>Magnitude of Change with Mitigation</b>	<b>Level of Residual Visual Impact</b>  <b>Residual Significance</b>	<b>Comments</b>
Employees of Biffa Waste	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the floodwall.</li> <li>Provision for a replacement floodgate to maintain existing access to the riverbank.</li> </ul>	Low	Slight (minor)  Not Significant	
Residents of Colwick Quays	High	Low	Moderate  Not Significant	No mitigated possible.	N/A	Moderate  Not Significant	
Employees of Total Oil	Low	Low	Slight (minor)  Not Significant	<ul style="list-style-type: none"> <li>Full reinstatement of grassed slopes.</li> <li>Ensure good concrete finish to the Total Oil floodwall.</li> </ul>	Low	Slight (minor)  Not Significant	12 – 18 months for establishment of grass seeding.
Employees of Armitage Pet Centre	Low	Low	Slight (minor)  Not Significant	No mitigation possible	N/A	Slight (minor)  Not Significant	
Recreational Users of the Riverside Footpath	Medium	Negligible	Slight (minor)/negligible  Not Significant	<ul style="list-style-type: none"> <li>Ensure a good concrete finish to the proposed floodwall.</li> <li>Reinstate the existing riverside footpath to its former or enhance condition.</li> </ul>	Negligible	Slight (minor)/negligible  Not Significant	

## D8. 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 D11*.

### D8.1 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.

### D8.2 Baseline Conditions

#### D8.2.1 Surface waterbodies

The River Trent flows from west to east through the study area.

There are two significant surface water outfalls along the proposed works, namely Riverview Pumping Station (Sub-reach 2.1) and Holmes Dyke (Sub-reach 2.4). Both have predominantly urbanised catchments and would respond quickly to rainfall.

Colwick Country Park consists of many large and small waterbodies, including an original route of the River Trent. These waterbodies are currently used for recreation and are discussed further in *Section D3*. There is a balancing pond at the eastern end of Colwick Industrial Estate.

#### D8.2.2 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 D8.1 for details.

**Table D8.1 Water Quality Grades**

Watercourse Stretch	GQA Chemistry Grade (2004-2006)	GQA Biology Grade (2004)
River Trent confluence with River Soar to Nottingham STW	A-B (Very good-good)	C (Fairly good)

### D8.3 Impact Assessment

#### D8.3.1 Construction Impacts

Construction through all reaches is on the banks of the River Trent. Works within Reach 2 will also affect the outfalls of the Riverview Pumping Station and Holmes Dyke.

### ***Impact on Watercourses and Waterbodies due to Pollution from Construction Activities***

Construction activities have the potential to cause pollution to the Colwick Industrial Estate Pond and the River Trent including its old course, particularly in Reaches 1 and 2. This may arise from the movement of construction plant and material, or run-off from the site. There is the risk of spillages from transportation or storage of construction materials, such as fuel.

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

#### D8.3.2 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% probability of occurrence.

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

### ***Impacts on Local Surface Water Drainage and Watercourses***

The Candle Meadow and Holmes Dyke watercourses discharge into the River Trent; these drain highly urban catchments. They become “locked” by flap valves at their downstream ends during periods of high flow in the River Trent. The Candle Meadow watercourse has a pumping station to overpump into the River Trent during these conditions, but Holmes Dyke would pose a flood risk. However, due to the urban nature of the catchments, the peak flows in both are likely to occur before the corresponding peak in the River Trent and consequently, the flood defence works should not increase the flood risk from such watercourses.

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

### ***Impact on Villages Outside the Scheme Area***

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

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

#### **D8.4 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 7.7.5, Volume 1*.

Method statements will be prepared to ensure water quality is not affected.

During construction, care will be taken to ensure that equipment and storage facilities are protected by secure fences and locked 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. To deal with the runoff from exposed ground and stockpiles, silt fences, 'dip and lip' earth banks or sandbags, may be used to divert it away from watercourses. Site roads will be kept free from dust and mud.

#### **D8.5 Residual Impacts**

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

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

**Table D8.2 Summary of Impacts on Water**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>CONSTRUCTION IMPACTS</b>			
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
<b>OPERATIONAL IMPACTS</b>			
Impacts from maintenance of new and raised flood defences and structures	No significant impact	None required.	None
Impact on surface water drainage behind the new and raised defences	No significant impact	None required.	None
Impact on villages outside of the scheme area	Moderate adverse and permanent	Refer to <i>Section 8, Volume 1.</i>	
Impact on the River Trent and its floodplain	No significant impact	None required.	None

## **D9. TRAFFIC AND TRANSPORT**

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

### **D9.1 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*.

### **D9.2 Baseline Conditions**

Daleside Road East (A612) is situated to the north of the residential and industrial areas of Colwick. Traffic on this highway is often congested due to the road being a major artery into Nottingham City Centre. This road joins with another major highway, Colwick Loop Road (A612) close to the industrial estate.

Colwick Industrial Estate contains a number of private roads, numbered 1 to 5. These serve all the businesses and industry within the area. The Crosslands Meadow housing estate comprises numerous small roads and cul-de-sacs. River Road provides the only access to one of the Colwick Country Park car parks.

### **D9.3 Impact Assessment**

#### **D9.3.1 Construction Impacts**

##### ***Impact on Local Roads due to Construction Traffic***

There will be an increase in traffic movements through Crosslands Meadow housing estate (Reach 1).

The location of the proposed access points are shown on Figures DD1.2 to DD1.5. In addition, material will be transported along the haul routes adjacent to the defences. The estimated lorry movements are shown in Table D9.1. 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**.

##### ***Impact due to Local Road Raising and Construction Activities Requiring Road Closures***

River Road (Reach 1) will be closed for approximately one week while it is raised and regraded. The closure will impact upon users of Colwick Country Park, due to restricted access to the car park.

