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## Part 7: Habitats, Flora & Fauna

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## 7 Environment: Habitats, Flora & Fauna

### 7.1 Introduction

- 7.1.1 A primary goal of the restoration of the Chesterfield Canal is “to protect, maintain, and where possible, enhance, a high quality natural and built environment” (CCP 2020 Vision, 2006). To that end particular care is being taken to ensure the conservation of historic structures, existing habitats, legally protected species and ecological diversity.
- 7.1.2 Nine miles of canal between Staveley in Derbyshire and Kiveton Park in South Yorkshire await restoration. This report deals with the eastern part of the restoration corridor which extends from Killamarsh to Kiveton Park and is approximately 6.4 km or c. 4 miles long. It commences on the west side of Killamarsh and terminates at the eastern portal of the former Norwood Tunnel at Kiveton Park. It entails both restoration of parts of the original route and the construction of new lengths of waterway.
- 7.1.3 This chapter is a summary of prior records and recent ecological studies undertaken to appraise the nature conservation interest of the proposed line of the canal and surrounding areas which may, directly or indirectly, be affected by the canals reinstatement.
- 7.1.4 Where applicable, the information considered here includes reference to the relevant statutory designations and those international designations and conventions which also apply. It also includes reference to the relevant national policies together with local and regional plans and policies.
- 7.1.5 Where there are gaps in the published, reported or survey data (or where surveys are on-going) these are noted in the text. These gaps will be rectified prior to submission of the planning application.
- 7.2.6 **It must be stressed that this chapter is not intended to be a definitive statement on the ecology of the canal corridor.** It is rather an initial assessment designed to identify those areas along the canal track which are of potential ecological importance and to identify those areas where additional research needs to be carried out. Further, it highlights the key constraints and opportunities associated with the proposed works and suggests the strategy which will be employed to avoid, mitigate or compensate for disturbance. Further detail on the practical implementation of this strategy is to be found in the Design Statements.

### 7.2 Methods and Sources

- 7.2.1 Between Killamarsh and Kiveton Park, several existing studies were available which permitted a preliminary desk based overview to be produced. This was then followed by a repeated series of walk over surveys over an extended period to verify the reports and published sources and, if possible, to ascertain if changes had taken place since the date of last full survey. As a result of this process a series of additional reports were produced or commissioned.

7.2.2 Surveys undertaken for this project include:

- Vegetation and habitat (Phase 1) (including trees and hedgerows)
- Bats
- Badgers
- Herptiles
- Water Voles
- Birds

Where these have reported they are incorporated in this summary and included in Volume Two.

7.2.3 Survey work was generally confined to the immediate **Canal Track**. Survey of sites outside the immediate Canal Track but within the **Canal Corridor** is more limited and is confined to sites which help to place the Canal Track in context. In the Surveys below where a reported site lies with the Canal Track (i.e. will be directly affected by the canal works) it is noted as **Within Track**, conversely any reported feature which is outside the works envelope (including all allowances for works stand off) is marked **Outside Track**.

7.2.4 The terms Canal Track, Canal Corridor and Canal Landscape are defined in Chapter One, section 1.9.

7.2.5 The resultant summary of prior work and survey is in two parts; In the first part the Habitats noted along the canal track and in the immediate vicinity of the canal track are described (a) in general terms and then (b) section by section. In the second part consideration is given to evidence for the presence of protected species within the corridor.

7.2.6 The chapter concludes with an initial appraisal of the project's potential impact. Specific actions to protect, mitigate or compensate for change or to enhance the environment are identified and discussed in the project proposals (Chapter 9 onward).

### **Desk Based Survey**

7.2.7 A wide range of information has been employed in this report. Prior records and existing data was gathered from a number of sources and a range of organisations, including statutory and non-statutory nature conservation agencies. This included;

- British Geological Survey
- Derbyshire Biological Records Centre
- Derbyshire County Council
- Derbyshire Ornithological Society
- Derbyshire Wildlife Trust
- North East Derbyshire Badger Group
- Rotherham Metropolitan Borough Council
- Sorby Natural History Society
- Soil Survey & Land Research Centre (Soil Survey of England and Wales)

- 7.2.8 Information was sought for existing records on or near to the proposed site, this included;
- Geological and Soil Survey Information
  - Protected Sites (e.g. SSSI, LNR, local Wildlife Sites, RIGS)
  - Protected and Scarce Species
  - Bird Data
  - Any existing Phase 1 Survey Information
  - Any prior Phase 2 Habitat or Species Surveys for the site.
- 7.2.9 In addition the MAGIC ([www.magic.gov.uk](http://www.magic.gov.uk)) and the Environment Agency's "What's in your Backyard?" ([www.environment-agency.gov.uk/homeandleisure/default.aspx](http://www.environment-agency.gov.uk/homeandleisure/default.aspx)) websites were consulted for records relating to landscape character, designated sites, selected habitat inventories, pollution and ground contamination.
- 7.2.10 Prior assessments and reports were consulted (see bibliography), and a search made for unpublished reports in the "grey literature".
- 7.2.11 A key report is the Chesterfield Canal Ecological Scoping Report carried out by Halcrow Group Limited between 2002 and 2003 with the final report being produced in March 2004. This study undertook desk and field based assessments of both the Chesterfield Canal and the proposed Rother Valley Link. The study gathered data from many sources and produced a Geographic Information System (which has been regularly updated since) for the entire canal environment; this database provides a summary of the canal environment as known at the end of 2003. The Halcrow report identified a number of potential environmental impacts and made several key recommendations which, where relevant to this specific length of the canal are acted upon here.

### **Vegetation and Habitat Survey (extended phase 1 survey)**

- 7.2.12 The site was initially surveyed by repeated walk over surveys during the summer of 2005. This was repeated and extended target notes produced during the summers of 2007, 2008 and 2009. The extended period over which repeat visits have been undertaken allows some assessment of the trajectory of change in habitats.
- 7.2.13 Survey followed established standard Phase 1 Habitat Survey Methodology (JNCC 1990). The vegetation types and habitats present in the Canal Track and in the immediately adjacent Canal Corridor were recorded, together with an indication of their relative abundance. This should be seen as indicative of the overall character and should not be taken as a complete record of all plants occurring across the site.
- 7.2.14 Habitat types were then plotted onto a series of 1:10,500 OS base maps which cover the entire route. The map extracts and accompanying target notes covering the sections between Killamarsh and Kiveton Park are given in the appendices.
- 7.2.15 The relative abundance of plant species was recorded using the subjective method of DAFOR abundance rating;

D	Dominant
A	Abundant

F	Frequent
O	Occasional
R	Rare

- 7.2.16 The modifier L for Locally was used where a particular plant was very unevenly distributed through a habitat and where a species might be Locally Dominant or Locally Abundant in particular locations.
- 7.2.17 During the vegetation survey the Canal Track Hedgerows (where present) were surveyed and assessed following the criteria laid down in the DoE information booklet *Hedgerow Regulations – Your Questions Answered* (WACDO10 – DoE, May 1997).
- 7.2.18 Records were also made of semi-mature and mature standing trees. The assessment included searching for features of interest to nesting birds and roosting bats.

### **Key and Protected Species**

- 7.2.19 Evidence for key and protected species was sought through both desk study and field survey. It is acknowledged that additional surveys will be required for all the key and protected species noted below at the time of the planning application to assess change and to acquire greater detail.

#### Badgers

- 7.2.20 A preliminary survey of evidence for Badger activity was undertaken in September 2007 using the methods given in *Surveying Badgers* (Harris, Cresswell & Jefferies 1989). Survey set out to locate and record badger setts and any evidence of badger activity including dung pits, scrapes, feeding signs, fur snags and pathways. These initial notes were then updated during regular walk-overs in 2008 and 2009.
- 7.2.21 Badgers and their setts are protected under the Protection of Badgers Act 1992. This act consolidates all previous legislation and makes it illegal to deliberately kill, injure or take badger; dig, ring or mark a badger, disturb one while in its sett or damage, destroy or obstruct its sett. The current legislation does not directly protect foraging areas used by badgers.
- 7.2.22 The Protection of Badgers Act 1992 defines a sett as “any structure or place which displays signs of current use by a badger”. English Nature (1995) describes them as “usually underground tunnel systems providing shelter for badgers, but may include other structures used by badgers such as hay bales, drainage culverts, or cellars”. Current use is commonly defined as a sett which has been in active use within the previous 12 months.
- 7.2.23 Any operation likely to affect badgers by direct disturbance to them or their setts is required under the Protection of Badgers Act 1992 to be licensed by the statutory licensing authority, English Nature.

#### Water Voles

- 7.2.24 The habitat of the water vole is afforded protection under the Wildlife and Countryside Act 1981(as amended by the Countryside Rights of Way Act 2000 in

England and Wales) and the Conservation (Natural Habitats &c) Regulations 1994. This legislation makes it an offence to intentionally or recklessly damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection while they are using such a place.

- 7.2.25 An initial site walkover identified a number of potential locations for water vole activity, chiefly small ponds and ditches, which were recorded. These were then surveyed using the methods given in the *Water Vole Conservation Handbook* (Strachen 1998). This involved examination of the banks and ditches for burrow entrances (and surrounding “lawns”), latrines, feeding stations, runs, pathways and footprints. Survey has taken place over an extended period with periodic visits from 2005 to September 2009.

#### Otters

- 7.2.26 Although suitable habitats for otters are becoming available within the wider River Rother catchment there is at present no evidence for their return to this area. Preliminary examination suggested that no habitat suitable for otter currently exists in the survey area.

#### Bats

- 7.2.27 All bat species and their roosts (including transient roosts) are protected under Schedules 5 & 6 of the Wildlife and Countryside Act 1981 (as amended by the Countryside Rights of Way (CroW) Act 2000 in England and Wales) and the Conservation (Natural Habitats &c) Regulations 1994. These make it an offence to intentionally or recklessly damage or destroy any bat roost; intentionally or recklessly obstruct access to a bat roost; deliberately, intentionally or recklessly disturb a bat; or deliberately kill, injure or capture any bat.
- 7.2.28 During the vegetation survey and other visits note was made of any trees, structure or feature which might be of interest to roosting bats (such as lifting bark, cracks, crevices and holes). This was supplemented by walkover surveys of the site following the Cuckoo Way along the former towpath (commencing alternately at Killamarsh and Kiveton Park) which were conducted at dusk during May, June and July 2008 to estimate the use of the site by foraging and commuting bats.
- 7.2.29 Emergence surveys of selected structures / trees likely to be affected by the proposed works have been undertaken and will be expanded as a next step.

#### Birds

- 7.2.30 Note of species observed during the vegetation survey was used to augment the observations of the Countryside Rangers for this area (Three Valleys Project, pers comm.) together with records from the Derbyshire Ornithological Society Database (observations from 1996 to 2004) and the relevant biological records centres. Coverage is at present biased towards the Derbyshire end of the route and further information on bird populations is being sought from Rotherham.

#### Herptiles

- 7.2.31 Herptile survey was conducted in two stages; a preliminary desk study and walk over survey, followed by repeated visits to identified target sites.

- 7.2.32 It is proposed to undertake detailed survey of these sites in the immediate future. This will include three survey visits employing night time torch survey and bottle trapping together with day time netting for adults and larvae and egg searches of vegetation (2 visits per site).
- 7.2.33 Particular attention was paid to the potential for Great Crested Newt which is also afforded protection under the Wildlife and Countryside Act 1981(as amended by the Countryside Rights of Way Act 2000 in England and Wales) and the Conservation (Natural Habitats &c) Regulations 1994.

### **Invasive Species**

- 7.2.34 The presence of any invasive plant or animal species listed on Schedule 9 of the wildlife and Countryside Act 1981 (as amended) was also recorded. Particular attention was paid to evidence of:
- Japanese Knotweed
  - Indian Balsam
  - Giant Hogweed
  - Mink
- 7.2.35 Other invasive and non-native species were also noted, especially where locally dominant. Treatment of non-native species will follow current best practice.

## Results

### 7.3 Site Description

- 7.3.1 The proposed Killamarsh to Kiveton Park restoration project site is approximately 4.8 km or 3 miles long. It commences on the west side of Killamarsh and terminates at the eastern portal of the former Norwood Tunnel at Kiveton Park.
- 7.3.2 The site (the Canal Track) is a narrow corridor between 10 and 30 metres wide – the width varying depending upon the track's position in the landscape. It commences on the west side of Killamarsh village, running along the contours along the eastern flank of the Rother Valley before climbing over the Coal Measure escarpment and descending the dip slope towards the Magnesian Limestone and the limit of our study area at Kiveton Park.

### 7.4 Topography, Geology, Geomorphology, Soils & Hydrology

- 7.4.1 The topography, geology, geomorphology and soils of the reinstatement corridor are described in detail in Chapter Five, above. The Hydrology and Climate of the site are described in Chapter Six, above.
- 7.4.2 In summary; the Coal Measures escarpment is the dominant landscape feature and gives rise to the north-south orientation of the Rother Valley and to the asymmetrical valley cross section with a gently sloping western side and a steeper and more sharply defined eastern side.
- 7.4.3 Much of the original Canal Channel through this section was infilled with inert waste (building debris) during the 1960's and 70's and qualifies as Brownfield Land. Where the channel is still open some sections remain in water (as at Norwood) but the majority of the original route is now dry. The route requires the construction new lengths of canal (as outlined in Chapter Two) and this will have a significant impact on the area.
- 7.4.4 The current condition of the route is described below.

### 7.5 The Habitats of the Canal Corridor & Canal Track

- 7.5.1 The Canal Corridor and Canal Track are show in foldout Maps A1 to A4 in Appendix A. The habitats recorded with the canal track and in the surrounding corridor are described in sections 7.6 to 7.10 (below) in the order they occur from Killamarsh to Kiveton Park. The habitats encountered here continue the range of habitats already noted in the Western Division from Staveley to Killamarsh.
- 7.5.2 In common with the Western Division the structure of the remaining canal track has strongly influenced the habitats which are present. The chief features are the remains of the off bank, the canal channel (and whether it is infilled or is open and dry or open and in water), the towpath bank, the towpath and the remains of the towpath boundary hedge and bank. This physical structure gives a strongly linear appearance to the vegetation communities within the Canal Track.

7.5.3 In broad terms the habitats on, and immediately adjacent to, the Chesterfield Canal route (both Western and Eastern Divisions) can be divided into the following main descriptive groups (based on Gillespies 1995, Frith 2000a, 2000b, 2005, 2006, Halcrow 2004, Coles 2005, 2006, 2007, ECUS 2006):- (note that common English names are used in these descriptions – a concordance of formal Latin names together with a brief description of the usual habitat preferences of individual species is given in Appendix A)

### **Grassland**

7.5.4 Recreational or Amenity Grassland Intensively managed mown grassland in parks and public gardens in urban areas. The grassland is dominated by a limited number of hardy trampling resistant species with a very limited number of herbs – a key characteristic is a lack of diversity. The habitat may include isolated or small groups / avenues of specimen trees. Introduced, non-native, species are common.

