Appendix 1. Bradford Beck – A History

The West Yorkshire city of Bradford is located in the eastern foothills of the Pennines. The local geology is ancient and includes the Bradford Coal Measures that are rock formations dating from the Carboniferous period of 310 million years ago [1]. Like most of the UK the land that makes the area of Bradford was fundamentally shaped by the succession of ice ages over geological time. During the ice ages the land in which Bradford sits was covered by a succession of large ice lakes of which the remains of their sediment deposits can be found on the slopes of the hills of Bradford.

The history of the beck system reflects the history and development of Bradford as a city and it is possible that the beck and its springs and tributaries may have been serving human and proto-human populations for around 800,000 years, which dates to the earliest recorded finds of human activity in the British Isles [2]. The written record notes the area as being settled in Saxon times and in 1086 it was known as "Bradeford" [3]. The name of the town related to the 'ford' or bridge over the central beck, near the Cathedral, although Bridge Street hasn't had an open stream or bridge for 140+ years.

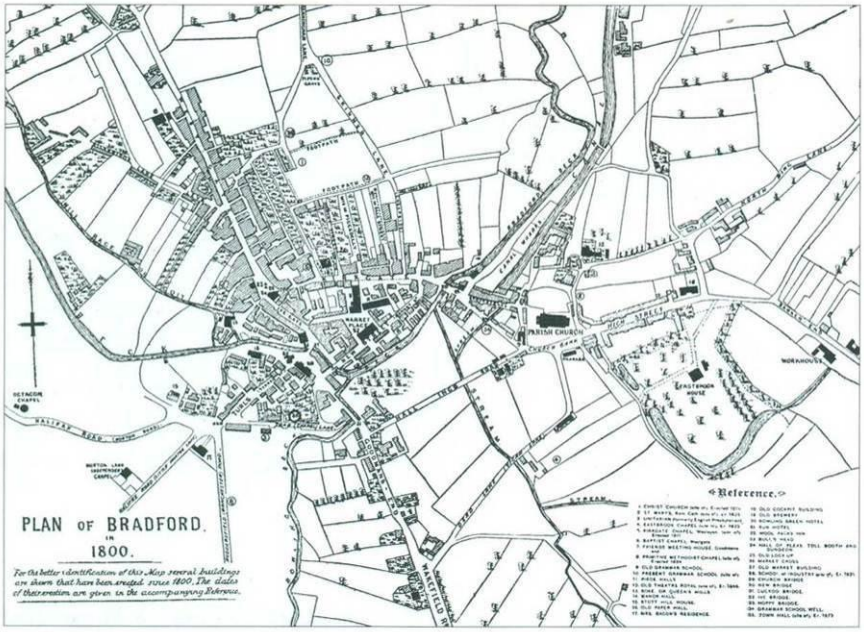

Figure 1. A map of Bradford town 1800. Source: Bradford Library Collection

Bradford was always important as a market place for wool and other textiles and this only increased as coal from local coal mines was harnessed to feed the new steam powered machines of the industrial revolution, and after the town was connected to the Leeds Liverpool canal in 1774. The above 1800 plan of Bradford shows the tiny scale of the small town with a field by Hall Ings, the floodplain for the beck, existing where City Hall is currently located. Bradford mushroomed in size as the industrial revolution took off and people flooded into Bradford with the prospect of finding paid employment. The growth of Bradford was assisted by the opening of the Leeds and Bradford Railway in 1846. The number of inhabitants rose from 6,393 in 1801 to 48,646 in 1861. A significant number of Irish immigrants found work in the town and by 1861 only 25% of Bradford's population could say that they were born there - the city had quickly become a population of economic immigrants, which is a trend that continues to the day.