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 D9.1 Estimated Lorry Movements**

Reach	Volume of Earthworks (m <sup>3</sup> )	Volume of temporary fill (m <sup>3</sup> )	Volume of Concrete (m <sup>3</sup> )	Other Materials and exportation of waste (m <sup>3</sup> ) <sup>(1)</sup>	Total Number of lorry movements <sup>(2)</sup>
<b>Colwick</b>					
Reach 1	5,085	0	0	96	1,295
Reach 2	8,604	0	1,840	160	2,805
Reach 3	3,670	0	0	72	935
<b>Totals</b>	<b>17,359</b>	<b>0</b>	<b>1,840</b>	<b>328</b>	<b>5,035</b>

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

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

### D9.3.2 Operational Impacts

#### *Impact of New and Raised Defences on Local Transport Infrastructure*

There will be a reduced risk of flooding to the road network supplying the city centre and the industrial estate.

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

### D9.4 Mitigation Measures and Monitoring

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

Specific considerations are to:

- Avoid residential areas and other sensitive locations.
- Prepare risk assessments for access through existing industrial areas.
- 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.
- Limiting construction vehicle movements to light traffic only through Crosslands Meadow housing estate.

### D9.5 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. There will be a **minor beneficial permanent** impact due to a decrease in flood risk to the local transport infrastructure.

**Table D9.2 Summary of Impacts on Traffic and Transport**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>Construction Impacts</b>			
Impact on local roads due to construction traffic	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Develop a TMP; refer to 7.10.5, Volume 1.</li> <li>• 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.</li> <li>• Prepare risk assessments for access through existing industrial areas.</li> <li>• No heavy vehicles through Crosslands Meadow housing estate.</li> </ul>	Minor adverse and short-term
Impact due to local road raising operations and construction activities requiring road closures	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Develop a TMP; refer to 7.10.5, Volume 1.</li> <li>• Ensure alternative Country Park car-park fully available.</li> </ul>	Minor adverse and short-term
<b>Operational Impacts</b>			
Impact of new and raised defences on local transport infrastructure	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent

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## **D10. CULTURAL HERITAGE AND ARCHAEOLOGY**

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

### **D10.1 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*.

### **D10.2 Baseline Conditions**

#### **D10.2.1 Archaeology**

##### ***Desk Study***

There are no Scheduled Monuments close to the works in Colwick. The desk study, did not identify any deposits of interest.

##### ***Results from Ground Investigations***

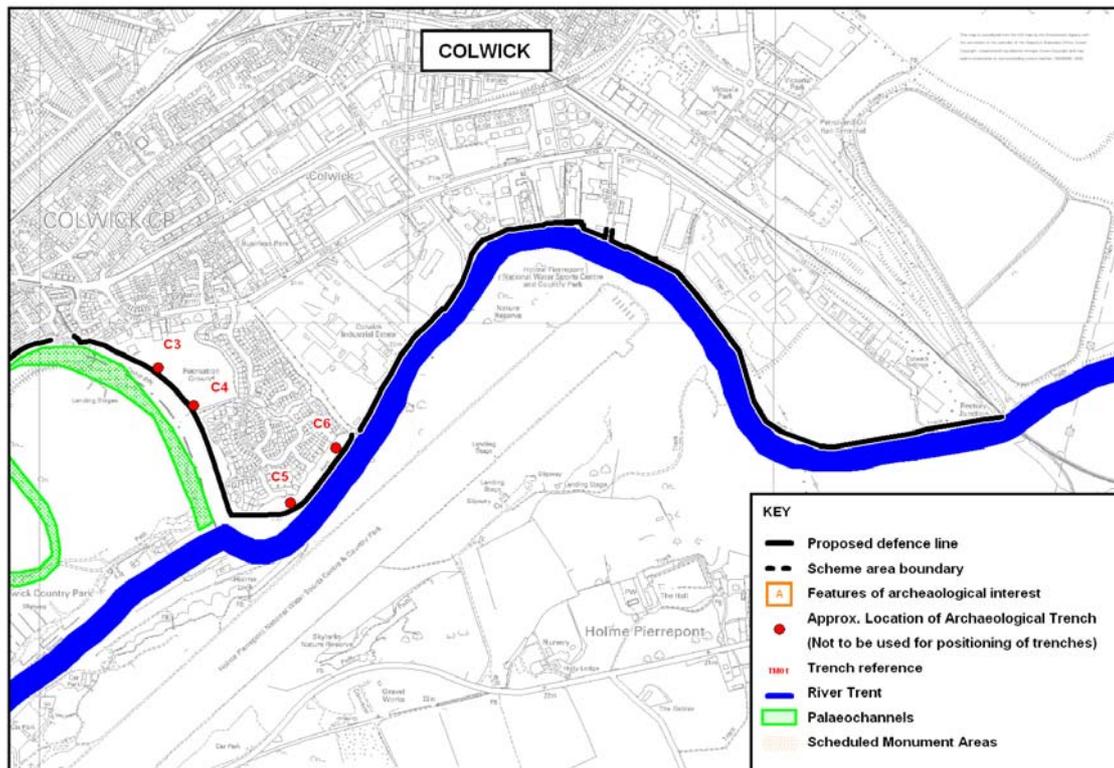
Four evaluation trenches were excavated in the Colwick scheme area; refer to Figure D10.1. The results are summarised in Table D10.1.

**Table D10.1 Results of Archaeological Ground Investigations**

<b>Trench</b>	<b>Results</b>
C3	Alluvial silts and sands found.
C4	Only recent deposits found, likely from the construction of nearby housing estate.
C5	
C6	Alluvial flood deposits found.

#### **D10.2.2 Listed Structures**

There are no Listed Buildings close to the works in Colwick.



**Figure D10.1 Location of Features of Archaeological Interest and Ground Investigation Trenches**

## D10.3 Impact Assessment

### D10.3.1 Construction Impacts

There are archaeological impacts associated with both the raising of existing flood defences and construction of new flood defence structures.

