

# Next Navigation East:

## Part 5: Geology, Geomorphology & Soils

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## 5 Environment: Geology, Geomorphology & Soils

### 5.1 Landscape & Topography

- 5.1.1 From Chesterfield to Killamarsh the Chesterfield Canal broadly follows the valley of the River Rother. At Killamarsh the canal turns eastwards and ascends the scarp slope of the Coal Measures escarpment which here forms the eastern flank of the Rother Valley. The canal ascends using the course of a minor stream, before crossing the watershed (formerly in a tunnel and, as now planned, in an open cut) and descending the dip slope of the escarpment eastwards to Kiveton Park. This ascent marks out the length from Killamarsh to Kiveton Park as the boldest section of the original Chesterfield Canal.
- 5.1.2 The Rother Valley runs south to north and is a broad, asymmetrical valley. The valley floor itself, as might be expected, is alluvial, relatively flat and varies between 200 m and nearly 1000 m in width. Valley floor features include former river channels, abandoned meander cut offs and extensive evidence of human modification of the river course in the form of dams, weirs and associated leats and lades. In this section the Rother valley floor has a gentle gradient descending from 50 m AOD at Staveley (Hall Lane) to 43 m AOD at Rother Valley Country Park -- a fall of 7 metres in a distance of around 7 kilometres (a gradient of c.1 in 1000).
- 5.1.3 The western flank of the valley slopes very gently away from the floodplain taking around 1.5 to 2 km to climb to around 150 m AOD. The valley side is rolling and dissected by two long eastward flowing streams – the Fox and Moss Brooks – these form their own distinct valleys which run east to west and contribute to the generally rolling and confused appearance of this area.
- 5.1.4 The eastern flank is formed by an escarpment in the Coal Measures and rises more steeply from the floodplain reaching 90 to 100 m AOD within 0.5 km of the Rother floodplain.
- 5.1.5 The eastern flank is also dissected by the valleys of tributary streams, most notably the Doe Lea, Smithy Book and Park Brook. This gives rise to a dissected topography -- the valleys appear more pronounced from the valley floor than those to the west because of the relative steepness of the eastern escarpment. The long profiles of the streams east of the River Rother are steeper than those to the west. The steep gradient and narrowness of the valley made them attractive to water powered industries and most of the eastern tributary valleys contain the remains of mill and forge dams.
- 5.1.6 At Killamarsh the eastern valley flank is dissected by the Church and County Dikes both of which form minor valley features. The canal utilises the line of the County Dike Valley to ascend the Coal Measures escarpment.
- 5.1.7 The crest of the escarpment is a marked landscape feature and clearly delimits the Coal Measures landscapes to the west from the Magnesian Limestone landscapes to the east.

- 5.1.8 The area was formally dominated by the iron & steel, chemical and coal mining industries. All three industries have left their mark upon the landscape and have left a legacy of polluted brown field land. At several locations industrial activity has been extensive enough to change the topography.
- 5.1.9 The greatest long term impact has been from coal mining. Shallow coal pits and bell pits of Medieval, post-Mediaeval and the early industrial age are common throughout the area. More significant impacts were wrought by the later 19<sup>th</sup> and 20<sup>th</sup> century deep mines. Along the canal route there were pits at Westhorpe (near Killamarsh), Norwood, Kiveton and Kiveton Park. These all contributed to mining subsidence and the creation of new wetland “flashes” together with the accumulation of colliery spoil heaps which have subsequently been landscaped or removed, often by surface mining (e.g. Kiveton Park Colliery tip is now the centre piece of the new Community Woodlands and offers visitors striking views over the surrounding countryside).
- 5.1.10 The latter years of the 20<sup>th</sup> century saw extensive surface coal mining (opencasting), often in tandem with the reclamation of the surface workings of deep mines. This has removed much of the evidence of former industry but has created entirely new landforms which may differ greatly from the landscape prior to industrialisation (see for example Rother Valley Country Park).
- 5.1.11 The iron and chemical industries have also contributed to changing the landscape between Killamarsh and Kiveton Park. Both industries utilise similar settings and both require extensive water supplies. This has resulted in re-profiling of the valley floor and changes to drainage (including river diversions). Both Iron and Chemical industries have produced extensive waste products which now form significant topographic features even where landscaped (e.g. north of the canal at Norwood Industrial Estate).