7.5.5 Short grassland A short fine grass community where red fescue, sweet vernal-grass, yellow oat-grass and wavy hair grass are common. Forbs are common and often exceed the cover of grasses. Legumes are a large component including common birds-foot-trefoil, black medick, white clover and hop trefoil. The Compositae are also prominent with species such as mouse eared hawkweed, cat's-ear and rough hawkbit.

7.5.6 Tall grassland A dense tall grass community dominated by tussock grasses – False oat-grass is usually the most abundant and can dominate large areas -- cock's foot, red fescue, rough meadow grass and Yorkshire-fog making up the rest of the grassy component. The herb component is not diverse although individual elements can be locally abundant. Hogweed, common knapweed, tansy, oxeye daisy and hawkweeds are common where vegetation is dense. Where it is thinner common toadflax, bladder campion, yarrow and legumes such as meadow vetchling, white clover, common birds-foot-trefoil and tufted vetch, form a lower layer amongst the grass. In some cases the tall grassland has a component of dense tall herbs including rosebay willowherb, common nettle and cleavers. The community is often recorded as transitional to Mosaic Scrub

### **Scrub**

7.5.7 Mosaic Scrub A widespread habitat which is actively expanding. Most grassland areas have components of scrub usually restricted to saplings of hawthorn, broom or birch; where these have developed into distinct "islands" separated by tall and short grass communities, possibly with some areas of bramble or bracken scrub, it is described as a mosaic scrub.

7.5.8 Mixed Species Scrub In areas the mosaic scrub has developed until it forms substantial stands of mixed species scrub. In most places this still retains grassland layer beneath it. As natural succession continues specimens of oak and ash reach sufficient height to shade out the ground flora. In consequence the field layer is an impoverished version of the grassland which was colonised. The margins of the mixed species scrub are obviously more open and consequently often very diverse with, for example, bush vetch, meadow vetchling, common sorrel and bladder campion being common.

- 7.5.9 Bramble Scrub Bramble occurs throughout the area as a component of both scrub and woodland – in such settings it is fairly sparse. Where it colonises open ground it forms dense tangles with little vegetation apart from a few saplings of hawthorn or birch growing up through it. On occasions bracken may replace bramble in small areas, in some cases becoming locally dominant.

### **Hedgerow**

- 7.5.10 Hedgerow and Hedgerow Scrub Two hedgerow types are observed in the Killamarsh to Kiveton Park Section: Hedgerows which delimit the margins of the original canal track and hedgerows which delimit field margins.
- 7.5.11 The “canal hedgerows” originate with the construction of the canal in the 1770’s. The hedge originally consisted of laid hawthorn with standard trees of oak and sycamore. Poorly maintained since the closure of the canal to Navigation in 1907, it now forms a straggling boundary of decayed and grown out hawthorn and infrequent standard trees on the towpath bank. It has been invaded at many points by Birch, Ash and Elder but still retains a distinct character. This canal boundary hedge is less commonly found on the off-bank side of the canal line as many landowners demanded access to the water for livestock.
- 7.5.12 The “field hedgerows” have a more diverse origin and are more variable in composition. Many appear to originate in the enclosure of the landscape around the canal which took place between 1760 and 1810 and have a similar make-up to that of the canal hedgerows. There are, however, a number of hedgerows and field boundary habitats – most notably those associated with ancient woodland, historic houses and graveyards – which have a greater diversity of species and these almost certainly predate enclosure and may be characterised as “ancient hedgerows”.
- 7.5.13 The guideline criteria used for the Rotherham Local Wildlife Site System Selection (April 2007) were as follows:
- H1:** A hedgerow that is at least 50 metres in length, originates from the pre-Enclosure Acts period and supports:
- (a) 10 or more species of native trees and/or shrubs, or
  - (b) If it supports 8 or more native tree and shrub species, then it must have a score of 5 or more for non-woody species listed in Table 10, or
  - (c) Supports 5 or more veteran trees.
  - (d) Ghost hedgerows associated with former ancient woodlands
- H2:** A hedgerow that is at least 50 m in length with a minimum of five native woody species and which would qualify as an important hedgerow under the most recent Hedgerow Regulations.
- 7.5.14 Only those hedgerows immediately adjacent to the proposed canal track or likely to be affected in some way by the restoration works were examined in this preliminary study.

## Woodland

- 7.5.15 Scrub Woodland Immature semi-natural secondary woodland with a low species diversity generally with a crowded young canopy of willow, birch, sycamore, ash and pendunculate oak which seldom exceeds 10 metres. The ground layer is shaded, restricted and lacks the plants commonly associated with ancient woodlands. Thus false oat-grass, cock's-foot and Yorkshire-fog are joined by common nettle, hogweed, cow parsley, cleavers, red-campion, wild angelica, rosebay willowherb and bush vetch.
- 7.5.16 Woodland All the woodland in the area which is not plantation can be described as semi-natural secondary woodland (for example on the sections of the canal line abandoned in the 1890's). Woodland tends to have significant proportions of pendunculate oak and the ground layer is grassy, dominated by wavy hair-grass and creeping soft-grass and has more acid loving species such as foxglove, creeping cinquefoil and bracken. Some areas of woodland are relict ancient woodlands.
- 7.5.17 Ancient Woodland
- 7.5.18 Estate Woodland Areas of managed woodland present on the margins of the canal and elsewhere in the canal corridor. These are generally deciduous and dominated by beech and sycamore, although some small areas of fir, pine and larch plantation can be found in the area. Some areas of deciduous estate woodland are secondary growth on areas of ancient woodland and have relict ground floras.
- 7.5.19 Wet Woodland Semi-natural secondary woodland in receiving locations on lower slopes, the valley floor or developed on river, pond or lake margins dominated largely by alder and crack willow (carrs and fens).

## Wetland

- 7.5.20 Seasonal Wetland: Wet Ground /Seasonal pools, permanently damp areas in base of former canal channel, below valley side springs, etc. These communities are very varied and are described individually by Target Note.
- 7.5.21 Permanent Shallow Water (marsh/flash): Marsh communities fed by permanently high water tables, vegetation elements include reedswamp and mosses.
- 7.5.22 Permanent Deep Water (pond/lake): Permanent standing water usually with a depth greater than 0.5 m. Fringing vegetation is well developed and often demonstrates a hydrosereal transition from open water to floating macrophytes to shallow water reedswamp to dry land. Where the margins are hard engineered the fringing vegetation may be absent.
- 7.5.23 River: River channels and margins. All the rivers and streams in the study area have suffered extreme pollution for much of the 20th Century, and are now highly modified and managed. Consequently most rivers and their margins are species poor although signs of recovery are being noted in water quality and biodiversity. Increased diversity and abundance of aquatic plants and invertebrates is encouraging the return of fish stocks which are now also beginning to recover.

## Agricultural Land

- 7.5.24 Agriculture is the dominant adjacent land use along much of the canal corridor. The majority of farms are mixed, but increasing pressure for horse pasture is encouraging farm diversification, change of use and fragmentation. Once centralised estate farms are now greatly subdivided and fields are often cropped by farms some distance away. This leads to a very confused picture of land ownership and tenure. In terms of habitat in the corridor survey we have crudely differentiated between:
- 7.5.25 Arable Ploughlands; areas with a regular ploughing regime and regular cropping. May be rotated to fallow pasture on a regular basis.
- 7.5.26 Pasture Agricultural grassland -- pasture and semi-improved pasture. May be ploughed but only infrequently.

## Urban Land

- 7.5.27 Urban area – undifferentiated. These are habitats subject to very strong anthropogenic control through buildings, structures, hard landscaping, surfacing and park management & gardening. The canal corridor has a dense urban appearance in Killamarsh; with slightly less dense urban development currently taking place a short distance from the canal track at Wales and Kiveton Park

**Habitat Summaries:** Descriptions of the different habitats encountered along the proposed canal route from Killamarsh to Kiveton Park.

Note that in each case the descriptions of the locations of the adjacent habitats are written as though facing Kiveton Park – the right bank / side of the canal is on the south or south east side of the canal, the left bank / side of the canal is on the north or north-west side of the canal.

The habitats for the entire division are summarised in a table at the end of this section. These notes are based on surveys conducted in the last two years.

## 7.6 Habitat Summary: Section Six – Killamarsh Town

### Old Farm Lock (Lock No.6a) to Nethermoor Lake, Killamarsh

- 7.6.1 This section is the central section of the passage of Killamarsh. The route investigated here is that selected by Chesterfield Canal Partnership Killamarsh Route Sub-Group based on the recommendations of the Jacobs Babbie Report (2004). This study examined all factors which affected the route and paid particular attention to the impact of the proposed routes on the local environment.
- 7.6.2 The section commences at the point where the original route will begin to require significant modification to achieve a route through the village. It then follows the

original line – with modification – through the western part of Killamarsh to the point where the line becomes heavily built over. It then diverts from the original line near to the Sports Centre and then runs downhill to pass under Sheffield Road before entering Nethermoor Lake.

### **Section 6 / Length 1: Old Farm Lock (Lock No.6a) to Walford Road**

SK 4509 8084 to SK 4517 8086

Length 80 m.

- 7.6.3 At the point where the proposed Old Farm Lock is to be constructed the canal channel is open and remains open until within 15m of Walford Road. The channel is substantially intact and until recently has held water (as witnessed by older edition OS maps). It does not have a water supply and following construction of the surrounding housing (presumably preventing or impeding overland flow) it now largely dries during the summer months. Large pools form after heavy rain but rapidly dry leaving only damp ground and some small puddles. Today the channel has some reedswamp in the remaining wet areas but these are increasingly being encroached by rank tall herb communities dominated by common nettle. Both the off and towpath banks are encroached upon by bramble and hawthorn scrub with some ash, birch and broom, while the towpath margins carry a fragmented short herb community.
- 7.6.4 On both banks of the canal are housing estates with two small areas of recreational managed grassland at SK 4445 8085 and SK 4540 8080. The embankment of the railway crossing the canal track at Bridge No.25A hosts a mosaic of well developed birch woodland and tall herb grassland and has considerable potential wildlife value (Jacobs Babbie 2004, p.67). The railway embankment will not be affected by the canal works.
- 7.6.5 There are no wildlife sites or records on this length.

### **Section 6 / Length 2 : Walford Road to rear of Peacock Close**

SK 4516 8086 to SK 4542 8081

Length 359 m.

- 7.6.6 The canal track continues through the urban area. Beyond Walford Road the canal is again completely infilled and landscaped. The surface is now managed recreational grassland. Some hint of the canal can be found in the line of mature trees which mark the northern down-slope or towpath side of the canal. Similar mature trees surround the site of the demolished Nether House north of the canal track and both could potentially provide bat roosts (Jacobs Babbie 2004, p.67). Both sets of trees are protected by a Tree Preservation Order (TPO number 163 Area, group woodland 1: Group of trees on land adjacent to Killamarsh footpath no. 17, canal towpath, Killamarsh). Upslope, to the south, are groups of housing interspersed with amenity grassland.
- 7.6.7 There are no wildlife sites or records on this length.

### **Section 6 / Length 3: Rear of Peacock Close to Bridge Street (Site of Mallinders Bridge No.27)**

SK 4542 8081 to SK 4565 8089 Length 180 m.

- 7.6.8 At the edge of the park land between Chandos Crescent and Peacock Close the canal track reappears and becomes a clearly delimited strip running between tall garden fences and introduced conifer hedges. The canal channel although partly silted and littered is clearly visible. The channel is damp with seasonal puddles but does not hold permanent water. Both up and down slope is dense housing. The channel carries rank tall herb communities with stands of common nettle. Garden refuse and consequent escapees are common on this length. Areas at the west end carry dense bramble and some hawthorn.
- 7.6.9 There are no wildlife sites or records on this length.

#### **Section 5 / Length 4: Bridge Street to Kirkcroft Drive**

SK 4565 8089 to SK 4587 8105 Length 245 m.

- 7.6.10 From Bridge Street to the head of Kirkcroft Drive the canal track is hemmed in on both sides by roads, buildings and gardens. The canal channel is infilled and carries a tarmac surfaced footpath. The path margins are mown grass and hawthorn.
- 7.6.11 At Kirkcroft Drive the original route is lost beneath a housing estate and the proposed diversionary route heads northwards down the hill with the playing fields and leisure centre to the west and the rear gardens of Nethermoor Drive to the east of the proposed line.
- 7.6.12 There are no wildlife sites or records on this length.

#### **Section 5 / Length 5: Kirkcroft Drive to Sheffield Road**

SK 4587 8105 to SK 4579 8119 Length 185 m.

- 7.6.13 This length runs roughly north-south and is the site of the proposed Killamarsh Lock Flight. The area of the flight and all land to the west is intensively managed recreational grassland attached to the adjacent Killamarsh Sports and Leisure Centre. To the east of the flight is a tarmac surfaced footpath and fence line forming the rear of the gardens of the house on Nethermoor Lane. Parts of this fence line are composed of the grown-out remains of a Hawthorn hedge – the line of which dates back to the first detailed OS map series in the 1850's. Regrettably the diversity of the hedge line is low and the ground flora is dominated by garden escapees.
- 7.6.14 There are no wildlife sites or records on this length.

#### **Section 6 / Length 6 & Length 7: Sheffield Road to Nethermoor Lake**

Length 6: SK 4579 8119 to SK 4576 3828 Length 88 m.  
Length 7: SK 4576 3828 to SK 4590 8161 Length 90 m.

- 7.6.15 The proposed route will pass under Sheffield Road in a box culvert (length 6). The channel will re-emerge following the line of a drainage ditch and footpath in a confined area between two groups of houses (length 7). The proposed line will then traverse a narrow marshy area dominated by willow and alder before crossing a drainage ditch (which extends long the rear of the flood barrier in both directions) and pass through the barrier bank via a flood lock to enter Nethermoor Lake.
- 7.6.16 There are no wildlife sites or records on this length. Attention is drawn to the potential for water vole in the drainage ditch and marshy areas – additional survey is required.

### **Section 6 / Length 8: Nethermoor Lake and Rother Valley Country Park**

SK 4559 8150 (centred on)

- 7.6.17 This section of the canal ends at Nethermoor Lake in Rother Valley Country Park. Nethermoor Lake is a creation of the open cast mining which took place on the floor the Rother Valley in the 1980's. Prior to coal extraction the valley floor was a series seasonally flooded meadowlands. Nethermoor Lake is part of the River Rother Flood Defence system and sits within a floodbank. The area around the lake can be deliberately flooded to temporarily store flood water and then the water released in a controlled manner.
- 7.6.18 The landscape of the valley floor is therefore almost entirely man-made with only small islands of the original land surface surviving around the farm and mill which are now used as a visitor centre.
- 7.6.19 The lake itself has steep sides with little in the way of aquatic or emergent vegetation. The land to the west of Nethermoor Lake is managed recreational grassland (football pitches), similar short grass communities (largely mown) are found to the south and the north west on the surrounding floodbanks. To the north east on former spoil mounds a birch and ash dominated woodland scrub is well established.
- 7.6.20 To the north and west of the Lake the course of the River Rother is now heavily canalised through the park for reasons of flood control. The river lying in a deep artificial channel with deep near vertical sides reinforced with steel piling and concrete linings.
- 7.6.21 To the north east of Nethermoor Lake is Meadowgate Lake Local Nature Reserve. This is managed as a waterfowl breeding site and has restricted public access.