Construction activities that could damage archaeological remains include fencing of works areas, stripping of topsoil and subsoil for compound areas and temporary haul roads and any excavation works.

In addition, the insertion of sheet piles can damage buried archaeological deposits. The extent of this impact is, however, limited to the loss of buried remains in the footprint of the pile 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 or during the piling operation. This can increase the impact on the historic environment.

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

#### D10.3.2 Operational Impacts

There will be no operational impacts.

#### D10.4 **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 site will include:

- Reach 2 - Monitoring of the piling operations. Archaeological observation of ground breaking activities in areas of demonstrably significant archaeological potential, followed by recording of any deposits.
- 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.

#### D10.5 **Residual Impacts**

Residual impacts are limited to the visual impact of the defences on the historic environment, which are minimal at this location. The adverse residual impacts after mitigation are of **no or minor significance**; refer to Table D10.2.

**Table D10.2 Summary of Impacts on Cultural Heritage and Archaeology**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>CONSTRUCTION IMPACTS</b>			
Impact on archaeology due to construction activities	Minor adverse and permanent	<ul style="list-style-type: none"> <li>• A detailed mitigation strategy agreed with archaeological officers and English Heritage.</li> <li>• Adhere to CIRIA's Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.11.5, Volume 1</i>.</li> </ul>	None
<b>OPERATIONAL IMPACTS</b>			
No significant operational impacts identified.			

## **D11. SOIL, GEOLOGY AND HYDROGEOLOGY**

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

### **D11.1 Method of Assessment**

Desk study, walkover surveys and intrusive ground investigation were carried out 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. Details of the investigations are contained in factual reports.

### **D11.2 Baseline Conditions**

#### **D11.2.1 Geology**

The ground investigation has generally confirmed the underlying geology of variable deposits of made ground overlying alluvium with shallow depth to bedrock of mudstone.

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-south-east west-north-west 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 comprises 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.

### D11.2.2 Soils

Both cohesive and granular made ground soils are present as either fill to flood embankments or fill for development works along the left bank.

Little information is available for the made ground at the site and processing of additional ground investigation will be carried out during detailed design to assess engineering parameters of the soil.

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

The weathered Mercia Mudstone was recovered in boreholes as sandy clay, but the Sherwood Sandstone was not encountered.

### D11.2.3 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. Information obtained from the Interpretative Report (BV 2006) indicates 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.

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

### D11.2.4 Contaminated Land

The chemical contamination of the made ground has been assessed by performing a suite of tests on borehole samples.

Comparing test results from all other samples to available industry guidelines, such as Soil Guideline Values (SGVs), the values are typically low. Results from samples of embankment fill from a borehole (Reach 1) close to Riverview Pumping Station and the border with Reach 2 were higher than other samples at the site but these results did not exceed available guidance values for parks and open spaces.

The Crosslands Meadow housing estate (Reach 1) is built on a former land-fill site. The site was registered to receive domestic and inert industrial waste and whilst it may provide a source of contaminants the possibility of a pathway existing through the granular alluvium is remote. Analysis during detailed design will be done to confirm this.

## D11.3 Impact Assessment

### D11.3.1 Construction Impacts

#### *Impact of Soil Compaction in Working Areas*

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

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

#### *Impact of Contamination of Soil and Groundwater by Fuels 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 Reach 2, 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**.

#### *Impact of Bank Loading*

The exacerbation of natural erosion processes can be caused by loading of river banks with equipment, materials and plant.

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

### D11.3.2 Operational Impacts

No impacts were identified.

## D11.4 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'. Mitigation measures would include:

- good site practice when working next to watercourses;

- restoration of ground conditions following completion of works. This would involve stripping the topsoil in advance of the works, careful storage of it during the works and reinstatement on completion;
- reseeded/replanting to ensure that soils are not washed away during floods.

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

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

- Contractor will be adopting industry standard working methods, including a controlled working area, stock piling of excavated materials, the use of drip trays for machinery etc.
- Provision of an environmental clerk of works who will ensure compliance with the agreed Site Waste Management Plan (SWMP).

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.

### **D11.5 Residual Impacts**

Residual impacts are limited to soil compaction and contamination from the construction works. The **adverse** residual impacts after mitigation are of **no significance**; refer to Table D11.1.

**Table D11.1 Summary of Impacts on Soil, Geology and Hydrogeology**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>CONSTRUCTION IMPACTS</b>			
Compaction of soil structure due to construction activities	Minor adverse and medium-term	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site'(2005); refer to <i>Section 7.12.5, Volume 1.</i></li> </ul>	None
Contamination of soil and groundwater due to construction	Minor adverse and short-term	<ul style="list-style-type: none"> <li>• Follow Environment Agency's 'Policy and Practice for the Protection of Groundwater.</li> <li>• Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.9.5, Volume 1.</i></li> </ul>	None
Disturbance of contaminated land	Not significant	<ul style="list-style-type: none"> <li>• Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.12.5, Volume 1.</i></li> </ul>	None
Bank loading	Minor adverse and short-term	<ul style="list-style-type: none"> <li>• Storage and tracking over river banks to be minimised.</li> </ul>	None
<b>OPERATIONAL IMPACTS</b>			
<i>No significant impacts were identified</i>			

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## D12. LAND USE

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

### D12.1 Method of Assessment

Land use was identified through walkover surveys and through desk study.

### D12.2 Baseline Conditions

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

Reach 1 is characterised by recreational land, bordered by housing estates. The recreational land is designated Protected Open Space according to the Gedling Borough Local Plan. Reaches 2 and 3 are dominated by Colwick Industrial Estate, a large area of industrial usage. The development within this reach extends to the riverside, meaning there is not a continuous footpath between the river and the industrial unit. Reach 3 also contains predominantly industrial land uses, however, the footpath has returned to the riverside, extending down to the Radcliffe Viaduct.