## 5.2 Landscape Character

- 5.2.1 A detailed landscape character assessment of Derbyshire was published in 2004. An equivalent study for Rotherham is currently (as of September 2009) in progress with interim results published. It is, however, evident from the work done to date that the Derbyshire – Rotherham boundary at this point is not marked by any major change in geology, geomorphology, history, landuse or settlement pattern; the landscape character types observed in Derbyshire continue into Rotherham. In this report the terminology of the Derbyshire report is used to describe the key landscape units and the proposed, but not yet settled, Rotherham terminology for comparable units is shown in brackets.
- 5.2.2 The Chesterfield Canal from Killamarsh to Kiveton Park runs through the Derbyshire Coalfield and South Yorkshire Coalfield. This is a broad belt of relatively low lying land approximately 45km long by 10km wide which forms part of the greater **Nottinghamshire, Derbyshire and Yorkshire Coalfield Region** (National Character Area 38). This area is “densely settled and industrial lowland characterised by mining settlements, mixed farming and woodland”. Even through this length of canal is relatively short it still passes through a number of Landscape Character types. (See The Landscape Character of Derbyshire, DCC 2004).

- 5.2.3 In Killamarsh the length commences at the transition from **Wooded Farmlands** to **Urban Conurbation**. Throughout Killamarsh the route is urban although flanked in places by recreational grassland. It remains in that character until it enters Rother Valley Country Park and Nethermoor Lake. Rother Valley Country Park was formed from extensively landscaped opencast workings, although after careful remediation it now shares many characteristics with the adjacent **River Meadows** of the Rother Valley (in the RMBC study the “Rother Valley”).
- 5.2.4 As the original line is regained, the reclaimed landscape of the Rother Valley Country Park gives way to **Wooded Farmlands** and then almost immediately to a small area which may be more properly described as **Wooded Hills and Valleys** (the RMBC study includes both in the “Thrybergh and Treeton Tributary Valleys”). The latter is marked by the presence an area of semi-natural ancient woodland – the Nor Wood.
- 5.2.5 At the crest of the Coal Measures escarpment at Norwood the character again changes and the route enters **Coalfield Village Farmlands** for the passage over the summit (RMBC describe this as “Thurcroft Plains”). It remains in that character until Kiveton Park.
- 5.2.6 To the east of Kiveton Park (and outside) of the restoration study area there is a further marked change to the **Magnesian Limestone Village Farmlands** (in the RMBC study the “Dinnington Limestone Plateau”) which marks one of the three main landscape character changes along the entire length of the canal from Chesterfield to West Stockwith. (The others being the transition to Triassic red sandstones around Worksop and to Quaternary gravels of the Idle and Trent east of Retford).
- 5.2.7 The main features of the relevant landscape characters of the Derbyshire & South Yorkshire Coalfield are summarised in the figure below. By way of comparison this also shows the characteristics for the related Estate Farmlands (found further south around Staveley).
- 5.2.8 The Landscape Character of Derbyshire (DCC 2004) proposes a series of planting and management guidelines (based on national guidance) for different landscape characters. These, together with the recommendations of the forthcoming Rotherham Metropolitan Borough Council report, will be adopted by this project as a guide to the remediation of land affected by works.

### **The Canal as an integral element of the Landscape**

- 5.2.9 The Chesterfield Canal was established as a landscape feature across North Derbyshire, South Yorkshire and North Nottinghamshire between 1768 and 1777. Its construction is part of the story of the early industrial revolution and comes about at a point where the landscapes of England were undergoing profound change and re-organisation (cf. Pawson 1979). (see Chapter Eight for further discussion with regard to the Canal corridor).