## **7.7 Habitat Summary: Section Seven – Killamarsh East**

### **Nethermoor Lake to Norwood Bridge, Killamarsh**

- 7.7.1 This section climbs from Nethermoor Lake to the original canal line near the site of Ellison's Cottages. It then follows the original line of the canal to Norwood Bridge.

### **Section 7 / Length 1: Nethermoor Lake to Barbers Bridge**

SK 4579 8164 to SK 4586 8168 Length 80 m.

- 7.7.2 The proposed canal track passes through a short section of damp open tall-grass between the edge of Nethermoor Lake and Barber's Lane. Around 30m to the south on the floodbank main flood is an area of hazel scrub on the floodbank interspersed with tall grass grass-land.
- 7.7.3 There are no wildlife sites or records on this length. But see the comments for Meadowgate Lake in the entry for Section 6/Length 8.

### **Section 7 / Length 2: Barber's Lane to Original Canal line**

SK 4586 8169 to SK 4598 8179 Length 162 m.

- 7.7.4 The site for the Moorhouse Locks is a west facing sloping field bounded by Hawthorn hedges. The field is rough pasture with damp areas or flushes occurring towards the bottom of the slope. The field appears to have been intensively grazed in the past but it does not now appear to be grazed. In consequence the field appears in transition to a tall herb/grass community with frequent Rough Meadow-grass, False Oat-grass, and Cow Parsley. Thistles with sedges and moss occur, and are locally dominant, in the wetter areas. There are young saplings of birch and hawthorn at several points, notably towards the top of the field.
- 7.7.5 The hedgerows are dominated by Hawthorn with occasional Elder and more rarely Blackthorn and Dog-rose. They have not been laid for some time and are growing out. The density and height of the hawthorn is shading out much of the ground flora although Ivy, Garlic Mustard and Rosebay Willowherb are relatively common. The diversity of the hedgerows is surprisingly low given they are roughly the same age as the canal.
- 7.7.6 There are no specific wildlife sites or records on this length, although the entire hill-slope is mapped by RMBC as acid grassland.

### **Section 7 / Length 3: Original Canal line to Ellison's Cottages**

SK 4603 8160 to SK 4610 8186 Length 416 m.

- 7.7.7 This length commences where the original line of the canal emerges from beneath the back gardens of the houses on Primrose Lane. The canal channel is open but dry and is dominated by tall herb/grassland communities and by infrequent isolated hawthorn, probably seeded from the adjacent grown out hedge-line.
- 7.7.8 This section was surveyed by Laws in 1997 and re-survey has confirmed his findings and established that the length is progressively drying. The towpath along this section is managed to keep it open and to some extent this has delayed succession on the towpath bank. Law full report is reproduced in Appendix A.

- 7.7.9 Laws (1997) noted that the towpath on the west side is bounded by a tall Hawthorn hedge with occasional Elder and more rarely Blackthorn and Dog-rose, which spills down the embankment on the west side. Beneath this relatively dense canopy there is relatively little ground flora. Ivy and Garlic Mustard locally frequent and Lords-and-Ladies noted rarely.
- 7.7.10 The towpath is dominated by tall herbs and rank grasses. Examples of these are; abundant False Oat-grass, frequent Cow Parsley and Common Nettle with locally frequent Rough Meadow-grass with Cock's-foot occasional and Russian Comfrey rare. At the southern end there is a small stand of invasive Japanese Knotweed. Less ruderal species occur here but only Common Knapweed is frequent, and there are few other herbs of interest.
- 7.7.11 The canal bed is dry and dominated by tall ruderals comprising; abundant False Oat-grass, locally frequent to abundant Rosebay Willowherb and frequent Great Willowherb, Hogweed and Common Nettle. This vegetation rises up the east bank where there are locally dense stands of Bramble and Common Nettle. Apart from a single senescent Elder, this bank, and the bank top, is clear of trees and shrubs and adjoins a rough grazed horse paddock.
- 7.7.12 As one travels north along the channel there is a small amount of scrub development within, and on the sides of, the canal channel. This is formed by occasional Hawthorn, Dog-rose and Field-rose (in the channel) with Ash more rarely noted. Around this scrub tall ruderals continue to dominate the towpath and off banks - Rosebay Willowherb, Bramble, False Oat-grass and Common Nettle continuing to be key components of this vegetation (Laws 1997; see appendix A).
- 7.7.13 Within the channel the first indications of wetter conditions are marked by a single small stand of Reed Canary-grass.
- 7.7.14 Along the towpath and west embankment there is little change from the previous section with perhaps the exception of Field-rose becoming locally frequent in the hedge and Upright Hedge-parsley is locally frequent along the base of the hedge (and also in the canal basin). Towards the northern end of this section a second hedge begins to develop on the east side of the towpath creating more shaded conditions.
- 7.7.15 Towards the site of Ellison's Cottages the canal channel becomes deeper and here the appearance of willow trees indicate wetter conditions. Grey Willow (Salix cinerea ssp. oleifolia) forms a dense stand and towards the north of this section water appears, but not as standing water as there was clearly a flow towards the south. Locally on the edges of the stand Rough Meadow-grass is frequent and a patch of Dog's Mercury was noted on the east bank. Amongst the willows the common moss Eurhynchium praelongum is locally frequent with Fissidens sp. occasional. Field Maple and Ash were infrequently and rarely noted but these appear to be planted.
- 7.7.16 Towards the north aquatic plants begin to feature with Greater Tussock – sedge, Yellow Iris, Reed Canary-grass and Reed Sweet-grass are all present. This is followed by a further short dry section which sees some breaks in the willow carr and the channel once again becomes dominated by False Oat-grass, Bramble and other tall herbs. This continues over the recent earth bank which marks the end of the dry section and forms a bund to retain water in the adjacent lengths.

**Section 7 / Length 4 and Length 5: Ellison's cottages (site of) to West of Norwood Colliery Wharf (site of) to West side of Rotherham Rd. (Gannow Lane) Bridge**

Length 4: SK 4610 8186 to SK 4653 8176

Length 572 m.

Length 5: SK 4653 8176 to SK 4668 8175

Length 158 m.

- 7.7.17 These two lengths together are equivalent to the Derbyshire County Wildlife Site NE257 which was surveyed by Law in 1997 (see Appendix A). Almost the entirety of both lengths was in water when last mapped by the Ordnance Survey and when surveyed by DWT in 2006. Since then the length has dried out considerably.
- 7.7.18 Photographic and map evidence shows that the entire length from the site of Ellison's Cottages to the site of the Rotherham Road Bridge was in water in the 1980's. By the time of the Law survey in 1997 the channel was encroached by reed and the area of open water had reduced. By the time of the resurvey in 2009 the reedswamp had spread across practically the entire channel and the end of the section adjacent to Rotherham Road has become dry. This drying appears more than seasonal drying as wetland taxa are being replaced by terrestrial tall herb communities and bramble scrub. The current situation is as follows:-
- 7.7.19 At the bund between Length 3 and Length 4, the canal becomes more clearly defined as 'in water'. Reed Sweet-grass swamp dominates most of the channel with remnants of open water in the central section. The areas of open water have reduced from those recorded by Law and over much of this length the Reed Sweet-grass which was "threatening to close this" has now done so although some areas of open water do remain especially to the north.
- 7.7.20 Where there is open water Common Duckweed is locally abundant ( particularly on the edges) and Bittersweet becomes occasional. Law noted "the water in this section appeared black and eutrophic with no submerged aquatic plants – none were visible and sampling with a grapnel produced none either". Recent re-survey also failed to locate any submerged aquatic plants.
- 7.7.21 Willow continues to fringe the west bank of this area with Hawthorn frequent as more mature bushes on the off-bank and as smaller bushes on the towpath edge. Locally Grey Willow becomes abundant along with Crack Willow and the Reed Sweet-grass becomes shaded out leaving areas of open, but heavily shaded open water, beneath the willow canopy. In this general area Bramble becomes more abundant along the path edges and Black Bryony frequent in the towpath hedge.
- 7.7.22 The towpath along this "in water" section appears to have a greater diversity of ruderal species. These include frequent Common Knapweed, Zigzag Clover, Oxeye Daisy, Bush Vetch, Tufted vetch, Red Fescue, locally frequent Creeping Cinquefoil and Black Medick together with occasional Meadow Vetchling, Perforate St John's-wort and Common Bird's-foot-trefoil. There appears to have been no overall change in the diversity of species since the Law survey in 1997.
- 7.7.23 As the canal begins to turn it opens out spilling laterally into a series of what appear to be relatively shallow subsidence "flashes". The canal channel is here completely

dominated by Reed Sweet-grass - Law recorded an open channel between reed beds but today there are only small patches of open water.

- 7.7.24 Fringing the Reed Sweet-grass are stands of Yellow Iris and locally frequent False Fox-sedge. At the bend itself Common Reedmace becomes locally abundant. On the off bank the flash areas are dominated and shaded by willow.
- 7.7.25 The towpath continues to be quite diverse but now with Black Medick locally frequent. Law suggests that the hedge by Bailey Drive is evidently young and the result of a recent planting, he notes that locally this is formed by a single species, Field Maple.
- 7.7.26 Beyond the bend Common Reedmace begins to assume dominance over the Reed Sweet-grass in the channel with abundant Common Duckweed, Yellow Iris and Reed Sweet-grass on the edges.
- 7.7.27 Meadowsweet, Common Knapweed and Zigzag Clover continue to be frequent to abundant along the towpath. Self seeding of hawthorn has formed a double hedge effect - Blackthorn is locally frequent within these hedges with Large Bindweed becomes locally frequent.
- 7.7.28 At a point opposite the bend in the adjacent Bailey Drive the channel reverts to Reed Sweet-grass swamp which now entirely covers the channel and no areas of open water are now visible.
- 7.7.29 The towpath vegetation is similar to the previous section but with False Oat-grass and Yorkshire-fog becoming prominent and Tansy becomes locally frequent. AT the point where the towpath leaves the canal edge mature Crack Willow forms a canopy over the canal with small areas of open water beneath. In less shaded areas Reed Canary-grass and Common Reedmace form single species stands.
- 7.7.30 As you enter Length 5 there is a significant change. The towpath bank become a vertical stone wall – the remains of Norwood Colliery Wharf. At the start of this section Gypsywort and Marsh Woundwort are locally abundant with occasional; Yellow Iris, Common Reedmace and False Fox-sedge. Also present, but more rarely, are figwort and Hard Rush.
- 7.7.31 Further north towards Rotherham Road the channel level gradually rises and the channel becomes progressively drier. The flora is more variable with locally abundant Reed Sweet-grass in the channel and on drier ground Raspberry is similarly abundant. Common Nettle and Great Willowherb are both noticeably frequent here. The south or off-bank rises steeply to a mature Hawthorn hedge with some willow species. The bank itself is dominated by Common Nettle and Bramble.
- 7.7.32 On the final leg towards Rotherham Road the canal channel becomes fully dry and there is some Ash and Willow. The section terminates in a dry sloping bank to the road level. Dog's Mercury is here locally abundant and Ivy and Herb Robert locally frequent, more occasionally noted was Wood Avens.

**Section 7 / Length 6: East side of Rotherham Rd. (Gannow Lane)  
Bridge to Norwood Bridge**

SK 4670 8174 to SK 4689 8193

Length 284 m.

- 7.7.33 This section is in water. The off bank has a diverse flora, the towpath bank is less diverse and abuts the Norwood Triangle Complex (below). The length is congruent with Derbyshire County Wildlife Site NE260.
- 7.7.34 This length comprises a section of canal between Rotherham Road, Norwood, and the county boundary between Derbyshire and South Yorkshire. It is currently 'in water' and was also surveyed by Law in 1997 (report reproduced in Appendix A). He noted:
- 7.7.35 Immediately beyond Rotherham Road a steep bank leads down to the beginning of the in water channel and here Dog's Mercury is locally frequent beneath a canopy of Field Maple and Hawthorn. This gives way to a steep offbank dominated by Bramble, locally frequent Cherry and occasional Male-fern. Further east the off bank is very scrubby and is dominated by Hawthorn and more rarely Ash (multi-stemmed and mature) also present are Field Maple and Sycamore with occasional Dog-rose.
- 7.7.36 Along the towpath edge of the channel there is a very narrow fringe of Branched Bur-reed. The towpath itself is dominated by coarse grasses with; frequent False Oat-grass, Common Couch and Cock's-foot. Tall herbs are also frequent. Upright Hedge-parsley, Common Nettle and Great Willowherb are all frequent with the ubiquitous Cleavers frequent amongst these. Other plants along this section, but away from the water edge, include; occasional Mugwort, Nipplewort, and more rarely, Lesser Burdock. Bramble is locally abundant along with Blackthorn suckers.
- 7.7.37 Following the sharp turn of the canal channel the aspect become slightly more open. The towpath bank of the channel supports a fringe of Reed Sweet-grass and Branched Bur-reed with occasional False Fox-sedge and frequent Clustered Dock.
- 7.7.38 The off bank is clear of shrubs and there is a band of Branched Bur-reed along the edge of the water grading to tall herbs of Meadowsweet, Great Willowherb and then higher up the bank where conditions are drier, to Rosebay Willowherb, Creeping Thistle and Bramble. All these species are locally abundant here.
- 7.7.39 Commencing about 20 m beyond the turn on the towpath side the bank is partially edged in concrete. Here there is a fringe of shorter, less ruderal vegetation with Perennial Rye-grass, Ribwort Plantain, White Clover and Yorkshire-fog all frequent. Odd clumps of False Fox-sedge are to be found along the length. Away from this edging there are areas of disturbed ground with frequent Creeping Thistle and Mugwort.
- 7.7.40 Further east towards Norwood Bridge the aspect becomes increasingly enclosed by woodland with mature trees on both banks. The canal channel has a fringe of dense broadleaved scrub woodland along most of the off-bank with abundant Hawthorn and locally frequent Field-rose the main shrub species. Other constituents of this vegetation are more rarely present and include; Pedunculate Oak, Crack Willow, Sycamore and Elm. A narrow band of tall ruderals and marginal aquatics occupy the towpath edges along the towpath bank.
- 7.7.41 Law notes that there is a prior historical record for Grass-wrack pondweed (Potamogeton compresses), a nationally scarce species listed in the UK Biodiversity Action Plan (UKBAP) and Lowland Derbyshire Local BAP (LBAP). A specific search was made for this species and it was not relocated. The only aquatic plant noted

during the survey was Common Duckweed. This is discussed further below (7.19.10) but it appears likely that this species is not present on this site.