Residential property is further discussed in *Section D3*. Areas managed for nature conservation are discussed in *Section D4*.

### D12.3 Impact Assessment

#### D12.3.1 Construction Impacts

##### *Impact of Loss of Available Land*

The majority of the potential impacts will be short-term and last for approximately three months. The potential impacts are as follows:

- some disruption of access to the land across the construction area;
- reduction in storage areas in industrial areas of Reach 2.

There will be some permanent loss of land as a result of an increased footprint of raised flood embankments. Temporary and permanent land take due to the proposed works are listed in Table D12.1.

**Table D12.1 Existing and Increased Footprints of New and Raised Defences**

Reach	Existing Footprint (m <sup>2</sup> )	Increased/New Footprint (m <sup>2</sup> )	
	Permanent <sup>(1)</sup>	Temporary <sup>(2)</sup>	Permanent <sup>(1)</sup>
1	9,213	31,485	9,868
2	5,073	18,410	6,885
3	1,247	2,177	1,291

<sup>(1)</sup> Flood defence footprint

<sup>(2)</sup> Working area during construction

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 1m - 5m will be created, 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 D6*.

Impacts on access rights are dealt with in *Section D3*.

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

#### D12.3.2 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 area. The maximum increase will be 0.07m during a flood event with a 1% probability of occurrence. *Section 8, Volume 1* describes this impact of the scheme.

#### **D12.4 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 D2*. As well as these general mitigation methods, other specific methods relating to land use impacts are summarised in *7.13.5, Volume 1*. The key points relating to horticulture and grazing impacts are given in Table D12.2 below.

#### **D12.5 Residual Impacts**

The majority of the potential land use impacts will occur at the construction and reinstatement stage; these are considered after mitigation to be short-term and of **minor significance**.

The only long term, permanent impact is the loss of approximately 0.25ha of land under the new/increased footprint of the defence, both embankments and flood walls. The creation of a 5m wide easement is also included in this measurement. Although the land use along the easement will be restricted to protect the defences, the current land use practices will continue and the impact is of no significance.

**Table D12.2 Summary of Impacts on Land Use**

Effect	Magnitude and Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>Construction Impacts</b>			
Loss of available land	Minor to moderate adverse and short-term to permanent	<ul style="list-style-type: none"> <li>• Liaison with local industry/business to minimise impacts on their works areas.</li> <li>• Best practice construction methodology; refer to <i>Section D2</i></li> <li>• Full reinstatement and protection while vegetation reestablishes.</li> </ul>	Minor adverse and short-term
<b>Operational Impacts</b>			
Impacts of decrease in available floodplain	Moderate adverse permanent	See <i>Section 8, Volume 1</i>	

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## **D13. USE OF NATURAL RESOURCES AND WASTE GENERATION**

### **D13.1 Main Materials Used and Sources**

#### **D13.1.1 Fill material for embankments**

During construction, the clay on the side slopes of an existing embankment will be excavated and the existing clay core benched to receive the fill material. The fill would be built up in layers using one of the materials below and the previously removed clay used to cap it. The clay would seal the fill against the ingress of water.

Potential local sources of secondary fill have been identified for the embankment raising works. Approximately 17,359 m<sup>3</sup> of fill material will be required for the embankments. Discussions are ongoing to determine the volumes and availability of the material.

#### **D13.1.2 Ready mixed concrete**

Approximately 1,840 m<sup>3</sup> concrete is required for the construction of the new flood walls and foundations in Reach 2.

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.

#### **D13.1.3 Steel Sheet Piles and Reinforcement**

Approximately 24m<sup>3</sup> of steel will be required for the 205m of sheet piling. The contractor currently sources most of their steel reinforcement from suppliers who produces their steel from entirely recycled materials using Electric Arc Furnaces.

#### **D13.1.4 Other materials**

Primary sources of materials will be avoided and, wherever possible, any imported materials will be from recycled or secondary sources. 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.

#### **D13.1.5 Waste regeneration 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 tree 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 and, 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; this is discussed in more detail in *Section 3.6, Volume 1*.

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

#### D13.1.6 Site Waste Management Plans

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.

#### **D14. IMPACTS IN-COMBINATION WITH OTHER KNOWN PLANS OR PROJECTS**

The Colwick Scheme Area forms part of the wider Nottingham Trent Left Bank Scheme. The cumulative impacts of the entire scheme are described in *Sections 8 and 10, Volume 1*, and include the impacts of increased peak river levels in the outlying villages. Locations are shown in *Appendix F*.

The following project may impact upon the scheme in Colwick:

##### ***Trent Valley Way***

This is an ongoing project to develop a continuous walkway along the banks of the River Trent. Discussions and consultation with Gedling Borough Council and Nottinghamshire County Council will progress through detailed design to try and assist in the delivery of this project.

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## **D15. ENVIRONMENTAL ENHANCEMENT**

One of the primary objectives of the Nottingham Trent Left Bank FAS is to protect and enhance the local environment wherever possible. A number of environmental enhancement opportunities have been identified for the Colwick scheme area and are listed below.

### ***Enhancements at Colwick Country Park***

Enhancements to Colwick Country Park have been discussed with Nottingham City Council. Details are provided in *Appendix C*.

### ***Trent Valley Way***

An extension of the Trent Valley Way is proposed as an enhancement. This is a very significant improvement and will provide the missing 0.5km link in this walkway, which stretches from Nottingham city centre to Gunthorpe.

The walkway will be incorporated into the defence. This will allow pedestrians and cyclists to use the immediate riverside for recreational purposes by providing a more attractive environment. As agreed with Gedling Borough Council, it will be their responsibility to obtain landowner consent and the necessary approvals to achieve formal footpath status. These agreements must be achieved in advance of the proposed works.