<b>Character Area</b>	S Yorkshire, Nott's & Derbyshire Coalfield	S Yorkshire, Nott's & Derbyshire Coalfield	S Yorkshire, Nott's & Derbyshire Coalfield	S Yorkshire, Nott's & Derbyshire Coalfield	S Yorkshire, Nott's & Derbyshire Coalfield
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LCT	DCR	DCF	DCE	DCW	DCH
<b>Type Name</b>	<b>Riverside Meadows</b>	<b>Coalfield Village Farmlands</b>	<b>Estate Farmlands</b>	<b>Wooded Farmlands</b>	<b>Wooded Hills &amp; Valleys</b>
<b>Geology</b>	Alluvial drift (silt, mud & gravel)	Coal measures	Coal measures	Coal Measures	Coal Measures
<b>Soil</b>	Seasonally waterlogged gleys	Heavy, seasonally waterlogged	Heavy, seasonally waterlogged	Heavy, seasonally waterlogged	Heavy, seasonally waterlogged
<b>Land Uses</b>	Pasture	Pasture	Mixed arable	Pasture	Mixed farming
<b>Main Habitat Type</b>	Wetland	Unimproved pasture	Farmland	Unimproved pasture	Woodland
<b>Other habitat</b>	Unimproved pasture	Acid grassland/heath	Acid grassland/heath	Woodland	Acid grassland/heath
<b>Woodland Character</b>	Un-wooded	Thinly scattered small woodlands	Thinly scattered small plantations & occasional remnant ancient woodlands	Thinly scattered small woodlands	Densely scattered small-medium woodlands
<b>Woodland Vision</b>	Occasional small wet woodland	Densely scattered small woodlands	Occasional medium-large plantations	Widespread small irregular woodlands	Widespread small-medium woodlands
<b>Woodland Type</b>	Alder-crack willow with downy birch	Oak-birch with ash, downy birch & hazel	Oak-birch with ash, downy birch & hazel	Oak-birch with ash, downy birch & hazel	Oak-birch with ash, downy birch & hazel
<b>Hedgerow trees</b>	None	Thinly scattered	None	Thinly scattered	Densely scattered
<b>Watercourse trees</b>	Dense	Dense	Scattered	Densely scattered	Dense
<b>Amenity trees</b>	None	Localised around settlement	Localised around settlement	None	Localised around settlement
<b>Boundary Type</b>	Thorn hedgerow	Mixed species hedgerows	Thorn hedgerows	Mixed species hedgerows	Mixed species hedgerows
<b>Settlement Character</b>	Unsettled	Villages & scattered farmsteads	Villages & scattered farmsteads	Scattered farmsteads	Hamlets & scattered farmsteads
<b>Traditional Materials</b>	Not applicable (Sandstone and brick structures)	Sandstone with Welsh slate roof	Sandstone with Welsh slate or red clay pantile roof	Sandstone with Welsh slate or red clay pantile roof	Sandstone with Welsh or stone slate roof
<b>Cultural Interests</b>	Canals & railways, Industrial heritage	Strip fields around villages, Industrial heritage	Renishaw Park	Hardwick Park	Ancient woodland

Figure 5.1 Landscape character types present in or near the canal corridor between Killamarsh and Kiveton Park

Source: The Landscape Character of Derbyshire, Derbyshire County Council 2004

5.2.10 The fact that the canal is an integral part of the enclosure landscape is most acutely demonstrated around Retford where the pattern of enclosure field boundaries is articulated off the canal line and many post enclosure “model” farms are situated

alongside the canal and have their own wharfs. Examples of “farm wharfs” can be found at Osberton, Clarborough, Heyton, Clayworth, Wisteon, and Misterton.

- 5.2.11 While across most of the route the canal’s construction is either roughly coeval with or slightly predates enclosure, there are locations where the canal cuts across earlier enclosure. At Killamarsh, for example, the canal cuts across field boundaries which reflect fossilisation of strip cultivation patterns. Even as late as the 1890’s, land ownership of the severed strips either side of the canal is often found in the same hands.
- 5.2.12 Landscape development following the opening of the canal is obviously strongly influenced by the canal route. The canal forms a barrier to movement across its course and in consequence development tends to occur around key bridge points and those locations where communities of canal workers became established. In Killamarsh the expansion of the former scatter of hamlets into a larger urban area commences with domestic and industrial infill between Malinders Bridge (with its wharf and warehouse) and Church Town with its side cut and coal wharf. A process that can be traced through successive editions of parish plans and maps.
- 5.2.13 Between the Chesterfield and Killamarsh the canal route was partly realigned by the Manchester, Sheffield & Lincolnshire Railway in the 1890’s. The diverted sections clearly cut across the older boundaries and form a new spine along which a partial late-Victorian landscape reorganisation takes place, usually incorporating new woodlands and estate buildings.
- 5.2.14 Today the proposed route is marked by the Cuckoo Way Trail (an established footpath and public right of way) together with hedgerows and, in places, by lines of mature trees and is an integral part of the character of the established landscape. In some locations, however, the line has become fragmented with the canal now only marked by the route of the Cuckoo Way along the edges of open agricultural fields.