- 7.7.42 This length runs adjacent to (but is not part of) NE5 Wildlife Site 1: NE259, **Norwood Triangle Complex** (centred on SK 4678 8188). This is an area of 1.35 ha between the A618 Rotherham Road and the north west side of the Chesterfield Canal, it includes areas of hawthorn and willow dominated shrub and small pockets of marsh. Up to 29 breeding species of bird have been recorded within the site.

## 7.8 Habitat Summary: Section Eight – Norwood

- 7.8.1 The Norwood section covers the existing historic Norwood Flight. To the south of the canal track (and outside the boundary of the required works) is the ancient Nor Wood. To the north is recently improved grassland currently used as horse pasture.
- 7.8.2 The entire section has been heavily modified by landscaping to create ornamental grounds for the Lower and Upper Norwood houses. Much of the land in the immediate vicinity of the proposed canal line is garden and is dominated by introduced species. The waterspaces are amongst the least modified elements and probably hold the greatest ecological potential. Access to the site is currently limited and in consequence we have not yet been able to undertake all the surveys required in sufficient detail.

### Section 8 / Length 1: Norwood Bridge to Top of Norwood Low Treble

SK 4689 8193 to SK 4699 8205

Length 164 m.

- 7.8.3 The bottom of the main Norwood Flight is still in water. The water is shallowed by silting and is heavily shaded by surrounding woodland. It has relatively limited areas of reedswamp dominated by Reed Sweet-grass and Branched Bur-reed with occasional False Fox-sedge.
- 7.8.4 At the start of the section the canal channel has a fringe of dense broadleaved scrub woodland along most of the off-bank this includes Pedunculate Oak, Crack Willow, Sycamore and Elm together with Hawthorn and locally frequent Field-rose as the main shrub species. This gives way to a more open garden like aspect at the site of the lower Norwood Locks and from there on up the flight the canal channel is in a garden setting with woodland to the south and grassland to the north.
- 7.8.5 At this point the un-surfaced towpath is diverted onto a surfaced tarmac road which runs up the flight. This further reduces biodiversity within the immediate vicinity of the lock flight.

### Section 8 / Length 2 and Length 3: Top of Norwood Low Treble to Top of Norwood Upper Middle Treble

Length 2: SK 4699 8205 to SK 4711 8208

Length 127 m.

Length 3: SK 4711 8208 to SK 4711 8208

Length 128 m.

- 7.8.6 These two sections runs through entirely managed garden / parkland grounds. The middle lock flight has been infilled and only the upper middle treble locks are visible. The majority of the canal track forms managed (mown lawn) grassland. The lower middle and upper middle side ponds, however, remain open and are the centre piece of the garden design.
- 7.8.7 The side ponds are possibly of the most ecological interest. Although they have been recently dredged as part of the garden works they retain fringes of Reed Sweet-grass and Branched Bur-reed with occasional False Fox-sedge. The full potential aquatic flora is unknown as access is restricted, although only Common Duckweed is present on the visible lengths of canal channel between the locks.

### **Section 8 / Length 4: Top of Norwood Upper Middle Treble to Top of Norwood Upper Quadrille**

Length 4: SK 4723 8204 to SK 4738 8198

Length 166 m.

- 7.8.8 This section leaves behind the garden and park like aspect to the previous two and becomes increasingly “natural”. The towpath leave the tarmac road and becomes a un-surfaced path. The upper pond is the least dredged of the three side ponds and supports an extensive area of Reed Sweet-grass and Branched Bur-reed reedswamp together with areas of Bulrush . In the open water on the towpath bank Common duckweed is frequent while Pondweeds (sp.) and Waterweeds (sp.) are occasional to infrequent. Water Starwort has been reported in the past but has not been observed.
- 7.8.9 The towpath itself is dominated by coarse grasses including False Oat-grass, Common Couch and Cock's-foot. Tall herbs are also frequent including Upright Hedge-parsley, Common Nettle, Cleavers, Great Willowherb and Rosebay Willowherb.
- 7.8.10 On the landward or north side of the towpath is Hawthorn scrub with Field Rose and Brambles. This gives way to Birch scrub on the edge of the former Kiveton West Colliery Site. The Colliery (which closed in the 1930's) has been reclaimed and much of the land is now given over to grassland. The southern fringe bordering the canal line remains as dense Birch woodland and scrub.
- 7.8.11 At the end of the upper pond the canal route commence the climb up the former Norwood Four-rise lock (the Upper Quadrille). The lock is overgrown with birch scrub woodland with an understory of ferns (including Male-fern and Harts-tongue fern) and Bramble. The woodland to the north is part of the birch woodland around the colliery site.
- 7.8.12 The woodland to the south is also birch woodland and scrub but grades laterally into the margins of the Nor Wood ancient woodland. As noted above this woodland includes Pedunculate Oak, Crack Willow, Sycamore and Elm. An area to the south of the upper pond and the upper locks has been replanted with Fir and Spruce which are now near mature.

### **Section 8 / Length 5: Top of Norwood Upper Quadrille to West Portal of Norwood Tunnel**

SK 4738 8198 to SK 4744 8197

Length 64 m.

- 7.8.13 At the top of the remains of the Norwood four rise lock the canal channel opens out into an area of open water which extends from the top of the lock to the bricked up western entrance to the Norwood Tunnel. This section is heavily silted and densely shaded by surrounding woodland – the water contains many fallen branches and woodland debris.
- 7.8.14 Where the water is not too heavily shaded there are small areas of Reed Sweet-grass reedswamp with even smaller areas of Branched Bur-reed. The water is black, eutrophic, and does not appear to support aquatic plants other than Common Duckweed.
- 7.8.15 The canal channel is surrounded by relatively dense mixed deciduous woodland. This include areas of Hawthorn and Birch scrub on the towpath bank together with well established Pedunculate Oak, Crack Willow, Sycamore and Elm on the off-bank. An area to the south of the length has been replanted at some time in the past with Fir and Spruce.
- 7.8.16 The understory is dominated by Bramble and a mixture of “woodland herbs” such as rosebay willowherb and bush vetch. The towpath runs through dense woodland and has a lower biodiversity than that in the previous sections.

## 7.9 Habitat Summary: Section Nine – Wales

- 7.9.1 This section extends from the top of the existing Norwood Flight to the M1 motorway and then across the land above the former Norwood Tunnel to the edge of the now reclaimed Kiveton Colliery site. It is the larger part of the surface route to replace the Norwood Tunnel.

### **Section 9 / Length 1: West Portal of Norwood Tunnel to Top of Norwood High Treble**

SK 4744 8197 to SK 4755 8196

Length 105 m.

- 7.9.2 The first 10 m of this length passes through the very edge of the Nor Wood. The area to be disturbed lies within the original cleared area around the tunnel mouth. It also includes areas of recent Fir and Spruce woodland plantation. Bramble is locally abundant along with Blackthorn suckers. After 10m the proposed route passes into open agricultural land. The area is infrequently ploughed and is currently used for cattle pasture although hay crops have been taken recently.
- 7.9.3 To the south of the proposed route lies a straggling, much grown out, hawthorn hedge line. The field layer consists of grasses including False oat-grass, Cock’s-foot and Yorkshire-fog together with varied and locally dominant stands of Common Nettle, Hogweed, Cow Parsley, Cleavers, Red-campion, Wild Angelica, Rosebay Willowherb and Bush Vetch.

### **Section 9 / Length 2 and Length 3: Top of Norwood High Treble to Foot of Norwood Top Treble to East side of Poplar Farm Culvert (M1 underpass)**



### Section 10 / Length 1: East side of Wales Bridge No.30e to Park Entrance

SK 4837 8203 to SK 4882 8239 Length 620 m.

- 7.10.2 Length Ten runs around the foot of the reclaimed colliery tip using the line of a former reclamation haul road and adjacent drainage ditch. The entire area of the proposed canal track has been subject to considerable disturbance during the colliery reclamation. To the south the edge of the former tip was not greatly disturbed however and features well developed birch woodland – almost mature in places.
- 7.10.3 The ditch is well shaded with some common ferns and grasses but relatively disturbed by reclamation works. The water largely drains from the colliery tip and appears relatively poor (an aquatic survey is required here) Track is largely bare mud, intermittent hedgerow along length – recent hawthorn hedge grown out.

### Section 10 / Length 2 to Length 6 (inclusive): Park Entrance to Entry to Hard Lane Culvert

Length 2: SK 4882 8239 to SK 4907 8235	Length 256 m.
Length 3: SK 4907 8235 to SK 4922 8237	Length 147 m.
Length 4: SK 4922 8237 to SK 4926 8238	Length 50 m.
Length 5: SK 4926 8238 to SK 4926 8238	Length 130 m.
Length 6: SK 4939 8240 to SK 4949 8243	Length 105 m.

- 7.10.4 All the lengths within the former colliery site (**Lengths 2 to 6**), from the site entrance to Hard Lane, are part of the reclaimed colliery site. They are very similar in composition, are ecologically immature and at present lack diversity. Much of the proposed canal track (which is clearly delineated on the ground) has been planted with a herb/grass mixture.
- 7.10.5 Hard Lane marks the end of the traverse of the reclaimed colliery site. Beyond the road the proposed route re-uses the last extant fragment of the Norwood Tunnel. The land over the tunnel has not been disturbed by the colliery works and has elements which are ecologically significant. While the tunnel will not disturb these areas, the works to restore the tunnel will require surface access and this must be undertaken with care.

### Section 10 / Length 7: Kiveton Waters to East Portal of Norwood Tunnel

SK 4953 8244 to SK 5001 8254 Length 492 m.

- 7.10.6 This length uses the surviving section of the Norwood Tunnel to make a link to the national network at Kiveton Park. At present the tunnel itself is sealed and has no ecological value (i.e. bats are excluded).
- 7.10.7 The Cuckoo Way (the towpath) passes over the ground above the tunnel using a well marked trackway. To the south (right) side of the trackway lies a series of small flat topped spoil heaps which reach 1.5 to 2 m above the track level and mark the

location of the tunnel construction shafts. These support a grazed short grassland with thistles interspersed with isolated stands of hawthorn and nettles. Some patches of open ground. The tunnel passes under this area.

- 7.10.8 To the north (left) of the trackway the ground drops away slightly to an area of damp low-lying ground which holds water after heavy rain and in the winter. This is Pennyholme Marsh - a local nature reserve. The marsh is part of a wider prospective local wildlife site.
- 7.10.9 An ecological scoping study was carried out by RMBC in 2004 based on the data compiled from records and site visits in 2002 . A further data search by Rotherham Metropolitan Borough Council has been carried out and a site walkover undertaken in September 2007. The habitat mosaic at this point is described by RMBC as calcareous lowland wetland. The reinstatement should not affect this area.
- 7.10.10 The site has suffered from landfill and dumping a the western (Hard Lane) end of the site (not related in any way to the canal project). This has been the subject of enforcement action.

### Key to Habitat Distribution Figure Overleaf

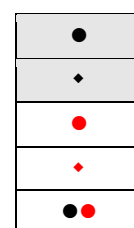
#### Channel Condition - In-filled or In-Water

- Original channel open and in water
- Original channel open (not in-filled) but dry (includes lengths with seasonal puddles)
- Original Channel in-filled
- New Channel to be constructed for the restoration
- Original Channel in Tunnel (extant and re-usable)



#### Habitat Present in Canal Track or Immediately Adjacent Areas

- Dominant habitat within canal track (Black Large Dots)
- Secondary or subsidiary habitat within Canal Track (Black Small Dots)
- Dominant habitat within adjacent area (Red Large Dots)
- Secondary or subsidiary habitat within adjacent area (Red Small Dots)
- Both means present in track and in surrounding area



Section	Length	Approximate Area Of canal Track (Ha)	Canal Channel Condition	Urban	Recreational Grassland	Short grassland	Tall grassland	Grass & Scrub Mosaic	Scrub Woodland	Bramble Scrub	Hedgerows	Woodland	Estate Woodland	Wet Woodland	Wet Ground / Seasonal Wetland	Permanent Shallow Water (marsh/flash)	Permanent Deep Water (pond/lake)	River/Stream	Arable	Pasture
6	1		In-filled	♦	♦	♦	●●	♦♦	●	♦♦	♦				♦					
6	2		In-filled	♦	●●				♦		♦									
6	3		In-filled	♦	♦●		●	●		●	♦				♦					
6	4		In-filled	♦	●●						♦									
6	5		New Channel	♦	●●						♦									

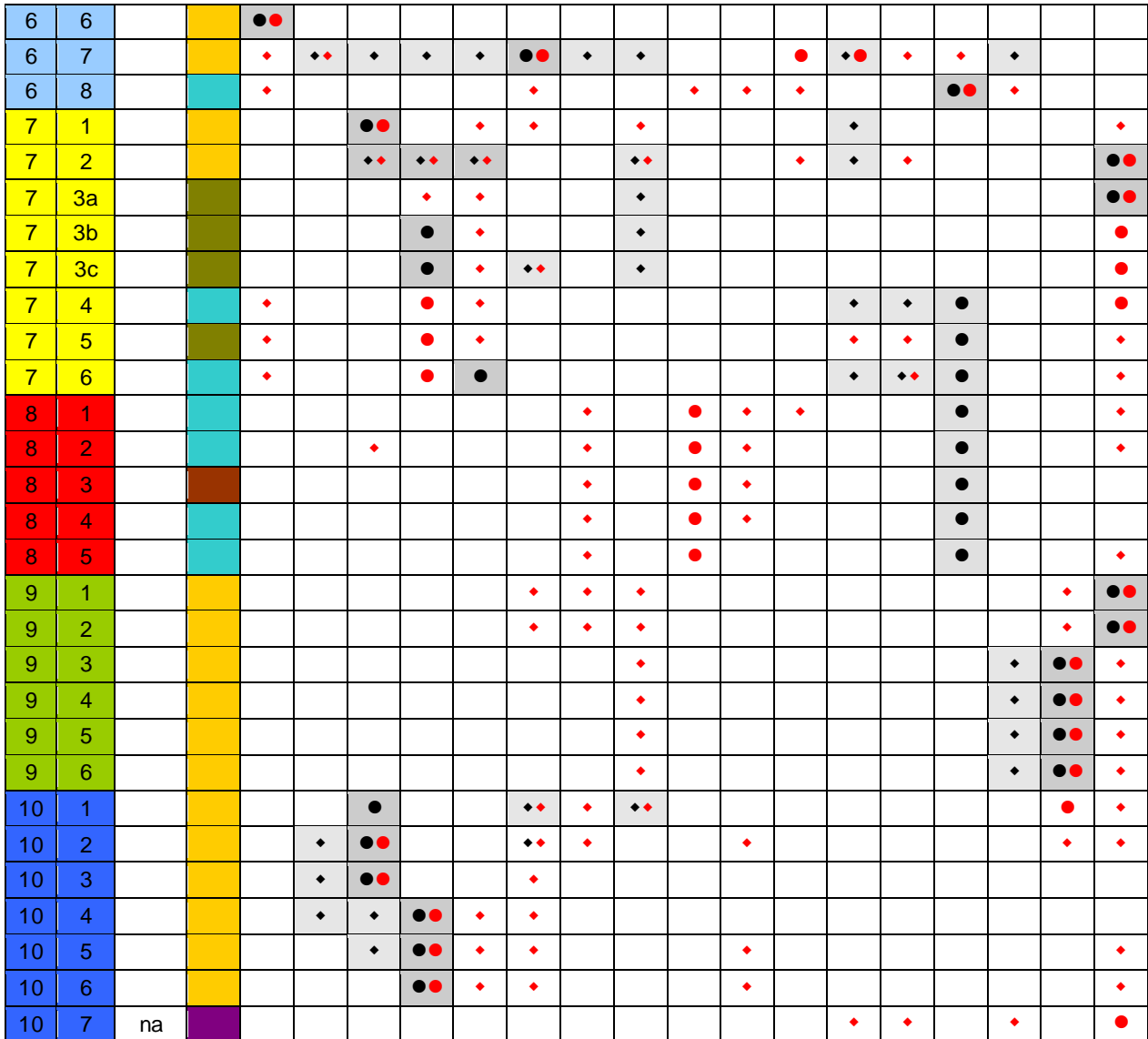


Figure 7.1 Distribution of Habitat Types by Section and Length between Killamarsh and Kiveton Park (for key see previous page)

NB: Length 10/7 – canal in tunnel underground , hence no “on track” habitats indicated

## Constraints and Opportunities

### 7.11 Known Sites of Ecological Importance within the Canal Landscape

7.11.1 In the canal corridor between Killamarsh and Kiveton Park there are a number of sites of wildlife and ecological importance. These have different and evolving degrees of legal protection.