Figure FF3.4 in *Appendix F* shows this potential enhancement.

### ***Other Enhancements***

As well as the above enhancements planned within the scheme area, there are proposals for additional biodiversity improvements off-site within the River Trent floodplain. Enhancements are discussed in more details in *Appendix F*.

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## **D16. SUMMARY AND CONCLUSIONS**

The Nottingham Trent Left Bank FAS will raise existing defences and, where required, construct new defences to protect approximately 16,000 homes and businesses against a flood with a 1% annual probability of occurrence.

Gedling Borough Council have confirmed that the works within the Colwick scheme area constitute 'permitted development' and do not require planning permission.

A large number of external parties have been consulted about the scheme through the Fluvial Trent Strategy, the Masterplan and Constraints Plan and the Scoping Report in 2005; the Scheme Alignment Leaflet in 2006; the original ES in April 2007; and various private meetings with affected parties and the local council.

We plan to commence construction of the Colwick scheme area in 2011 and 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, including 1,344 within the Colwick scheme area, and some critical infrastructure. This will have a positive impact on people's health in the event of a flood. However, properties in surrounding villages could experience a maximum increase in flood levels of 0.07m during a flood event with a 1% annual probability of occurrence. There will also be 69 extra properties that will now have a 1% annual probability of flooding. Separate studies have been undertaken in the locations affected by increased flood risk and works have started to reduce flood risk in Barton in Fabis and Burton Joyce. These schemes will provide protection from a flood event with a 1% annual probability of occurrence including all 48 properties in Burton Joyce. This work is expected to be complete in 2009. Measures to protect individual properties in Gunthorpe, Bleasby and Gibsmere were undertaken in 2008. In addition further work is proposed in Hoveringham, Gunthorpe and Radcliffe on Trent. In Stoke Bardolph work is on-going to determine whether individual property protection measures can be used. All of this work will reduce the impact of the Nottingham Trent Left Bank FAS on the surrounding flood levels.

The majority of adverse impacts from the scheme in the Colwick scheme area will occur during the construction period and will therefore be temporary and short-term. This will include significant disturbance to the local human population during the construction period. This is a result of noise and vibration, increased traffic, road closures and reduced access to footpaths and recreational areas. This will include the full closure of River Road for a short period. The impacts will be of most significance to the 10 businesses where construction is within their boundaries and the additional 13 properties within 50m of the proposed works. Various mitigation measures will be implemented to reduce and manage these adverse impacts. These will include timing the works to avoid major events, the appointment of a public liaison officer, minimising working areas, clear signage of necessary diversions and careful programming of the works.

There are few landscape impacts in the Colwick scheme area. In the recreation ground the works will slightly raise an existing embankment and the new defences in the industrial park will not significantly change the landscape and visual amenity value.

The scheme runs adjacent to Colwick Country Park SINC but will not directly affect it. Good working practice will prevent any pollution impacts to the SINC and the River Trent.

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 D16.1 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 minor 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. In the Colwick scheme area we aim to:

- extend the Trent Valley Way through Colwick Industrial Estate;
- provide enhancements to Colwick Country Park.

Overall, 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 negative 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 D16.1 Summary of Environmental Impacts for Colwick**

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>HUMAN POPULATION</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact on local properties and businesses as a result of construction activities in close proximity	Minor/moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Liaise with residents and local businesses.</li> <li>• Access and storage areas will be agreed with landowners prior to works commencing.</li> <li>• Minimise working areas within private properties.</li> <li>• Full re-instatement of working areas within business in Reach 2.</li> </ul>	Minor adverse and short-term
	Impact on sensitive sites	Not significant	<ul style="list-style-type: none"> <li>• Protection and screening of playground.</li> </ul>	None
	Impacts on local recreational resources as a result of construction activities	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>• Formal closure and temporary diversion where possible of footpaths, with clear signage provided.</li> <li>• Liaison with Gedling Borough Council over works within recreation area.</li> <li>• Minimise working area in Reach 1 to allow the continued use of football pitches and playground.</li> <li>• Maintain access to Colwick Country Park.</li> <li>• Maintain unrestricted access for Greater Nottinghamshire Bike Ride.</li> </ul>	Minor adverse and short-term
	<b>OPERATIONAL IMPACTS</b>			
	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 on villages outside of scheme area	Moderate adverse and permanent	See <i>Section 8, Volume 1</i>		

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>FLORA AND FAUNA</b>	<b>CONSTRUCTION IMPACTS</b>			
	Construction impacts on Colwick Country Park	Minor adverse and short-term	Mitigation Method Statement to be agreed with Nottingham City Council. Likely to include: <ul style="list-style-type: none"> <li>Resowing with wildflower seed.</li> <li>Enhancement measures; refer to <i>Section 9, Volume 1</i>.</li> <li>Pollution control.</li> <li>Timing of works.</li> </ul>	None
	Loss of trees	No significant impact	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.	None
	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.	None
	<b>OPERATIONAL IMPACTS</b>			
Impact on SINC's due to: <ul style="list-style-type: none"> <li>Increased flood protection to left bank.</li> <li>Maintenance of an easement/access adjacent to the defence.</li> </ul>	No significant impact	None required.	None	
<b>NOISE AND VIBRATION</b>	<b>CONSTRUCTION IMPACTS</b>			
	Construction site noise	Moderate to major adverse and short-term	<ul style="list-style-type: none"> <li>Good construction practice.</li> <li>Liaison with residents and local businesses.</li> </ul>	Minor to moderate adverse and short-term
	Construction traffic noise	Refer to <i>Section D9</i>		
	Sheet piling noise and vibrations	Moderate to major adverse and short-term	Regular monitoring of frequencies.	Moderate to major adverse and short-term
	<b>OPERATIONAL IMPACTS</b>			
<i>No significant impacts identified</i>				