### **Potential Impact of Canal Reinstatement on Landscape Character**

- 5.2.15 The canal has been an integral part of the landscape of North Derbyshire, South Yorkshire and North Nottinghamshire for over 230 years. During that time it has become important to the development of industry and settlement and to the landscape’s overall appearance.
- 5.2.16 Restoration of the original canal line will preserve this historic relationship with the area’s landscape character and will strengthen it by (a) progressive reintroduction of defining features which have been lost and (b) regular maintenance of landscape features. In the case of the towpath bank hedgerows, for example, the proposals below would retain the major hedgerow and tree elements which are present today in the landscape while enabling the reconnection of the surviving fragments into a coherent whole.
- 5.2.17 It may, therefore, be argued that reinstatement and subsequent operation and long term management of the canal will protect the route as a significant visual, heritage and ecological element in the landscape.
- 5.2.18 Where new lengths of canal are proposed, the route selected has been chosen to minimise intrusion into the existing landscape by minimising earthworks (through

careful balance of cut and fill to reduce cuttings and embankments) and through the use of existing hedge lines and field boundaries as the off bank fence line of the new cut. In addition, the disposition of structures is designed to maintain all existing linkages within the landscape and not to introduce additional barriers. The intention is that the new sections will reinforce the existing pattern of land allotment and not strike across or slight it. Care has been taken to ensure that the new line links sensitive habitat areas and does not cut through them or reduce their area.

- 5.2.19 In setting out to restore and reinstate the Chesterfield Canal, all works will take full account of the landscape character of the Canal Corridor 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.

### **5.3 Geology, Geomorphology & Geomorphic History**

- 5.3.1 The Chesterfield Canal runs west to east across the grain of the country and crosses four major groups of rocks which become progressively younger as one goes eastwards. The canal commences in Chesterfield on the Carboniferous Coal Measures, reaches the Permian Magnesian Limestone at Kiveton Park and Triassic Sandstones at Worksop. It then reaches Kueper Marl at Hayton and runs onto Quaternary (late Pleistocene and Holocene) sands and gravels in the Trent Valley at West Stockwith.
- 5.3.2 The Killamarsh to Kiveton Park section of the Canal route runs entirely upon sandstones, shales and coals of the Carboniferous Coal Measures (Smith et al 1967). The general strike of these rocks is north-south and they have a general eastern or north-easterly inclination. Superimposed on this broad trend are a series of north-south orientated basin-like synclinal depressions separated by uplifted anticlines (e.g. Brimington Anticline) which were created by (possibly Hercynian) earth movements of pre-Permian age. Faulting within the Coal Measures is complex but is dominated by North-South fault lines. A significant local fault, the Spa Fault, orientated north-west to south-east, runs through the former Kiveton Park colliery site and is downthrown to the north-east.
- 5.3.3 Throughout the canal corridor, Carboniferous rocks outcrop at surface and both coal and, to a lesser extent, ironstone has been mined since Mediaeval times and possibly earlier (Eden et al 1957). Coal seams that outcrop across the proposed canal alignment are all to the west of the M1 motorway (i.e. are exposed on the scarp slope of the escarpment). There is evidence for shallow mine workings in the 1st and 2nd Wales coal seams beneath the M1 motorway and eastwards beneath the proposed route. These workings now appear to be stable as repeated survey of this route since the 1980's has failed to record subsidence.
- 5.3.4 The inter-bedded sandstones, siltstones and mudstones within the Coal Measures are classed as a minor aquifer, although no public water supplies are abstracted from them in the canal corridor. Due to the abandonment of deep mining, the groundwater levels are now relatively high and can be tapped very near the surface.
- 5.3.5 To the east of Kiveton Park the Canal passes onto the Permian Magnesian Limestone. The Permian rocks rest unconformably on a much eroded