1 Stephens J, Mitchell G. & Edwards W. (1953) Geology of the country between Bradford & Skipton. Geological Survey of Great Britain HMSO

2 Roberts A.P. & Grün R. (2010) Archaeology: Early human northerners *Nature* 466,189–190 doi:10.1038/466189a

3 A Partial History of Bradfordspartcaus.schoolnet.co.uk/ITBradford.htm

The beck was used as a water source and power supply for the surrounding factories and to this day the remnants of inlets can be seen in the beck channel. One of the oldest examples of this is the Goit, a mediaeval millrace, which runs parallel to Thornton Road in the west of the city and is thought to date from the mediaeval period when the water would have been used to power local corn mills. The Goit channel itself was on an incredibly subtle slope of 2000:1 and parts of its channel are occasionally daylighted when demolition of old warehousing buildings occurs along the northern central part of Thornton Road around Goitside. Goitside in the middle of the 19th Century was notorious as holding one of the city's most wretched slums.

Sadly as industrialisation became more intense and the city's population swelled the beck became terribly polluted with raw sewage, offal, refuse, street sweepings as well as industrial effluent from mills and workshops [4]. By 1840 the beck was in a very poor state and had, in the absence of controls on pollution effectively became a fetid open sewer. Since local people obtained their drinking water from springs or wells near the beck or from the beck itself, outbreaks of cholera and typhoid occurred. Only 30% of children born to mill workers reached the age of 15. Life expectancy, of just over 18 years, was one of the lowest in the country.

By the mid 19th century Bradford was the richest city in England but was an extremely polluted and defiled place with the beck known as the 'filthiest river in England'. A Royal Commission report from 1867 noted how refuse material, wastewater, and furnace ashes from the local manufacturers were simply being dumped onto the banks of the beck or straight into it. In the 1840's the beck was so polluted that small boys could set fire to it because of all of the volatile chemicals in it [5]. One German tourist in 1846 made an unflattering description of all of the English industrial cities he visited, but described Bradford as the worst, noting in effect that if one wished to feel "how a poor sinner is tormented in Purgatory, let him travel to Bradford." The contemporary paintings below by William Cowen (1849) and Wilson Anderton (1850) illustrate vividly the ominous billowing black clouds from brick chimneys and the grey cinder-laden industrial town amidst the picturesque rural landscape on the hills surrounding Bradford.

Figure 2.View of Bradford by Wilson Anderton 1850
Source: Bradford Musuems and Galleries.

Figure 3. View of Bradford by William Cowen 1849.

The Canal, which can also be seen in the Cowen painting was 5.6km in length and ran from the Leeds and Liverpool Canal at Shipley into the centre of Bradford. It served as an important trade route but suffered from pollution problems with its water supplied from the beck and was closed in 1866 when it was declared to be a public health hazard. It reopened in 1870 with a new water supply pumped up from Shipley by steam engines but was closed for the second time in 1922 and its course subsequently filled in over the following decades. The situation of constant pollution for the beck did not change for decades. Eventually the Frizinghall treatment works was built in 1862 although it rapidly became overloaded. In 1906 the Bradford Council bought the Esholt Estate to the north east of the city and constructed a much bigger and more modern treatment works to cope with the demand [6]. However by this time the beck had been dubbed by Bradfordians, for at least a few generations, with the ignominious name, "the mucky beck". And it has been noted from 19th Century texts that the pollution in other Yorkshire streams was measured anecdotally against the depths of contamination that the Bradford beck had reached.

[4] Bradford Charity & Public Purse: A history of Bradford Hospitals from 1870. Gary Firth Bradford Hospitals NHS Trust 2001

[5] Rivers Commission Report 1867

[6] Official opening of the exhibition of by-products of the Esholt Works 9.7.51 City of Bradford Sewage Department

By 1850, aside from all the pollution entering it, the beck was already becoming substantially modified with considerable bank straightening having occurred. At that time of few building controls and no town planning landowners had also been building into the beck or simply building over it for many years[7]. A map of central Bradford in 1851 shows the water course flowing right up to near Kirkgate where it then disappeared. The beck from that point, in a series of processes across the 19th Century and 20th Century, gradually began to disappear as the city continued to develop. The Victorian sewer network which still serves the city were constructed in the 1860's and 1870's and the beck was rendered invisible in the city centre in a culvert around 3 to 4 metres under the city streets [8].