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>AIR QUALITY</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact on the local environment from dust generating activities and vehicle emissions	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>Refer to <i>Section 13, Volume 1</i>.</li> <li>Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.9.5, Volume 1</i>.</li> <li>Refer also to <i>Section D9</i>.</li> <li>Use of alternate methods e.g. use of mains power rather than generator.</li> </ul>	Minor adverse and short-term
	Impact on the local environment from construction plant and vehicle emissions	Minor adverse and short-term	As above plus: <ul style="list-style-type: none"> <li>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.</li> </ul>	None
	<b>OPERATIONAL IMPACTS</b>			
<i>No significant impact identified</i>				
<b>LANDSCAPE AND VISUAL AMENITY</b>	<b>CONSTRUCTION IMPACTS</b>			
	The introduction of new small-scale elements within the existing landscape	Moderate/major adverse	<ul style="list-style-type: none"> <li>Cladding in materials that are characteristic to the area.</li> <li>Where no cladding is proposed ensure an appropriate concrete finish.</li> <li>Planting to screen new floodwalls where appropriate.</li> </ul>	Minor/moderate adverse
	An increase in the height of existing floodwalls and associated structures such as access ramps	Minor/moderate adverse	<ul style="list-style-type: none"> <li>Ensure new sections of raised floodwalls blend into the existing structure.</li> <li>Ensure continued security of businesses.</li> </ul>	Minor/negligible adverse
	The introduction of a new landform element within the existing landscape	Minor/moderate adverse	<ul style="list-style-type: none"> <li>Tree, scrub and hedgerow planting to screen views of proposed embankment.</li> <li>Where appropriate introduce footpath to crest of embankment.</li> <li>Where possible introduce varying slope gradients and profile.</li> </ul>	Minor/moderate adverse
	An increase in the height and overall footprint of existing embankments	Minor/moderate adverse	<ul style="list-style-type: none"> <li>Ensure raised embankments blend into their landscape setting through landform design and reinstatement grass seeding. Where it does not compromise operational requirements appropriate planting may be utilised to reduce</li> </ul>	Minor/negligible adverse

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
			the visual impact.	
	Slight foreshortening of views over existing defences to be raised and/or over new defences	Minor/negligible adverse	<ul style="list-style-type: none"> <li>No mitigation realistically possible.</li> </ul>	Minor/negligible adverse
	Increased road and footpath levels that must be graded into the surrounding pavement surfaces	Minor/moderate adverse	<ul style="list-style-type: none"> <li>Grade ramps so that a smooth road surface is achieved.</li> <li>Ensure all existing access points are maintained.</li> <li>Minimise disruption to existing vehicular and pedestrian movements during the construction phase.</li> </ul>	Minor/negligible adverse
	Removal of existing trees to accommodate working areas	Minor adverse	<ul style="list-style-type: none"> <li>Advanced liaison over timing and nature of works.</li> <li>Time works to avoid important local events.</li> <li>Provide alternative access to recreation facilities.</li> <li>Provide safe access to playgrounds near working areas.</li> </ul>	Minor adverse
	Disturbance as a result of temporary construction activities	Moderate/major adverse	<ul style="list-style-type: none"> <li>Where possible locate construction compounds and storage areas away from sensitive residential receptors and adjacent to suitable vehicle access points.</li> <li>Reinstate all areas affected by the works to their former land use.</li> </ul>	Negligible
	<b>OPERATIONAL IMPACTS</b>			
<i>No significant impact identified</i>				
<b>WATER</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact on watercourses and waterbodies due to pollution from construction activities	Moderate to major adverse and short-term	<ul style="list-style-type: none"> <li>Adhere to the Environment Agency's Pollution Prevention Guidelines and Method Statements.</li> </ul>	None
	<b>OPERATIONAL IMPACTS</b>			
	Impact on villages outside scheme area	Moderate adverse and permanent	<i>Refer to Section 8, Volume 1 and Human Population above.</i>	
	Impact on local surface water drainage behind the new and raised defences	No significant impact	None required.	None
Impacts from maintenance activities	No significant impact	None required.	None	
Impact on the River Trent and its floodplain	No significant impact	None required.	None	

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>TRAFFIC AND TRANSPORT</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact on local roads due to construction traffic	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>Develop a TMP; refer to 7.10.5, Volume 1.</li> <li>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.</li> <li>Prepare risk assessments for access through existing industrial areas.</li> </ul>	Minor adverse and short-term
	Impacts due to local road raising operations and construction activities requiring road closures	Moderate adverse and short-term	<ul style="list-style-type: none"> <li>Develop a TMP and prior notification of road closure.</li> <li>Ensure alternative Country Park car-park available during closure.</li> </ul>	Minor adverse and short-term
	<b>OPERATIONAL IMPACTS</b>			
	Impact of new and raised defences on local transport infrastructure	Minor beneficial and permanent	No mitigation required.	Minor beneficial and permanent
<b>CULTURAL HERITAGE AND ARCHAEOLOGY</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact on archaeology due to construction activities	Minor adverse and permanent	<ul style="list-style-type: none"> <li>A detailed mitigation strategy agreed with archaeological officers and English Heritage.</li> <li>Adhere to CIRIA's Guidelines 'Environmental Good Practice on Site' (2005); refer to Section 7.11.5, Volume 1.</li> <li></li> </ul>	None
	<b>OPERATIONAL IMPACTS</b>			
	No significant impacts were identified.			