- Carboniferous surface and give rise to a definite limestone “upland plateau” with a distinctive landscape character (Smith et al 1967).
- 5.3.6 The result is a strong geological control on landscape evolution. The north-south orientation of the Rother Valley is probably controlled by the underlying structure of the Coal Measures since the early Pleistocene precursor streams of the River Rother probably followed a west to east course to ultimately drain into the proto-Trent system (cf. Briggs, Gilbertson and Jenkinson 1985, Coles 1988).
- 5.3.7 Pleistocene and recent deposits in the study area are rare and extremely fragmentary and of necessity much has to be inferred from adjacent areas.
- 5.3.8 Patches of erratic pebbles and weathered diamicton (till / boulder clay) occur on the upper flanks of the Rother Valley north of Eckington and north and east of the canal corridor area around Todwick, Kiveton Park and Anston. Further small patches occur across the Magnesian Limestone at Thrope Salvin, Thorpe Common, Whitwell Common and south to Clowne. A small area of possible fluvio-glacial sands and gravels occur around Beighton. Some show extensive post-depositional cryoturbation. There is no evidence that Devensian ice crossed this area (Jones and Keen 1993) and it is likely that these deposits originate in a previous cold stage (Anglian?).
- 5.3.9 The presence of erratics and diamicton on the upper flanks of the Rother Valley does demonstrate that the basic topography of the area was created before the Anglian glaciation. This accords with more extensive evidence from the White Peak to the west and the Dukeries to the east (Briggs, Gilbertson and Jenkinson 1985, Coles 1988).
- 5.3.10 Deposits which demonstrably relate to the Devensian Cold Stage are also rare; valley fills of periglacial solifluction deposits (known as “head”) occur in tributary valleys running down the scarp slope at Staveley, Renishaw and the County Dike and on the valleys on the dip slope at Broad Bridge Dike. The Geological survey shows a large area as solifluction deposits to the north of Kiveton Park Station. This area is, however, in a topographically anomalous position (it is on an upper hill slope and hill top not on a valley floor). When examined in the field it appears to grade into the surrounding “boulder clay”, and is hard to differentiate from it, suggesting that is simply a continuation of the exposure of weathered diamicton in this area.
- 5.3.11 High level river terraces of possible late-glacial age occur on the Rother at the confluence of the Rother and the Doe Lea between Staveley and Renishaw (Eden *et al* 1957). Areas of possible “patterned ground” (cryoturbation structures) have recently been noted south of Killamarsh on air photographs (Coles 2006).
- 5.3.12 Holocene alluvium occurs throughout the Rother but has been significantly disturbed by industrial activity (including wholesale open cast extraction in some areas). There are no known Holocene palaeoecological sites within the study area but there is potential for short term records in abandoned or artificially cut off meanders of the River Rother at Killamarsh.
- 5.3.13 Holocene alluvium in the shallow valleys draining the dip slope of the coal measures escarpment is thin and patchy and dominated by fine grained alluvial silts with lenses of sand and gravel. Where examined in detail and dated (e.g. Coles 1988), these valley fills appear to have been subject to continual re-working and re-

deposition during the later Holocene. This is arguably a reflection of the intensity of land use and industrial activity from the 1700's onwards (Coles 1988).

## 5.4 Sites of Importance to Earth Science

- 5.4.1 Geologically and Earth Science sites of particular national importance may be protected as Sites of Special Scientific Interest. Other sites of importance may be recorded as being Regionally Important Geological Sites (RIGS).
- 5.4.2 There are no geological SSSI or RIGS sites on the canal track. There are no geological SSSI within the canal corridor.
- 5.4.3 Within the wider canal corridor and immediately adjacent area there are three RIGS, none of which will be affected by the restoration proposals. These are:-
- 5.4.4 **Westhorpe Railway Cutting**, Killamarsh. Carboniferous Coal Measures. Site located approximately 550 m from the canal track.
- 5.4.5 **Red Hill Quarry** SK503828 RIGS Inventory Site Number R66. Lower Magnesian Limestone, Permian. Outcrop of red sandy limestones with marl. Reason for schedule: "Exceptional example of this horizon with important geological features relating to ancient environment of deposition not seen in accessible exposure elsewhere. Research interest." The site is located approximately 200 m from the already restored canal at Dog Kennels Bridge, Kiveton Park.
- 5.4.6 **Kiveton Lodge (2)** SK508827 RIGS Inventory Site Number R68. Lower Magnesian Limestone, Permian. Thick section of sandy and reddened limestones, with lower marl beds. Reason for schedule: "Unique geological features relating to ancient environment of deposition." – located approximately 350 m from the already restored canal at Dog Kennels Bridge, Kiveton Park.