#### Sites of Special Scientific Interest (SSSI)

7.11.2 There are no biological SSSI within either the Canal Track or Canal Corridor. The nearest sites to the canal are the Moss Valley SSSI which lies 5km to the south-west of the study area and the Anston Stones SSSI which lies 5km to the north-east of the study area. Neither will be impinged on by the canal reinstatement.

#### Local Nature Reserves

7.11.3 Local Nature Reserve (or LNR) is a statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities. Parish and Town Councils can also declare LNRs but they must have the powers to do so delegated to them by a principal local authority. Criteria for designation are based upon the local importance of habitat or the rarity of species (see <http://www.english-nature.org.uk/Special/lnr/office.htm>).

7.11.4 To establish an LNR, the declaring local authority must first have a legal interest in the land concerned. This means owning the freehold, leasing it or having a nature reserve agreement with the owner. The land need not lie within the area which the declaring authority controls but if it does not, the authority within whose jurisdiction the land falls must be in agreement.

7.11.5 There is one statutory designated site within the study area: Meadowgate Lake Local Nature Reserve within Rother Valley Country Park. This site lies to the north of the proposed canal route and is separated from the route by a small un-named pond and two areas of woodland and grassland. The proposed canal construction will not impact on this site.

#### County Wildlife & Natural Heritage Sites

7.11.6 There are several non-statutory County Wildlife or Local Natural Heritage Sites along the canal corridor from Killamarsh to Kiveton Park. These are essentially synonymous with "Sites of Interest for Nature Conservation" or "SINCs".

7.11.7 Each Local Authority has a *Local Wildlife Sites Register* listing the sites within their area and their particular wildlife interest. Unlike SSSI or LNRs Local Wildlife Sites do not have legal protection and rely upon the good will of the landowner to enable them to be managed appropriately. They do have some degree of protection through the planning process (cf. PPS 9) and in the Local Development Framework process this will be enhanced.

Register	Site Name	Relationship to Canal Line
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Number		Proximity	Distance (metres)	Nearest Section
DWSR NE203	Hut Lane Meadows	Area	1290	6
DWSR NE196	High Moor Pond	Area	1000	6
DWSR NE194	High Moor	Area	1030	6
DWSR NE255	Dale Road Marsh	Corridor	700	6
RMBC HS650	Meadowgate Lake	Corridor	270	7
DWSR NE257	<b>Chesterfield Canal</b> (west of Rotherham Rd)	Track	0	7
DWSR NE260	<b>Chesterfield Canal - Norwood</b> (east of Rotherham Road)	Track	0	7
DWSR NE259	Norwood Triangle Complex	Corridor	10 to 120	7
<b>RMBC LS 5</b>	<b>Nor Wood &amp; Chesterfield Canal</b> containing three sub areas:-			
RMBC LS 5	<b>Norwood Locks &amp; Surrounds</b>	Track	0 to 50	8
RMBC LS 5	Nor Wood	Corridor	50 plus	8
RMBC LS 5	Woodall & Killamarsh Ponds & surrounding woodlands	Area	1100	8
DSWR NE261	Killamarsh Pond	Area	1000	8
<b>RMBC LS 4</b>	<b>Chesterfield Canal &amp; Pennyholme Marsh</b> , containing several sub-areas of which the following are in or near the study area – the rest are to the east.			
RMBC LS 4	<b>Pennyholme Marsh</b>	Track*	0	10
LS 4	Chesterfield Canal	Track**	0	restored
Notes:-				
* Canal runs in an existing tunnel beneath and to one side of the site				
** This is to the east of the section under consideration – the already restored Canal runs through the middle of the wildlife site				

**Figure 7.x** Sites of Interest for Nature Conservation along the canal track and corridor and their proximity to the proposed waterway. Sites wholly or partially within the canal track are highlighted in red.

- 7.11.8 In restoring the Canal it is essential to take into consideration the reasons for the designations of these sites, and endeavour to avoid, minimise, mitigate or compensate for any impacts on these features, and to integrate them into the design proposals where practicable.
- 7.11.9 In Derbyshire the “Local Wildlife Sites” are locations that contain important habitats or support Biodiversity Action Plan or locally uncommon or rare species. The criteria for inclusion are clearly set out in a regularly updated Handbook (for details see [www.derbyshirebiodiversity.org.uk/sites/handbook/index.php](http://www.derbyshirebiodiversity.org.uk/sites/handbook/index.php)). The process is administered on behalf of the local authorities by the Derbyshire Wildlife Trust and the decision to include a site is taken by the Derbyshire Wildlife Sites Panel.
- 7.11.10 In Rotherham Metropolitan Borough all wildlife (natural heritage) sites are under review as part of the Local Development Framework Process. At present there is a

list of “candidate Local Wildlife Sites” the criteria for which are based on the Borough’s Biodiversity Action Plan and criteria derived there from. All candidate sites are included in the listed below with an understanding that the sites and the criteria used to define them may well change as further work is carried out during the LDF process.

- 7.11.11 The Local Wildlife Sites and candidate sites along the canal route and the proximity of the site to the proposed route are noted in figure 7.x, above. Some of the North East Derbyshire sites are closer to sections in the Western Division but are included for completeness.

### **Key Sites**

- 7.11.12 The majority of Local Wildlife sites will not be affected by the reinstatement of the Canal. Where sites lie close to, but not on, the restoration route appropriate constraints to prevent damage to those sites will need to be built into the engineering design (for example in the laying out of construction access tracks and so forth).
- 7.11.13 Between Killamarsh and Kiveton Park four key sites lie on or very close to the canal track (and are show in red in the above table). Of these, three are sections of the original route and one lies over the extant fragment of the Norwood Tunnel which is proposed for re-use.
- 7.11.14 The Chesterfield Canal and Norwood Sites (NE257 & NE260) lie to the west and east of Rotherham Road. Repeated survey (reported in Laws 2007a and b, attached in Appendix A) and supported by recent re-survey has shown that both these areas are suffering a loss of diversity. Since neither area has been subject to any from of restoration activity this cannot be the cause of the decline. It is likely that the Chesterfield Canal NE257 site is reducing in overall diversity because it is gradually drying out (the water area mapped by Law is notably greater than that seen in 2008 and 2009) and as it undergoes hydrosereal succession from open water to reedswamp. This loss is a cause of concern and if continued would result in the loss of the site as a LWS.
- 7.11.15 The Chesterfield Canal – Norwood site (NE260) to the east of Rotherham road is still in water but appears to have lost all aquatic flora apart from the ubiquitous Canadian Pondweed. This may be due to encroachment and shading by surrounding woodland and also changes in water quality resulting from work to the Norwood Ponds and Flight by the current landowners. Further damage to the off bank vegetation was caused by the landowner undertaking work on an adjacent site with out reference to the bankside flora. The decline is so severe that at the present time this site is proposed for removal from the LWS register and is only retained on the basis of possible water vole activity.
- 7.11.16 The restoration of a through flow of water would be beneficial to both sites. The careful management of the bank-side flora to reduce over-shading would be a further benefit from restoration. To maintain the full range of habitats seen on the western site (NE257) will require the creation of off line reserves using existing subsidence flashes to preserve shallow water habitats.

- 7.11.17 The Norwood Locks and surrounds are the centrepiece of the restoration programme. None of the flora and fauna identified to date on this section are incapable of relocation within the scheme. Those possible Redbook species are located on the side ponds which have recently been dredged by the owner as fishing ponds and require no further work as they do not form part of the navigation.
- 7.11.18 A full programme of exclusion and translocation will be required on the Norwood Flight before work can commence. It should, however, be noted that the range of wildlife in this section is comparable to that recorded on the Thorpe and Turnerwood Flights which were successfully restored and now form the core of Local Wildlife Site Four.
- 7.11.19 The Pennyholme Marsh lies partly above the remains of the Norwood Tunnel which is proposed for re-use. Access to this tunnel fragment will be from Hard Lane (western end) using an existing stone surfaced farm track and from the original Eastern Portal (eastern end). There is no requirement to undertake works in or around the marsh. Access to the Eastern Portal will be via existing farm tracks which run around (and above) the southern edge of the marsh.
- 7.11.20 The marsh itself as recently suffered damage from the activities of the current landowner. It is believed that RMBC has undertaken enforcement action to restore the marsh. The marsh is therefore in a fragile condition at present.

## 7.12 Significant and Protected Species

- 7.12.1 Protected species are listed in Schedule 5 of the Wildlife and Countryside Act 1981 and Schedule 2 of the Conservation (Natural Habitats &c.) Regulation 1994.
- 7.12.2 In respect of the Chesterfield Canal the Ecological Scoping Report (Halcrow 2004) together with the up to date records of the Derbyshire and South Yorkshire Wildlife Trusts provide an outline of the significant and protected species which may be encountered on the canal line.

## 7.13 Significant and Protected Species: Badgers

- 7.13.1 Badgers and their setts are protected under the Protection of Badgers Act 1992. This act consolidates all previous legislation and makes it illegal to deliberately kill, injure or take badger; dig, ring or mark a badger, disturb one while in its sett or damage, destroy or obstruct its sett. The current legislation does not directly protect foraging areas used by badgers.
- 7.13.2 **Killamarsh Town:** There is no evidence of badger activity through the Killamarsh Town section.
- 7.13.3 **Killamarsh East:** This section has more suitable potential habitats and for some distance runs adjacent to Rother Country Park where there is established badger activity. From Nethermoor Lake to Rotherham Road no definitive evidence of activity within the canal track was noted during survey. It is likely, however, that the areas between the existing canal track and Nethermoor Lake earmarked for the Moorhouse flight may well be used as foraging areas.

- 7.13.4 North of Rotherham Road towards Norwood Bridge the character of the Killamarsh East section changes (see above); the channel holds water and is fringed by established ancient woodland. The Nor Wood is known to have badger populations and it is probable that these will use the canal towpath. Some fur snags were noted near Norwood Bridge.
- 7.13.5 **Norwood:** The original route of the canal here runs between the ancient woodland of Nor Wood and recently created grasslands on reclaimed railway and colliery land (see above). This provides a range of habitats suitable for badger and there is extensive evidence of activity in the surrounding area. From Norwood Bridge to the top of the Upper Middle Treble Locks the canal track is partly hard landscaped (including a tennis court) and the towpath has been converted to a tarmac surfaced access road. This has reduced the likely hood of extensive badger activity within the canal track at this point.
- 7.13.6 From the top of the Upper Middle Treble Locks to the Western Portal of Norwood Tunnel the track becomes more “natural” with new birch woodland on the North Bank and the ancient woodland of Nor Wood on the south bank. Adjacent to the towpath (the Cuckoo Way) there is evidence for badger activity in the form of scrapes, fur snags and pathways. There is no evidence for setts (active or inactive) within the canal track.
- 7.13.7 **Wales:** The Wales section takes the canal up and over the top of the Norwood Tunnel. It leaves the edge of Nor Wood and immediately enters open arable fields. The surveys have not recorded an evidence for badger activity along the proposed route across these fields. There is evidence for activity in nearby hedgerows and it is likely that some foraging takes place in these fields.
- 7.13.8 **Kiveton Park:** The survey noted some possible evidence for badger activity on the proposed canal track where it skirts the foot of the now reclaimed colliery tip. No evidence was noted within the already delimited canal track across the area of the reclaimed Kiveton Park Colliery. Reclamation was only completed in 2005 and it is likely that the range of habitats developing in the Kiveton Community Woodlands will in time provide suitable territory for badgers and this should be borne in mind in the design of the restoration programme.
- 7.13.9 The final length from Hard Lane to the East Portal of the Norwood Tunnel will use the existing tunnel. The potential impact in this length will be during restoration works. No evidence of badger activity was recorded in this length. Records show that badger activity is common along the already restored canal to the east to the site.

#### Initial Assessment

- 7.13.10 From the limited evidence to date there would appear to be little direct threat to badger populations from the restoration of the canal. No setts were recorded within the canal track. Those habitats likely to support badger will not be affected by the canal works.
- 7.13.11 Existing land-use (especially urbanisation in Killamarsh and hard landscaping and access roads at Norwood) has already restricted Badger activity on the proposed canal line. The canal track itself is dominated by scrub habitats and restoration will

create areas of new grassland and is unlikely to lead to any net loss of foraging habitats.

7.13.12 While there might be short term fragmentation effects during re-construction there is no evidence that waterway restoration (unlike road construction) leads to long term fragmentation of populations (IWAC 2008). The proposed channel design is mammal friendly with soft, gently sloping, banks on both sides and these should not pose a barrier, or danger, to badger movement. On the restored section from Shireoaks to Kiveton Park there is evidence that badgers are now adept at using the restored bridges as route-ways.