Receptor	Impact Description	Significance of Impact before Mitigation	Mitigation Measures	Residual Impact
<b>SOIL, GEOLOGY AND HYDROGEOLOGY</b>	<b>CONSTRUCTION IMPACTS</b>			
	Compaction of soil structure due to construction activities	Minor adverse and medium-term	<ul style="list-style-type: none"> <li>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.</li> <li>Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.12.5, Volume 1</i>.</li> </ul>	None
	Contamination of soil and groundwater due to construction	Minor adverse and short-term	<ul style="list-style-type: none"> <li>Follow Environment Agency's 'Policy and Practice for the Protection of Groundwater.'</li> <li>Adhere to the CIRIA's Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.9.5, Volume 1</i>.</li> </ul>	None
	Disturbance of contaminated land	Not significant	<ul style="list-style-type: none"> <li>Adhere to the CIRIA Guidelines 'Environmental Good Practice on Site' (2005); refer to <i>Section 7.12.5, Volume 1</i>.</li> </ul>	None
	Bank-loading	Minor adverse and short-term	<ul style="list-style-type: none"> <li>Minimise storage and tracking on banks.</li> </ul>	None
	<b>OPERATIONAL IMPACTS</b>			
<i>No significant impacts were identified</i>				
<b>LAND USE</b>	<b>CONSTRUCTION IMPACTS</b>			
	Impact of loss of available land	Minor to moderate adverse and short-term to permanent	<ul style="list-style-type: none"> <li>Liaison with affected landowners/users.</li> <li>Full re-instatement of land.</li> </ul>	Minor adverse and short-term
	<b>OPERATIONAL IMPACTS</b>			
Impacts of decrease in available floodplain	Minor adverse and permanent	See <i>Section 8, Volume 1</i> .	Minor adverse and permanent	

**ANNEX D1**  
**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
  -  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**

-  ARABLE

**GRASSLAND AND MARSH**

-  UNIMPROVED ACID GRASSLAND
-  SEMI-IMPROVED ACID GRASSLAND
-  UNIMPROVED NEUTRAL GRASSLAND
-  SEMI-IMPROVED NEUTRAL GRASSLAND
-  IMPROVED GRASSLAND
-  MARSHY GRASSLAND
-  SPECIES POOR SEMI-IMPROVED GRASSLAND

**ENGINEERING LEGEND**

-  WALL
-  LINE OF HIGH GROUND
-  SHEET PILING
-  TEMPORARY EASEMENT / WORKING AREA
-  EMBANKMENT
-  ACCESS ROUTE
-  DRAINAGE
-  CROSS SECTION

**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.

**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

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	Name	Date
PE	UPDATED ENVIRONMENTAL STATEMENT	SEP.06
PD	UPDATED ENVIRONMENTAL STATEMENT	MAR.07
Rev.	Nature of revision	MAR.07

NOTTINGHAM TRENT LEFT BANK FAS

ENVIRONMENTAL STATEMENT

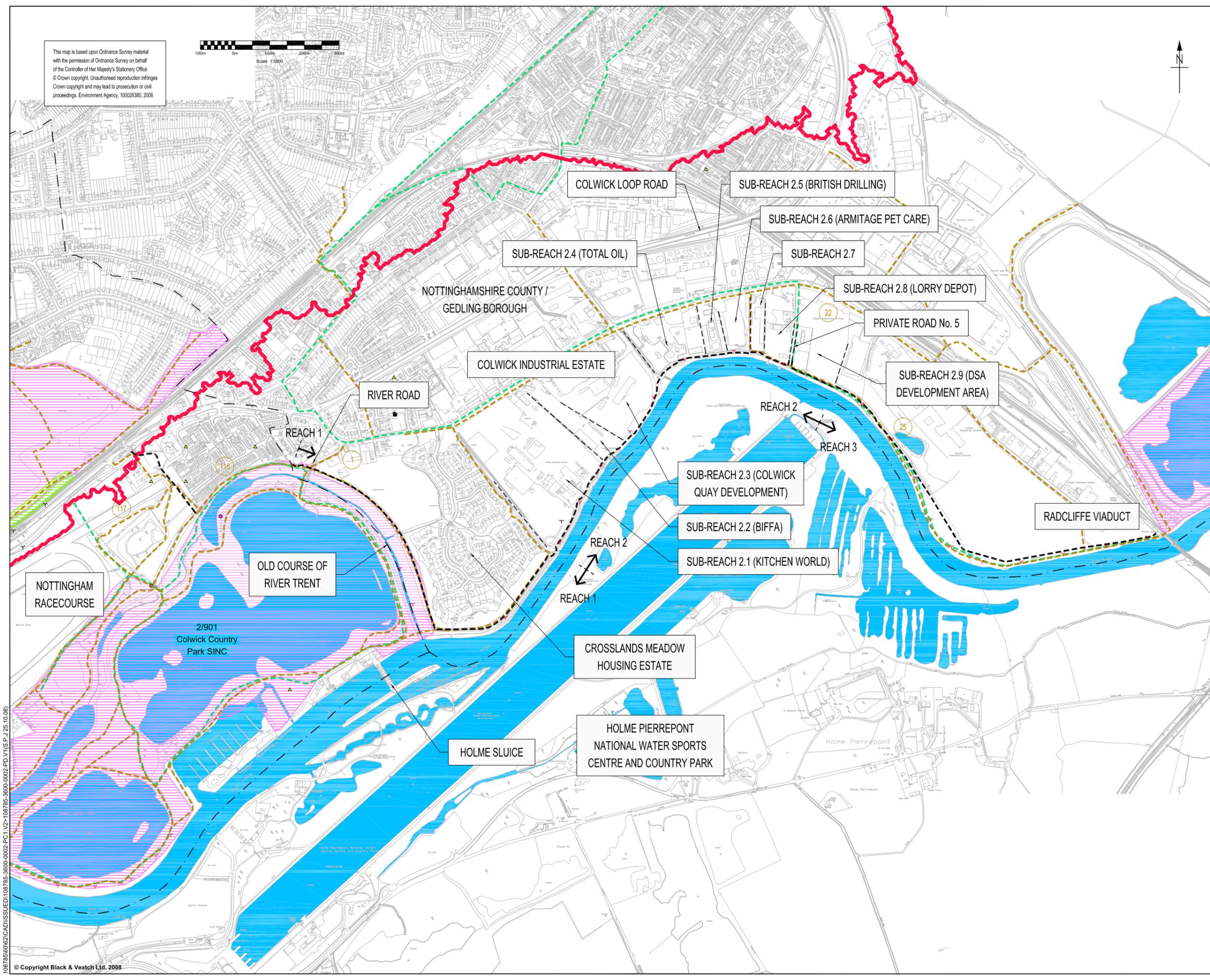


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108785-3000-0001-PE

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Drawing No. 108785-3600-0002	Cad Ref	Rev. PD
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Note: The limits, including the height and depth 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