## 5.5 Soils

- 5.5.1 The paucity of glacial deposits means that the majority of soils are determined by local parent materials although it is likely that there is a "hidden" loessic component. The Soil Survey of England and Wales (1984) recognised three principle soil groups in the area:-
- 5.5.2 Bardsey Soil Association (713a): Surface water gleys, seasonally waterlogged and slowly permeable soils which have developed largely over soft rock, in this case the Carboniferous Coal Measures. They vary slightly in drainage capacity – with those developed over sandstones tending to be better drained. Bardsey soils are found on gently undulating to rolling terrain between 10 and 140 m AOD and are extensive throughout Northern England.
- 5.5.3 Conway Soil Association (811b): Deep stoneless, fine silty soils found on the flood plains of rivers and streams affected by high ground water levels and are seasonally waterlogged by winter flooding.
- 5.5.4 Disturbed (anthropogenic) Soils (92c): At several locations the soils are the product of extensive ground disturbance. In some cases this is due to industrial activities

(e.g. iron smelting) and the addition of materials such as ash and slag. More commonly the disturbance is the result of open cast mining which commenced in the 1940's and 1950's and continues sporadically to the present. The restoration of open cast sites involves return of old soil material which is obviously mixed. A typical former opencast soil is therefore a loamy soil of varying thickness over a slowly permeable, compact clay loam, silty clay loam or clay sub-soil.

- 5.5.5 Soils within urban and industrial areas were not surveyed by the Soil Survey and are not classified. Where these soils have been recorded they are modified versions of the original soil type. The degree of modification varies but in many cases it is significant enough for them to be described as anthrosols.

### **Agricultural Quality**

- 5.5.6 Generally the soils of the canal corridor and track, in common with much of the Coalfield area, are relatively poorly drained and, in agricultural terms, may be regarded as being cold and heavy. As a whole the area traditionally supports dairy farming but, where soils are freer draining over sandstone, there is more extensive arable cropping.
- 5.5.7 The alluvial soils on the floor of the Rother Valley are seasonally waterlogged gleys of poor agricultural versatility and are Grade Four. They are used for pasture with some cropping for silage.
- 5.5.8 The soils of the surrounding valley sides are poorly drained heavy soils prone to seasonal water-logging and are Grade Three. Use depends on local topography and the intensity of field drain use.
- 5.5.9 The soils of the dip slope of the Coal Measure escarpment are also generally grade three but are slightly more free draining and, while dominated by pasture, there is a higher proportion of arable cropping.
- 5.5.10 There are no areas of grade One or Two soil (soils with the highest versatility of agricultural use) on the canal track but they do occur in the canal corridor to the east on the Magnesian Limestone (outside the Killamarsh to Kiveton Park study area).
- 5.5.11 The entire Canal Track lies within an area designated as a Nitrate Vulnerable Zone.

### **Soils along the Canal Route**

- 5.5.11 The distribution of soils along the proposed route has been determined by reference to Soil Survey data supplemented by survey reports from adjacent projects, geotechnical logs and field observations.
- 5.5.12 The proposed canal route commences at Killamarsh on soils of the Bardsey Soil Group. At Walford Road the route passes onto anthropogenic soils (urban soils) and more heavily disturbed areas of the Bardsey Soil Group.
- 5.5.13 Less disturbed areas of Bardsey soils occur along the margins of the Norwood Flight with well established woodland soil variants occurring beneath the semi-ancient Nor Wood. Further areas of disturbed ground and anthrosols occur on the site of the former Kiveton West Colliery and adjacent to the M1 motorway.

5.5.14 From the M1 Motorway the route passes onto relatively undisturbed and relatively poorly drained Bardsey Group soils. These continue to the edge of the former Kiveton Colliery site where they again give way to heavily modified anthropogenic soils.

## 5.6 Contaminated Land

5.6.1 The history of heavy industry and dense settlement has left a legacy of contaminated land throughout the district. Evidence for contaminated land in the canal corridor has been derived from Environment Agency and British Geological Survey records supplemented by field observation.

5.6.2 Three main sources of contaminated land are present:

- Landfill and ground disposal
- Mine workings
- Iron & Chemical works

5.6.3 The distribution of contaminated land in the canal corridor is shown in figure 5.2. It is apparent that the majority of potentially contaminated sites lie at the Killamarsh end of the corridor and cluster along the County Dike.

### Landfill and Ground Disposal

5.6.4 Landfill sites are classed according to the type of waste they receive:

- **Hazardous waste** - This is waste that may be harmful to human health or the environment e.g. asbestos, chemicals, healthcare waste, electrical equipment, lead-acid batteries, oily sludges and pesticides.
- **Non-hazardous waste** - This may include municipal waste, general office waste and catering waste.
- **Inert waste** - This is waste that does not undergo a significant physical, chemical or biological transformation such as construction and demolition waste.