7.13.13 Additional work on badger populations at key locations including Norwood End, Norwood Flight and the Nor Wood itself, will be carried out as each section is brought forward for planning permission.

## 7.14 Significant and Protected Species: Bats

7.14.1 All bat species and their roosts (including transient roosts) are protected under Schedules 5 & 6 of the Wildlife and Countryside Act 1981 (as amended by the Countryside Rights of Way Act 2000 in England and Wales) and the Conservation (Natural Habitats &c) Regulations 1994. These make it an offence to intentionally or recklessly damage or destroy any bat roost; intentionally or recklessly obstruct access to a bat roost; deliberately, intentionally or recklessly disturb a bat; or deliberately kill, injure or capture any bat.

7.14.2 Prior records of bats are not common along the canal track from Killamarsh to Kiveton Park. The Halcrow database (2004) contains no information but the Derbyshire Wildlife Trust records roosting bats at one location in Killamarsh (much removed from the proposed canal track):

44 Ashlea Lane, Killamarsh, Sheffield, S.Yorks (sic)	SK 460 808	1991
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### Potential Roosting Locations

7.14.2 A survey of structures suitable for bat roosts or hibernacula along the route was carried out by a licensed bat handler in 2006. Subsequent visits and emergence observations have been undertaken.

7.14.4 The following structures have been investigated:

- Un-named Culvert near LD&ECR Bridge. The entrance could not be located and it appears completely buried. No inspection possible.
- The site of Mallinders or Bridge Street Bridge is infilled with rubble (presumed to be the remains of the dropped bridge). The eastern side is landscaped and grassed over but the western side remains rubble-like and may contain voids suitable for bats. None were recorded in emergence survey.
- Norwood Bridge (Bridge No.27) – Brick and stone bridge dating to 1832. Has some potential roost niches, however, no evidence of bat roosting was observed. This grade 2 listed bridge will require repair during restoration and, if possible the opportunity will be taken to introduce bat bricks.

- County Dike Culvert under Canal – This original culvert is largely sediment and water filled and in consequence is difficult to survey. The culvert should not be affected by major works but some removal of sediment build up will be required at some point in the future. A remote camera study will be required. No bats observed in repeated visits.
- Norwood Tunnel West Portal – The tunnel entrance is bricked up and no entry for people is possible – the tunnel itself is blocked by a roof collapse within 10 m of the entrance. A small opening (c. 40 by 20 cm) with iron bars is present in the brick wall at around 1.8 m above the ground / water surface. Bats have been seen emerging at dusk and it is very probable that this short length of tunnel is a bat roost.
- Norwood Tunnel East Portal – The tunnel entrance is bricked up and there are no openings which would permit bat access to this section. When the blocking wall was last taken down to permit inspection of the remaining length of tunnel in 2003 no evidence of bat activity was noted. While bats are active above the restored section of canal around Kiveton Park they are not roosting in this tunnel fragment.

7.14.5 In addition to the above, the following structures may be affected by canal restoration but have yet to be surveyed.

- Sheffield Road Culvert (unnamed feeder stream to Nethermoor Lake). Modern concrete culvert under Sheffield Road. Brief inspection suggests no bat activity in the culvert.
- Poplar Farm Underpass under the M1 Motorway. This large modern concrete structure is unlikely to provide roosting locations. The height of the structure precludes survey without scaffolding or crane.

7.14.6 Attention has also been drawn by Jacobs Babbie (2004) to several large trees adjacent to the canal track in Killamarsh which may host bat roosts. Roosting has not, however, been confirmed by observation. None of these trees lie within the Canal Track and they will not be affected by the proposed reinstatement. Similar strictures apply to the mature woodland adjacent to the canal throughout the Norwood Section.

#### Observations

7.14.7 Infrequent bat movements were observed along the canal track in Killamarsh, most notably in the area of recreational grassland to the rear of Chandos Crescent and Peacock Close. No evidence of roosting was noted in spite of the presence of suitable local trees. The DWT record for bats roosting in a house lies to the south of this site.

7.14.8 Occasional bat movements were observed over the fringes of Nethermoor Lake in late summer 2008 and summer 2009.

7.14.9 Pipistrelle bats have been recorded foraging over the Norwood flight and Norwood side ponds (section Eight) every year since 1995. The first recorder noted that “nearby trees were not suitable for bat roosts and it is likely that the bats roost in houses nearby” (Gillespies 1995). It is likely that this activity is related to the insect richness of the ponds and their margins. Bat activity was also recorded here by the

Arup study (2008). Bats have been seen emerging from the opening in the blocking wall at the entrance to the remains of the western end of the Norwood Tunnel suggesting that this is a bat roost or hibernacula.

- 7.14.10 Bats have been observed in the County Dike valley and around Killamarsh Pond. The Arup study recorded Daubenton’s bat, noctule bat and pipstrelle bat around Woodall Pond.
- 7.14.11 Bat activity has not been recorded immediately west or east of the motorway, although as the habitat mosaic is highly suitable this may reflect observers and observation. Bat activity is common around the Kiveton Waters ponds on the reclaimed colliery site at Kiveton Park and was recorded by the Arup study (2008).
- 7.14.12 The Eastern portal of the tunnel is blocked and the last inspection did not record any evidence for bat roosts. In contrast bat activity is commonly recorded over the restored canal eastwards towards Worksop.

Initial Assessment

- 7.14.13 The mosaic of habitats along the route from Killamarsh to Kiveton Park would appear to be highly suitable for bats (Arup 2008). The re-instatement of the canal would do little to affect the overall balance of this mosaic but would increase the overall area of standing and slow moving water. This will support insect populations of great attractiveness to bats and which should therefore be of net benefit.
- 7.14.14 The potential impact of construction activities upon bat roosts and potential hibernacula appears to be limited. No structure requiring reconstruction – such as Norwood Bridge -- has any evidence for bat roosting (additional final checks will be made by licensed bat handlers prior to any application for planning permission).
- 7.14.15 In conclusion, the only proven bat roost associated with the canal is the western fragment of the Norwood Tunnel accessed via the grill in the blocking wall in the Western Portal. Under current proposals the new route will avoid the western portal and there will be no requirement to open up or disturb the interior of the tunnel fragment at any point.

**7.15 Significant and Protected Species: Water Vole**

- 7.15.1 Water Vole are commonly found along the River Rother and its tributary streams. In, or near, the study area, the Halcrow database (2004) lists records for water vole in ditches and abandoned meanders of the Rother near Forge Bridge, Killamarsh and several records for the ponds and ditches around Killamarsh Meadows. There is also one record to the Dale Brook as it runs through Killamarsh.
- 7.15.2 Prior records (Derbyshire Wildlife Trust, etc) in the area include (in approximate order along the corridor):

Location	Grid Ref (if given)	Date (if given)	Notes
River Rother	SK 443 802	1999	East bank of River Rother to west of Killamarsh (described as but NOT

				Killamarsh Meadows)
River Rother	SK 443 802	2000		East bank of River Rother to west of Killamarsh (described as but NOT Killamarsh Meadows)
Un named ditch	SK 445 801	1999		Drainage ditch on River Rother Flood Plain to west of Killamarsh and south of major ox-bow pond on floodplain (described as but NOT Killamarsh Meadows)
Un named drainage ditch nearby	SK 445 802	1997		Drainage ditch on River Rother Flood Plain to west of Killamarsh (Forge lane Fishing Ponds)
River Rother	SK 445 807	1999		East bank of River Rother to west of Killamarsh, north of minor ox-bow lake on floodplain.
River Rother	SK 445 807	2000 (2)		East bank of River Rother to west of Killamarsh, north of minor ox-bow lake on floodplain.
Un named ditch nr fishing pond	SK 446 807	1998		Drainage ditch on River Rother flood plain to west of Old Hall Farm. (called Killamarsh Meadows – it is not)
Un named pond	SK 447 803	1999		South end of the southernmost of Mr Swaines fishing ponds at Killamarsh.
“Killamarsh Ponds”	SK 454 817	1998		This is not the actual Killamarsh Pond (= SK 472 809) this grid ref gives the east bank of River Rother north of Nethermoor Lake.
Meadowgate LNR		2008		
Norwood Locks		1975, 1974, 1977, 1979, 1984,		
Killamarsh Pond	SK 472 809	1976, 2008		The actual Killamarsh Pond.
Woodall Pond		1976, 1973		
E Section of field 5236, Wales	SK 4882	1996		Probably along existing drainage ditch
SE side of new track, field 2688, 6400	SK 4881	1996		Probably along Broad Bridge Dyke
Kiveton Waters		2008		Recorded on subsidence flashes on Kiveton Colliery Site and have colonised new ponds by 2008
Harthill Reservoir		1979, 1982		BW reservoir outside survey area
Pennyholme Marsh, Broad Bridge Dyke	SK 4982	1985, 1990-1997		

7.15.3 The River Rother sites all lie outside the canal corridor and other than supporting the notion that water vole are relatively common in this area they are uninformative with respect to the canal itself. Only the site at Norwood lies within the canal track and will be disturbed by restoration.

#### Observations

7.15.4 To determine the distribution of water vole a series of preliminary site surveys were undertaken in the summer 2007 and spring 2008 using the non-invasive methods

given in the *Water Vole Conservation Handbook* (Strachen 1998). This involved examination of the waterway banks for burrow entrances (and surrounding “lawns”), latrines, feeding stations, runs, pathways and footprints.

7.15.5 The route has a diverse mosaic of habitats many of which are suitable for water vole. The restoration should not affect this corridor wide mosaic and should increase the diversity of those sections with low values at present.

7.15.6 Unsurprisingly water vole appear relatively common in landscape with a diverse waterscape.

#### Initial Assessment

7.15.7 Water vole were not observed in section 6 – possibly due to the absence of suitable habitats (the canal here is almost entirely infilled) and the built up character of the landscape around the canal track. No prior records were noted in this area.

7.15.8 It may be suggested that reinstatement of this section would be of benefit to water vole populations as it would link the currently fragmented sections and provide a migration corridor for vole movement. It is likely that since water vole are present to the west and north of the canal track they would rapidly colonise the new length of waterway.

7.15.9 Prior records and evidence for water vole indicates that water vole are common in parts of section 7, 8 and 9 wherever there are areas of water of variable depths with a diverse flora and numerous micro-niches coupled to the presence of adjacent grassland and foraging territory.

7.15.10 Water vole were less common than expected in the ponds on the Norwood Flight. This may be due to domestic cats from the properties on the flight.

7.15.11 Water vole are likely to be present and possibly common on the eastern half of section 10.

7.15.12 The precautionary principle assumes that water vole are present throughout sections 7, 8, 9 and 10 in consequence a full resurvey will be required to establish the presence and density of activity prior to commencement of works. A working plan will be agreed with English Nature prior to the submission of the planning application for this division.

7.15.13 Where mitigation measures for Water Vole are indicated then these will follow established best practice (e.g. Strachen and Moorhouse 2006, ADA 2007)

#### Impact of Restoration

7.15.14 Prior experience shows that reinstatement of a waterway can be beneficial for water vole populations. For example, the restoration of the Chesterfield Canal from Chesterfield to Staveley between 1998 and 2003 has resulted in a net increase in wetland habitat and a significant increase in water vole distribution and numbers as evidenced by DWT survey records (Perkins 2006b). Since completion the water vole population has grown rapidly and the canal is now a significant habitat for water vole. In 2007 the five miles from Chesterfield to Staveley was designated as a County Wildlife Site on the basis of its water vole population.

- 7.15.15 In studying the impact of this restoration it was noted that, unsurprisingly, the distribution of water vole depends upon the bank condition.
- 7.15.16 Where historic structures were re-used – at locks and bridges – hard banks remain and were restored. These are not well suited to water vole burrows and tend to be surrounded with hard surfaces which provide poor habitat. In consequence water vole populations in the vicinity of locks and hard banks are low .
- 7.15.17 On the lengths of open canal restored or created from scratch it proved possible to use an open profile and soft clay banks – this has greatly favoured the water voles return and population densities on such lengths are notably higher.
- 7.15.18 Derbyshire County Council Countryside Service, the Chesterfield Canal Trust and Partnership are proud of the resurgence of the water vole population in the area since the reinstatement of the canal. DCC in particular have worked closely with DWT to ensure that the habitat is managed in a way which is sensitive to the needs of the water vole population. The Canal Partnership is well informed about the legislation surrounding the protection of both water voles and their habitats and fully acknowledges their duty of care with respect to both.

#### Protection & Mitigation Strategy

- 7.15.19 Mindful of the importance of the canal for water vole the following mitigation strategy has been proposed.
- 7.15.20 This strategy is based on best published advice (e.g. Arnott 2001, English Nature 2008) and will be consulted upon further with DWT and English Nature as the project goes forward. Before implementation we would seek the opinion of these bodies and make any necessary improvements they can suggest.

#### Proposals / Method Statement

- 7.15.21 Prior to the commencement of works it is proposed to closely crop the vegetation along the bank margin and across the proposed work site. This should encourage outward migration (exclusion) of water vole and discourage new arrivals.
- 7.15.22 Given the proximity of known Water Vole activity and following the precautionary principle a final inspection of the proposed works site will be undertaken by an appropriately trained ecologist around six to four weeks prior to the commencement to works.
- 7.15.23 Further, during the works the partnership will employ an appropriately trained ecologist to undertake monitoring of the site, the site clearance activities and the works.
- 7.15.24 Contractors working on the site will be made aware of the potential presence of water vole at the tendering & contractual stages.
- 7.15.25 All workers will be briefed as to possible presence of water vole at the commencement of work and will be informed as to procedure to follow (i.e. cease work and inform supervisor).
- 7.15.26 Each worker (and most importantly digger drivers) will be issued with a simple “site card” or “cab card” which illustrates the water vole and advises workers as to procedure upon discovery of water vole (i.e. cease work and inform supervisor).

- 7.15.27 If at any time new Water Vole should be found then the written agreement of the Statutory Nature Conservation Organisations (SNCO) will be required. To obtain such a consent requires the preparation and submission of an appropriate method statement covering both exclusion and reinstatement to English Nature (who require agreement from the Environment Agency). Work will obviously cease until adequate mitigation is decided upon by the SNCO and written consent is achieved.

## 7.16 Significant and Protected Species: Other Mammals

### Otter

- 7.16.1 Although suitable habitats for Otter are becoming available within the River Rother catchment there is at present no evidence for the return of this species to this area.

### Other Mammals

- 7.16.2 Other Mammals present in the area include the increasingly endangered Hedgehog (*Erinaceus europaeus*) and the Brown Hare (*Lepus capensis*). The former is recorded throughout and is relatively common in Killamarsh and Kiveton. The latter has not been recorded in this section but suitable habitats exists on the summit length (restoration Section Nine).