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

Designed by:	CWa	Date:	JAN.07
Drawn by:	SPJ	Date:	JAN.07
Checked by:	EAS	Date:	MAR.07
Reviewed by:	Psm	Date:	MAR.07



Client drawing No.	Revision
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Project  
**NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME**

Drawing title  
**FIGURE DD1.1 COLWICK OVERVIEW**

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

Drawing No.	108785 - 3600 - 0002	Revision	PD
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108785/60/62/CAD/ISSUED/108785-3600-0002-PC1.V2-108785-3600-0002-PD.V1(S.P.J.25.10.08)

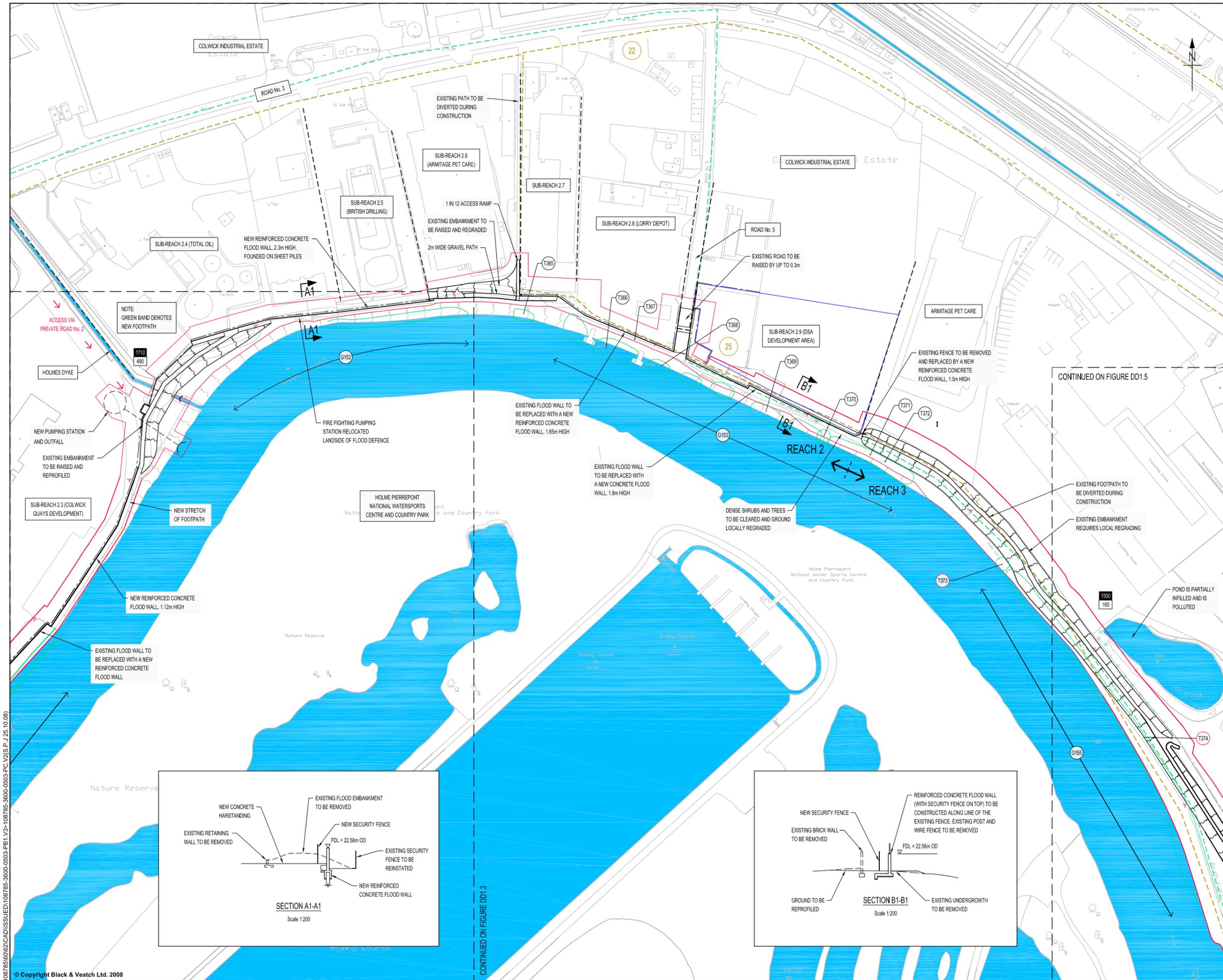
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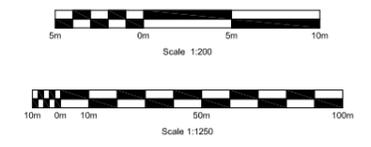


Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

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

CONTINUED ON FIGURE DD1.5



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



Client drawing No. Revision



Project: NOTTINGHAM TRENT LEFT BANK FLOOD ALLEVIATION SCHEME

Drawing title: FIGURE DD1.4 COLWICK GENERAL ARRANGEMENT - SHEET 3 OF 4

Approved by: EAST	Date: OCT.08
Drawing scale: 1:200 1:1250	Sheet size: A1
Drawing No. 108785 - 3600 - 0503	Revision: PC

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