5.6.5 Figure 5.2, below, lists the known historic and active landfill sites in the area.

5.6.6 It will be noted that the majority are now historic landfill sites and only one, Steetley Quarry, remains active. The majority of sites lie more than 200m from the proposed canal track. The exceptions are the infill of the Canal at Old Hall Farm and the former Kiveton Colliery tip. The former is a relatively small area (see figures) which falls within the Western Division area and whose treatment is reported in "Next Navigation West: Restoration of the Chesterfield Canal from Staveley to Killamarsh" (CCP 2009).

5.6.7 The former Kiveton Colliery site has already been subject to a full and complete remediation (English Partnerships 2004) and the site now forms the Kiveton Community Woodlands run by the Forestry Commission. As part of this remediation a canal track was cleared across the site and a surface cutting formed. No further remediation this site is required prior to reinstatement of the canal (see Chapter Ten).

EA Site Name	Location	Grid Reference (centred)	Type of Fill	Relationship to proposed canal line	First waste received	Last waste received
SW Corner of Site	Forge Lane, Killamarsh	SK 4459 8090	Non-hazardous waste, foundry waste	Not on Canal Line (>200 m from track)	31 Dec 1981	31 Dec 1992
Old Chesterfield Canal	Adjoining Old Hall Farm, Station Road, Killamarsh	SK 4479 8069	Non-hazardous & Inert waste	In Canal track proposed for reinstatement (See Western Division)	31 Dec 1979	31 Dec 1980
Canal to the east of Nethermoor Lane	Killamarsh	SK 4610 8103	Non-hazardous waste	On old line of canal NOT used in reinstatement (>300m from line)	31 Dec 1977	30 June 1978
Norwood Chemical Works	Rotherham Road, Killamarsh, Derbyshire	SK 4649 8200	Non-hazardous waste	Not on Canal Line (>250 m from track)	31 Dec 1977	31 Dec 1993
Rother Valley Country Park	Mansfield Road, Wales Bar, Near Sheffield	SK 4664 8209	Non-hazardous waste	Not on Canal Line (>300 m from track)	31 Dec 1984	31 Dec 1990
Railway Cutting	Off Mansfield Road, Norwood	SK 4740 8203	Non-hazardous waste	Not on Canal Line (>200 m from track)	31 Dec 1969	31 Dec 1976
Disused Tip, Kiveton Park, Chesterfield Canal	Colliery Site, Kiveton Park, Sheffield, Rotherham	SK 4905 8251	Colliery waste	On canal line but canal corridor already remediated	? 1865	31 Dec 1992*
Steetley Quarry	Steetley Quarry, Red Hill, Kiveton Park, Sheffield, Rotherham	SK 5029 8263	inert waste	Near already restored canal at Dog Kennel Bridge Kiveton Park (>500 m from line)	31 Dec 1965	Active

Notes: \* Remediation and reclamation of the colliery site completed in June 2005.

**Figure 5.2 Historic and Active Landfill sites along the Canal Corridor**  
 (source: Environment Agency 2009)

5.6.8 Two sites, Norwood Chemical Works and the Railway Cutting Norwood, are buffered by substantial “Land Fill Gas Consultation Zones”. The restoration route of the canal passes through the both zones and this will be a factor in the design of the ground investigation works to be undertaken in the detailed design phase. The location of landfill sites will also affect the potential locations of water supply bore holes should ground water sources be sought (see below).

#### Mine Workings

5.6.9 As might be expected from a former mining area, coal mining has left a legacy of spoil tips and shafts. The main sites along the canal corridor are listed in Figure 5.3 below.

5.6.10 Each of the Collieries noted has left areas of contaminated ground. In all cases the site have undergone varying degrees of reclamation and remediation. The site of Norwood Colliery is now under the Norwood Industrial Estate, West Kiveton has been reclaimed to form private grounds, High Moor Colliery is pasture land and Kiveton Park (the largest site) is a public country park.

- 5.6.11 Of the large colliery sites only Kiveton Park lies on the canal track. All have been subject to large scale remediation and none should now pose problems for the restoration of the Chesterfield Canal.
- 5.6.12 Other small scale colliery sites – generally of early 19<sup>th</sup> century date and earlier -- have been identified by the archaeological and heritage surveys (see Appendix B for the Heritage Map and Gazetteer). None of these older pits and shafts lie on or near the restoration route or the proposed access points. Shallow workings may extend under the proposed canal line but there is no evidence that these are actively subsiding (survey lines run from Killamarsh to Kiveton along the proposed route in 1990, 2004 and 2009 show no change in level). The problems posed by mining are discussed further in Chapter Ten.