## 7.17 Birds (General)

- 7.17.1 Ornithological studies have been carried out for several seasons on both the line of the Canal and the Trans Pennine Trail. Observations suggest that the corridor is host to a range of common bird species and that there is relatively little difference between the canal track and similar habitats in the surrounding canal corridor and landscape (for example the adjacent Trans Pennine Trail).
- 7.17.2 Halcrow (2004) did not identify any protected bird species along the canal track, however, they did note that the canal corridor is subject to relatively little disturbance and that “the local habitat mosaics may support locally good bird populations”.
- 7.17.3 The most important bird location in the area is Rother Valley County Park to the North of the Canal track where there are notable seasonal concentrations of waders and migrating birds. Moorhouses Lake is an LNR on the basis of its importance to migrating birds. The proposed canal route avoids Moorhouses Lake.

## 7.18 Herptofauna

### Great Crested Newt

- 7.18.1 There are no records for Great Crested Newt from the Canal Track, but it was recorded at Field Lane field pond on the south-western edge of Killamarsh (SK 4511 7996) in 2001 (DWT records). Although this site is outside the study area for the Killamarsh to Kiveton Park section this find-spot does show that GCN are present in the general area.

- 7.18.2 Detailed survey of the route for GCN has yet to be undertaken. An initial walkover and assessment of the route suggests that there are a number of locations where GCN are likely to be present in and in which detailed survey will be undertaken:
- **Site of Old Farm Lock:** Damp ground conditions and shallow puddles in the base of the otherwise dry canal channel provide possible habitat for GCN.
  - **Site of Nethermoor Lake Lock and Floodgate:** Shallow semi-permanent pools and alder car behind floodbank.
  - **Original canal channel at Norwood End:** Mosaic of shallow seasonal pools, shallow permanent water and deeper water with fen carr and reedswamp. Status of fish population uncertain.
  - **Stream bank and field margins near Coalpit Lane, south of Wales:** Mosaic of semi-wetland and wetland habitats potentially suitable for GCN but no standing water makes it less likely.
- 7.18.3 Nethermoor lake and the Norwood Flight side ponds and channels are in water and support a thriving fish population (all are used as fishing lakes) making them unsuitable for GCN. The recreational grasslands of Killamarsh and the ploughed agricultural fields south of Wales are also unlikely habitats.
- 7.18.4 Where GCN populations are identified then appropriate mitigation measures will be put in place based upon English Nature (2001).

#### Grass Snake

- 7.18.5 There are no records for Grass Snake from the Canal Track or the surrounding corridor. The nearest record in Derbyshire is in the grassland communities surrounding Mastin Moor Flash, four miles to the south of the study area.

#### Invertebrates

- 7.18.6 No systematic study of invertebrates along the route has been undertaken. There is evidence from adjacent sites at Renishaw (south of the study area) which unsurprisingly suggest that beetle, moth and butterfly diversity is linked to diversity of local micro habitats – especially edge habitats around scrub woodland. The species recorded while locally abundant were all common species.

## **7.19 Plants**

- 7.19.1 The canal corridor between Killamarsh and Kiveton Park is marked by a great variability in plant communities and their relative diversities.
- 7.19.2 The Killamarsh Town section is dominated by common recreation and amenity planting species and overall, has low biodiversity and value. There are a number of common introduced (non-native) species in this area and there is clearly scope for using the canal to introduce a greater diversity of native species and increase the range of habitats.
- 7.19.3 The Killamarsh East section largely follows the historic canal track. The presence of lengths still in water and a degree of benign neglect has led to a greater diversity of habitats and plant species.

- 7.19.4 The Norwood section also follows the historic canal line and runs adjacent to the ancient woodland of Nor Wood. Nor Wood is recorded from mediaeval times onwards and was by c. 1550 being managed as a coppiced woodland (see Chapter 8). Sections of the wood have been replanted and in some area conifers have been introduced however, overall, the woodland remains very diverse with significant ancient woodland ground flora elements. The restoration will have no affect on the woodland.
- 7.19.5 The Wales section is largely agricultural and has a low diversity of species. What diversity is present is confined to the hedge lines.
- 7.19.6 There are no records for any significant or protected plant species within the canal track on the proposed route.

#### Floating Macrophytes, Reedswamp & Aquatic Marginal Plants

- 7.19.7 The majority of the proposed canal restoration route is currently dry. There are three areas which retain or have some standing water suitable for floating macrophytes and the development of hydrosere successions; Nethermoor Lake, the canal at Norwood End and the canal at the Norwood Locks.
- 7.19.8. **Nethermoor Lake** has no records for aquatic vegetation. There is some emergent reedswamp on the north shore but the lake has a steep sided underwater profile and there is little evidence for extensive floating macrophytes.
- 7.19.9 **Norwood End** has an isolated 200m section in water which hosts a number of reedswamp, aquatic marginal and floating macrophytes. Survey in 1996, 2006 and 2008 suggest that this length has suffered some loss in diversity between 2005 and 2009 caused by the gradual drying out of the channel at this point. Certainly there has been a reduction in water area (photographic evidence) and an increase in reedswamp at the expense of open water. Water formally flowed through a culvert under Rotherham road. This now appears to be blocked and water is no longer refilling the channel.
- 7.19.10 **Norwood Locks** has a length of canal and a series of former side ponds. These have exceptionally clean water and host a number of floating macrophytes. The lower length of canal (cited as the "Norwood Canal") has a record from 1990 for flat leave pondweed (Potamogeton compressens). Resurvey has so far failed to locate this taxa and Law (2007b) notes that the 1990 identification was not supported by voucher samples and in their absence the record should be treated with caution as this taxa is easy to misidentify.
- 7.19.11 Further detailed survey of aquatic macrophytes in the Norwood Locks length needs to be undertaken in order to establish if this taxa is present or not. Potentially this could be the only Red Book species on the Derbyshire & Rotherham sections of the Canal.

#### Woodlands

- 7.19.12 The section through Killamarsh is urban with a scatter of urban standard trees along the route.
- 7.19.13 The most important area of woodlands adjacent the route is the Nor Wood. Ancient woodlands which can be traced with some certainly back to the 1500's.

- 7.19.14 The other woodlands recorded in the survey of the canal track are narrow linear scrub woodland habitats, although areas of established semi-natural broadleaved or mixed plantation occur commonly adjacent to the canal track and throughout the canal corridor. Many of these established woodland areas are small and often already highly fragmented (Woodland Inventory, Forestry Commission 2002).

## **7.20 Invasive Species**

### **Mink**

- 7.20.1 Mink is present throughout the wider area, but no specific evidence for mink within the study area has been noted.

### **Japanese Knotweed**

- 7.20.2 Japanese Knotweed occurs in stands at Killamarsh, Norwood and Kiveton Park. The locations have been noted and advice will be sought on appropriate treatment at each site as each unit is brought forward for reinstatement. In most cases this will involve chemical treatment followed by excavation and removal of the root stock to appropriate licensed burial site.

### **Indian Balsam**

- 7.20.3 Indian Balsam has been noted along the River Rother at many locations and is clearly spreading. Management plans for the wider corridor will address this problem.
- 7.20.4 The Three Valleys Project Team have been undertaking “Balsam Pulls” in the Moss Valley with local volunteers. The effectiveness of this solution is being assessed and many be extended to other areas in the Rother Valley including the above sites.

# Preliminary Assessment and Mitigation Proposals

## 7.21 Introduction

- 7.21.1 The environmental and ecological work undertaken to date on the Killamarsh to Kiveton Park section has been preliminary and scoping. It has established the nature of the route and the main issues likely to be faced by reinstatement.
- 7.21.2 This part of the chapter sets the key issues raised by a preliminary assessment of the impact of restoration upon the local environment and ecology. It goes on to suggest how these issue may be addressed by avoidance, mitigation or compensation measures.
- 7.21.3 It also establishes where more data will be required before a management plan for this section can be finalised. The proposed next steps towards this goal are set out, below, in the conclusion.

## 7.22 Landscape Character, Geology and Soils

- 7.22.1 The line of the Chesterfield Canal has been a landscape feature for 230 years during the development of the modern cultural landscape. The dewatering and infilling of the canal has eroded the coherence of this historic corridor; continued fragmentation will eventually lead to its loss as strong visual element within the landscape. Restoration would enable the canal to be reinstated as a strong horizontal linking element within the landscape. The management and plantation regimes proposed should endeavour to replicate, as far as possible, the original character of the formation and it relationships to other features in the landscape.
- 7.22.2 The *Landscape Character of Derbyshire* (DCC 2004) proposes planting and management guidelines for different landscape characters. The restoration of the Chesterfield Canal should take full account of these guidelines in (a) the design of mitigation, compensation and enhancement measures and (b) the setting out of a long term management regime for the Canal Track.
- 7.22.3 Reinstatement of the canal will have no effect upon known sites of geological importance. While within the eastern restoration sections there are very few locations where there are existing geological exposures, the reinstatement programme offers an opportunity to create new exposures through the Carboniferous Coal Measures. These new exposures would increase local geo-diversity and would support local and regional strategies. They could also be incorporated at stops along the proposed miners trail and help to tell the story of mining in the area.
- 7.22.4 Reinstatement will have no adverse impact on soil quality or agricultural land use. Where the new canal route passes through agricultural land the extent of loss is small.

## 7.23 Section 6: Killamarsh Town

### Issues

- 7.23.1 There are no environmentally sensitive sites on route in this section. The majority of the proposed canal track is low diversity amenity grassland. There are no known protected species on route.

### Mitigation & Enhancement

- 7.23.2 No mitigation is required, but there are significant opportunities to enhance the diversity of habitats and species within urban Killamarsh. This will be achieved through:-
- (1) introduction of waterspace
  - (2) creation of reed shelves and reed pockets along line
  - (3) management of grown out hawthorn hedgerows
  - (4) phased replacement of introduced woodland taxa with native species and
  - (5) creation of new bat roost locations within new bridge structures.
- 7.23.3 This will also improve the canal corridor as linier feature and contribute to its development as core Green infrastructure.
- 7.23.4 The new lock at Old Farm will cut across a very tight bend in the canal and will leave the original channel (not infilled at this point) vacant. The new lock by-wash will be taken through the original channel which will be partially stepped and weirs inserted to create a series of shallow wetland pools. This will increase local biodiversity and help to mitigate for the loss of shallow water habitat to the west of the site of Old Farm Lock.

### Engagement

- 7.23.5 Community engagement will be encouraged to maintain the new diverse habitats, both through passive acceptance of the new waterspace and through community volunteers working to manage the new canal corridor.

## 7.24 Section 7: Killamarsh East

### Issues

- 7.24.1 The proposed route crosses three areas of nature conservation interest.
- 7.24.2 The Moorhouse Flight will commence on land which forms part of the Rother Valley Country Park Wildlife site, it then passes across an area of land designated as of interest for its grassland habitats.
- 7.24.3 From Ellison's Cottages to Rotherham Road the Norwood End length of the original canal is a Derbyshire County Council Local Nature Reserve.
- 7.24.4 The original canal east from Rotherham Road to Norwood Bridge has also been designated as a Local Nature Reserve. This site has recently been removed from the list of sites (Laws 2008) although it still retains many features of interest.

7.24.5 To the west of the original line between Rotherham Road and Norwood bridge is the Norwood Triangle Wet Woodland LNR site. There will be no impact on this site from the restoration.

7.24.6 Both lengths of original canal channel have past records and present potential for the presence of water vole.

#### Mitigation

7.24.7 **Moorhouse Flight:** The loss of grassland habitat will be relatively limited and will be mitigated by careful design to reduce the overall width of the structures. The greatest impact is likely to occur during construction.

7.24.8 The working area for the lock construction will be kept to an absolute minimum. Topsoil will be removed and stored separately so that it may be returned (with its seed bank) to the area around the locks. Removal of invasive scrub and better management will encourage new areas of grassland.

7.24.9 **Ellison's Cottages to Rotherham Road:** The area is an LNR on the basis of its flora and habitats. At present these are at risk of disappearing due to the progressive drying of the canal at this point. Restoration of a through flow of water will be beneficial in maintaining the current biodiversity.

7.24.10 To maintain the current range of depths when the canal is dredged an "off line" reserve will be created parallel to the canal from Ellison's Cottages to the Norwood "elbow" bend. This is shown as the Gannow Side Ponds on the main restoration plan. The ponds will be fed from the canal via a sluice and will return water to the canal again via a sluice. This will enable the section to be sealed off in the event of the need to drain the main canal or to control a pollution incident.

7.24.11 The existing flash like wetland "pockets" created by mining subsidence along the off bank from the Norwood "elbow" bend to the edge of the industrial estate will be maintained and will be expanded by the creation of a linking reed shelf along the entire restored channel in this length.

7.24.12 The side ponds and new reed shelves will be established using dredged sediments (with seedbank) and manually transplanted plants from the main channel.

7.24.13 Creation of the side pond will precede the full navigation restoration of the main channel. This will allow the side pond to become fully established (and to assess the success of the side pond strategy on the principle that "monitoring informs action") prior to major disturbance of the existing community.

7.24.14 There are also opportunities to create additional wetland habitats along the Primrose Lane Mooring Arm. This length will incorporate a reed shelf along much of its length and a shallow water wetland around the winding hole. Should the Gannow side Pond prove unsuccessful in maintaining local biodiversity it will be possible to convert practically all of this length into a wetland reserve.

7.24.15 **Rotherham Road to Norwood Bridge:** This section has suffered damage in recent years due to the inadvertent actions of the riparian landowner on the off-bank. Agreement has now been reached on future management of the adjacent site and it is hoped that the species diversity of the canal channel and off-bank will now begin to recover.

- 7.24.16 Reinstatement of the channel is here constrained by the presence of a shallow cutting and an embankment over the County Dike brook. Reinstatement will therefore have to use the original channel form and it will not be possible to create a formal reed shelf along the off bank. Notwithstanding, dredging will be planned so as to leave a substantial body of in-situ material adjacent to the off bank ensuring retention of much of the current reedswamp.
- 7.24.17 **Water Vole:** A water vole management and mitigation plan based on best practice (e.g. Strachan & Moorhouse 2006, ADA / Natural England 2007) will be produced in conjunction with the detailed works phasing plan. This will set out, in agreement with English Nature and the Wildlife Trusts, the procedures to be adopted to ensure that water vole are excluded from working sites and that the works are staggered and phased so as to allow the gradual step-wise movement of water vole.

#### Enhancement

- 7.24.18 The construction of the Moorhouse Locks will have a short term impact on the grassland habitats on the route. The locks will result in some loss of habitat, however, the canal project will enable the positive management the grassland around the locks. Positive management is required to (1) prevent development of scrub woodland and (2) to manage the hedgerows around the site to prevent them growing out and spreading across the area.
- 7.24.19 The canal project is therefore an opportunity to enhance the management of the grassland areas which are currently neglected.
- 7.24.20 The reinstatement of the canal channel will increase the water area within the critical LNR length from Ellison's Cottages to Rotherham Road and the former LNR from Rotherham Road to Norwood Bridge. An increase in wetland area by 50% is planned and will be achieved by the dredging the channel to close to its original profile and by the creation of an off-line reserve and reed shelves.
- 7.24.21 Dredging of the channel will follow a policy of, wherever possible, retaining and storing the dredged sediments separately so as to provide a seed bank for new lengths of canal and off line reserves.
- 7.24.22 Dredged sediments will only be used for the seeding of new lengths of canal channel within the same hydrological catchment. Sediments dredged at Killamarsh east derive from the Rother Catchment and thus can only be used for seeding in the Killamarsh East and Killamarsh Town sections.