Site Name	Location	Grid Ref	Operating	Type of contamination present	Relationship to proposed canal line
Highmoor Colliery	High Moor Lane, High Moor, Killamarsh	SK 4682 8002	1870 - 1980	Colliery waste	Not on line (>1000 m)
Norwood Colliery	Colliery Site, Rotherham Road, Norwood.	SK 4659 8184	1867 - 1950	Colliery waste	Not on line (>200 m)
West Kiveton Colliery	Upper Norwood, Killamarsh	SK 4740 8220	1874 - 1931	Colliery spoil, tar residues (coking bank)	Not on line (>50 m)
Wales Collieries	South of Coal Pit Lane, Wales	SK 4820 8180 (Estimated)	c.1850	Colliery waste	Not on line (>50 m)
Kiveton Park Colliery	Colliery Site, Kiveton Park, Sheffield, Rotherham	SK 4905 8251	1866 - 1992	Colliery waste	On Line but site now reclaimed with allowance for canal track including cutting

Figure 5.3 Historic Colliery sites along the Canal Corridor (source: Geological Survey 2005 & Environment Agency 2009)

#### Iron & Chemical Works

- 5.6.13 In North East Derbyshire and South Yorkshire metal working and chemical production and processing have also made significant contributions to the creation of contaminated land. In the Killamarsh to Kiveton Park canal corridor these industries are represented by:-
- Killamarsh Forge Operating c.1820 to present.
  - Derbyshire Chemical Works. Operating c.1870 to present (under different names)
  - Norwood Chemical Works Operating c.1865 – 1920.

- 5.6.14 None of the sites recorded lie on the canal line and none will be disturbed by the proposed works.
- 5.6.15 Where the active plants discharge to water they do so down stream of the potential canal feeder points and care will have to be taken not to reduce the dilution factors for these discharges. Where chemicals are discharged to air none require exclusion zones which would prevent development along the canal line.

Site Name	Location	Grid Ref	Operating	Type of contamination present	Relationship to proposed canal line
Ross & Catherall Ltd., Killamarsh Forge	Forge Lane, Killamarsh	SK 4459 8090	c. 1820 – to date. Active	Non-hazardous Foundry waste	Not on line (>200 m)
Derbyshire Chemical Works	Norwood Lane, Norwood Killamarsh (now part of industrial estate)	SK 4620 8190	?1870 - 1947	Chemical	Note that Polymeric and Onyx operate from the same site as the Derbyshire Chemical Works.
Polymeric Treatments Ltd.	Norwood Industrial Estate, Rotherham Road, Killamarsh, Derbyshire, S21 2DR	SK 4624 8201	Since 1947 (under different ownerships )- <b>Active</b>	Chemical	For contamination assessment they are one site.
Onyx Leigh Environmental Limited	Norwood Industrial Estate, Rotherham Road, Killamarsh, Derbyshire, S21 2DR	SK 4624 8201	Since 1947 (under different ownerships )- <b>Active</b>	Chemical	The site is NOT on the canal line and is >100m from canal track at closest point – most of site is >200 m distant.
Norwood Chemical Works	Rotherham Road, Norwood, Killamarsh.	SK 4683 8180	?1865 - 1920	Chemical. Site part remediated in the 1990's	Adjacent to surviving in-water length. Will not be disturbed by works

**Figure 5.4** Historic and Active Iron and Chemical Work Sites Colliery sites along the Canal Corridor (source: Environment Agency 2009)

### Relationship of Contaminated Land to the Proposed Canal Reinstatement

- 5.6.16 The distribution of potentially contaminated sites follows the canal line but does not impede the on going restoration of this section.
- 5.6.17 It should be noted that the Kiveton Park Colliery site was extensively remediated by English Partnerships as part of the creation of the Kiveton Community Woodlands. During this process the canal track was cleared and cleaned – no additional work will therefore be required prior to construction of the new canal channel and the spoil arising will be used on site and will not require disposal to a secure landfill site.

5.6.18 Contaminated land also contributes to groundwater pollution and this is discussed further in Chapter Six.