#### Engagement

- 7.24.23 The loss of open water habitat has led to the end of fishing on these lengths. Restoration of a mixed habitat or reedswamp and open water would encourage the return of fish and would engage the local community with the protection and management of this wetland habitat.

## **7.25 Section 8: Norwood**

#### Issues

- 7.25.1 The Norwood flight and surrounding woodland (the Nor Wood) is of considerable nature conservation value (RMBC Local Site 5).

- 7.25.2 The Nor Wood is, in part, an ancient woodland and contains nationally scarce species such as Large-leaved Lime. It is very varied and diverse wood with a mixture of acid, neutral and wet woodland areas. Parts of the wood are subject to Tree Preservation Orders.
- 7.25.3 The Norwood Locks and side ponds contain a population of the nationally scarce True Fox-sedge and are bordered by Ash-Sycamore-Dog's Mercury woodland. The water-bodies are clean and clear and of good quality but support a surprisingly modest water-vole population. Bats are present but un-quantified. The complex is bordered throughout by estate grounds and gardens.
- 7.25.4 The Woodall and Killamarsh Ponds are of interest for their neutral and wet grassland margins and for areas of Alder woodland with a nettle understory.

#### Mitigation and Enhancement

- 7.25.5 **Norwood Flight:** Reconstruction will result in temporary disturbance of wetland areas. The lower and middle side-ponds can be sealed with stop planks or temporary bunds to enable works on the locks. Temporary siphons and pipes will be used to carry water down the flight and maintain water flow in both side ponds and the in-water section at the bottom of the flight.
- 7.25.6 The upper pond also forms the canal channel and will require dredging to navigable depth. It is proposed to erect a silt screen along the outer margins of the dredging area to reduce suspended sediment in the "off-line" area. After completion of dredging and other works this will be retained. Following reconstruction similar silt screens will be erected at the entrances to the middle and lower side ponds (navigation will not be permitted in the side ponds). This should prevent sediments suspended by boat movement and propeller wash in the main channel from entering the side ponds. Similar approaches have been employed on the Rochdale Canal with mixed results – the lessons learned there will be applied here (see IWAC 2008).
- 7.25.7 Opportunities for enhancement of reed beds are limited on this section by the built heritage. New lengths of water will be created however by the reinstatement of the section between around the infilled Middle Norwood Treble Locks.
- 7.25.8 The upper four-rise locks will require vegetation clearance and the removal of young scrub woodland. The pound beyond, from the head of the four-rise to the west portal of the Norwood Tunnel, is in water although it is badly silted and partially infilled with reed growth. Some areas, especially on the off-bank are being encroached by thin Alder carr woodland. Clearance and dredging of this channel will result in some loss of that habitat and steps are being take to identify areas where compensatory habitat can be created.
- 7.25.9 The new diversionary route will divert from the original channel in this area and pass into a new shallow cutting to the south of the tunnel portal. This will leave an area in water in front of the portal. A wooden post and rail turning bumper will be installed in the channel to enable boats of 57ft or less to wind here if required. This area between the turning bumper and the portal will be dredged to a shallower profile and retained as shallow water reedswamp. This is the boundary with the Wales section.
- 7.25.10 Given the presence of water vole on the flight a management and mitigation plan based on best practice (e.g. Strachan & Moorhouse 2006, ADA / Natural England

2007) will be produced in conjunction with the detailed works phasing plan. This will set out, in agreement with English Nature and the Wildlife Trusts, the procedures to be adopted to ensure that water vole are excluded from working sites and that the works are staggered and phased so as to allow the gradual step-wise movement of water vole. The potential to incorporate some vole access features in the existing wash walls will be investigated provided it can be made compatible with the need to protect the built heritage.

- 7.25.11 A similar management and mitigation plan will be produced for encouraging bats along the canal line and will include measure such as retaining the old tunnel as a bat roost and incorporating bat roosting niches (“bat bricks”) in extensively modified or new structures.
- 7.25.12 **Nor Wood:** There are no major or protected trees on the Norwood Flight. Construction access to the works may require scrub clearance but there is no requirement to remove woodland. Should it be necessary to remove any tree due to proximity to structures or it’s condition it will be replaced by a native woodland species.
- 7.25.13 The Norwood Flight Feeder Leat runs through Nor Wood. The leat is narrow and in relatively good condition. While overgrown in places it does not require any major works. In consequence all vegetation management, repairs and maintenance work on the leat will be carried out by hand or using hand power-tools thereby minimising potential impact on the woodland.
- 7.25.14 The restoration of the leat will restore a shallow woodland-brook type habitat lost since it was drained.
- 7.25.15 **Killamarsh and Woodall Ponds:** Both Ponds are managed as fishing lakes and there will be no change to that management regime. Use of the water already draining from the ponds should have no effect on the ponds themselves. There are opportunities to improve the ecological management of the pond margins possibly with the engagement of the local fishing clubs.
- 7.25.16 The reinstatement of the Norwood Feeder Leat will reduce the amount of water in the County Dike between the Ponds and the County Dike Culvert. At the latter point water “borrowed” from the system is returned to the Dike from the canal via a side weir. The discharge of the Dike to the west of that point should be unaffected. The County Dike has a poor water quality and ecological condition. A study of the ecology of the County Dike is required to assess the impact, and determine the appropriate levels, of abstraction.

## 7.26 Section 9: Wales

### Issues

- 7.26.1 **Norwood Tunnel East Portal:** The western portal of the Norwood Tunnel is bricked up but the blocking has a single rectangular opening. The opening has allowed the tunnel to be used as a bat roost.

- 7.26.2 The channel leading to the portal is in water and although no water vole has been reported in this location, they are present in the upper pond immediately below this level and it is likely that they will be present here also.
- 7.26.3 **Nor wood Margin:** The transition from the original line to the diversionary route takes place on the edge of Nor Wood. This area of partially replanted ancient woodland is an important and diverse habitat. Works within the woodland will require the clearance of a small area of existing plantation woodland (approximately 25m by 20m). The greatest potential damage is to a small area of woodland margin habitat which contains significant diversity.
- 7.26.4 The Nor Wood is host to several protected species including badgers and bats. The area required for works contains no known badger sett or bat roost. This will be confirmed by detailed survey prior to seeking planning permission.
- 7.26.5 **Summit Pound & Summit Ponds:** The new alignment passes along a field margin of moderate diversity and will follow, and incorporate, an existing field drain. The field drain is steep sided and the water is generally well shaded by surrounding vegetation - a tall grass/herb community. There are no records of water vole on this section (and no evidence of their presence such as latrines, were observed during the walk over survey) however, their presence may be expected as they are frequent on both the Norwood Section and the restored canal at Kiveton Park.
- 7.26.6 The surrounding agricultural land is of low biodiversity.

#### Mitigation & Enhancement

- 7.26.7 **Norwood Tunnel East Portal:** restoration plans have diverted the new canal route south of the original portal. This will enable the eastern portal to remain undisturbed as a bat roost. The structures on the diversion will incorporate bat roosting bricks and niches.
- 7.26.8 The original canal channel will be partially dredged and separated from the new channel by a series of wooden posts to prevent entry by boats. This will enable the old channel to develop as an off-line reserve which will provide excellent conditions for water vole.
- 7.26.9 **Nor Wood Margin:** All works in the area of woodland will be undertaken in winter and early spring. Sequential vegetation removal and installation of mammal fences around the work site, together with capture and release, will ensure no loss of small mammals.
- 7.26.10 There will be a loss of plantation woodland. Cleared trees will be replaced by an equal area of native woodland planting which will be extended along the canal off-bank outside the original area of the woodland. As the key threatened habitat is the woodland margin this should increase the areas of margin type habitat. Soil from the construction area will be cleared and stockpiled separately and will be used to re-soil the margins of the completed works. The contained seed-bank should encourage rapid growth of field layer plants.
- 7.26.11 Canal bank construction will employ soft banks and, wherever possible, reed-shelves, suitable for water vole and water fowl.

- 7.26.12 Wherever possible new structures, such as bridges, will incorporate bat bricks and roosting niches. During landscaping attention should be given to creating areas suitable for badger setts.
- 7.26.13 The reinstatement of the canal will provide an opportunity to improve the ecological management of the Nor Wood, possibly through some form of stewardship or management agreement. This may include the gradual removal and replacement of non-native species with native trees and the creation of minor clearings to increase woodland margin habitats. The woods are a popular local walking location and there are opportunities to engage the local community in their maintenance and management.
- 7.26.14 **Summit Pound & Summit Ponds:** A detailed water vole survey will be undertaken prior to seeking planning permission. The construction of the new alignment will take every precaution to prevent damage to water vole populations through the use of temporary exclusion, sequential vegetation removal and mammal proof fencing. A vole management plan will be agreed before commencement of works with English Nature and all work will be undertaken by appropriately qualified and licensed contractors.
- 7.26.15 A similar survey will be undertaken for Great Crested Newt and, if present, a management plan will be produced prior to seeking planning permission.
- 7.26.16 The new lengths of canal and side ponds will occupy land which is currently used for agriculture. They will diversify the habitats and create a migration corridor linking east and west sections of the canal.
- 7.26.17 The new canal provides a natural extension of the Kiveton Community Woodlands Park and there are opportunities for linking with the volunteer groups already active in the park.

## 7.27 Section 10: Kiveton Park

### Key Features

- 7.27.1 This section of the route includes both recently restored land and an area of ecological interest:
- 7.27.2 The new surface route commences at the eastern boundary of the former Kiveton Colliery site and follows an alignment already defined by a cutting and earthworks along a reserved corridor up to the west side of Hard Lane. This runs through the centre of the reclaimed colliery site and is composed of a new landscaped surface and stone surfaced towpath. On reclamation the canal line was seeded with a grassland seed mixture and since then it has gradually developed a tall grassland/tall herb community. This has low ecological value at this time.
- 7.27.3 At Hard Lane the proposed canal line will enter the remaining segment of the Norwood Tunnel. The line of the tunnel passes under and to the south of the farm track between Hard Lane and the Eastern Portal of the Tunnel. The line of the tunnel being marked by spoil mounds and upcast from the construction shafts. The farm track is sited on spoil from the tunnel construction and is raised above the level of the ground to the north which forms the Pennyholme Marsh.

7.27.4 The Pennyholme Marsh is an area of seasonally flooded shallow-water wetland which is of ecological importance because of its of its flora and its potential value to birds, water vole and herptiles. The south western end of the Pennyholme Marsh site has been damaged by infilling. Following enforcement action by RMBC much of this material has been removed, although the site remains in a fragile condition.

7.27.5 There is potential for damage to this site during the construction period.

#### Mitigation

7.27.6 The Norwood Tunnel repair works will be carried out from the Hard Lane cutting and from the Eastern Portal. The work camp for this section will be located on the hard standing adjacent to Kiveton Waters with works access off Hard Lane. There should be no requirement to undertake surface works along the line of the canal adjacent to the Pennyholme Marsh.

7.27.7 Limited access will be required along the line of the existing farm track for the period of re-construction. The existing farm track is surfaced by rough stone and earth. It is used by farm vehicles and also forms the line of the Cuckoo Way across the tunnel top between Hard Lane and the Eastern Portal. During reconstruction the farm track will be surfaced with coarse crushed stone on a terram base.

7.27.8 Upon completion of works this will be either (a) retained in full and surfaced with a finer gravel top layer to provide a combined farm access track and Cuckoo Way or (b) (should farm access not be required) the coarse stone will be partially removed to leave a 2m wide corridor which will be surfaced with finer stone and toptrek to provide a fully surfaced Cuckoo Way through the site. In each case the objective will be to minimise damage to existing local habitats by working within track wherever possible.

#### Enhancement

7.27.9 The creation of new waterspace though the centre of the Kiveton Colliery Site (now Kiveton Community Woodlands) will increase the range of habitats on the site through the use of a channel profile with an off-bank reed shelf.

7.27.10 The existing shallow water reserves and ponds adjacent to the canal line will be retained and will continue to take drainage water from the colliery tip. This water after passage through the shallow ponds and reedbeds will be fed into the canal.

7.27.11 Additional wetland areas may be created on the off bank of the canal route between the new Kiveton Bridge and Hard Lane. The opportunity should be taken to explore the creation of area of new wet woodland in this area.

#### Engagement

7.27.11 The Kiveton Community Woodlands are managed by the Forestry Commission who are working to develop better links with the local community. There is scope to develop these links to manage the wetland corridor which will be threaded through the woodlands site.

# Conclusions

## 7.28 Next Steps

7.28.1 Sufficient is now known to be able to identify those locations where there is a potential for damage to habitats or where there are likely to be protected species. Sufficient is also now known of the habitats along the route to identify where enhancement of biodiversity may be undertaken.

### Further Ecological Study Before Commencement of Works

7.28.2 Further work is required on the extent and condition of those habitats and species which have been identified as being at risk from the restoration works. This is in order to quantify the risks and to design appropriate avoidance, protection, mitigation and compensation measures.

7.28.3 In order, therefore, to formulate a satisfactory ecological management plan for the canal track, it will be necessary to gather more information. This will include:-

7.28.4 Detailed ecological survey of the Nethermoor Lake, Norwood Industrial Estate, Norwood Bottom, Norwood Flight & Ponds, Nor Wood and Pennyholme (Tunnel Top) Lengths (those congruent with known wildlife sites) to establish current condition and distribution of key and protected taxa.

7.28.5 Further survey of protected species in the new build canal corridor. Including, for example, elements of “unlikely” or “blank spot” testing for Great Crested Newt, etc.

7.28.6 Any additional Surveys identified as required by the projects consulting ecologist.

7.28.7 **Outcome:** Better understanding of the ecology and natural heritage of the canal track to enable the final revision of the engineering design to incorporate ecological constraints.

*Overleaf – recommended periods for further survey work on key Species and Habitats*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wintering Birds												
Breeding Birds												
Badgers												
Water Vole												
Common Dormice												
Otters												
Bats												



- 7.28.17 Integrate the habitat management plan with the conservation management plan for the built heritage.
- 7.28.18 Set out an appropriate long term management strategy for the ecology of the canal track and the ways in which it should be monitored to assess the effectiveness of the protection, mitigation and enhancement measures. This data should feed into the five yearly review of the management plan.
- 7.28.19 **Output:** An Ecological Management Plan for the Canal.