It is thought that the culverting was originally made to try and alleviate the flooding that plagued Bradford roughly every decade, although it seems likely it was also done to alleviate the city of the smell and sight of the then heavily polluted beck. Decisions were made to also completely culvert the little streams of Bowling Beck and East Brook into underground pipes as they ran into the city centre. Figures 5 and 6 show the significant reshaping of the beck between 1850 and 1900 in the north of Bradford. By 1900 much of the natural shape of the beck had vanished. The modern legacy is of a small river that has been converted into a fast efficient straight-line drain with no natural banks. One of the best sites to see this is at Gaisby Lane (see fig.4) where the waterway is enclosed in a deep and inaccessible, almost canyon-like, open culvert. Figure 5 at Polar Road is where the brick lined culvert ends. What is striking with this stretch of engineering is how little the bricks seem to have aged in the many decades they have lain there.

Figure 5. The Bradford beck on Gaisby Lane looking downstream towards Shipley.
Source: Michael Canning 2012

Figure 6. the Poplar Road bridge, looking upstream.

[7] William Cudworth (1881) Historical Notes on the Bradford Corporation Thomas Brear, Kirkgate

[8] http://www.bradford.nhs.uk/wp-content/uploads/2011/08/Public-health-annual-report-2012.pdf

Figure 6. North Bradford and surrounds 1850. Source: Edina Digimap 2012

Figure 7: North Bradford and surrounds 1907. Source: Edina Digimap 2012

In the 1940's some Bradford residents have particular memories of a fearsome scuttling noise when armies of rats would occasionally migrate out of the sewers and across the roads on hot summer nights to find cooler nests. In the 1950's a new phase of culverting began in the city centre and some older structures were replaced with new modernist concrete tunnels. The two photographs above from this period illustrate the building process. In the early 1970's the culverting system was opened up again when work began on the city's bus depot. Sometime in the mid to early 1950's segments of the beck to the north of the city became fenced off to keep people away and in 1972 signs were erected around the beck warning of contaminated water.

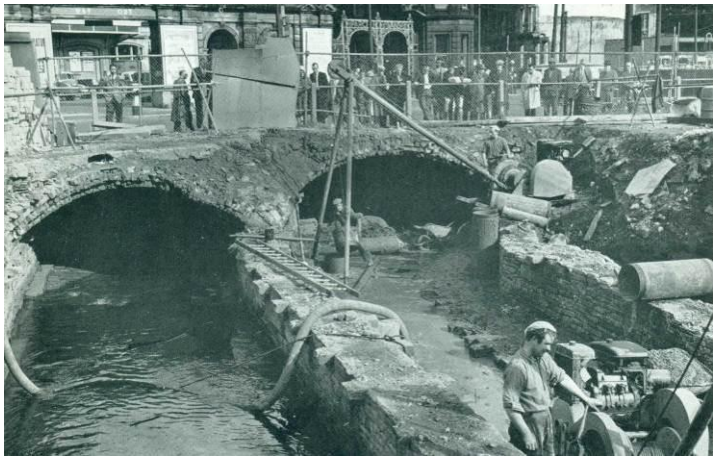

Figure 8: Bradford Beck, construction of culvert in vicinity of Forster Square, September 1962. Source: The Yorkshire Post.

Figure 9: Bowling Beck, construction of new culvert March 1964, the exposed masonry is Cuckoo Bridge built in late 1700's. Source: Telegraph and Argus.

By the early 1980's the water quality of the beck was still in poor condition and the fencing off of tributaries continued, as illustrated by the caging off of the small open stretch of Westbrook in the University grounds (see figs 10 & 11.). In addition by the early 1990's a mostly unreported change was being noticed in the city's hydrogeology where it was becoming apparent that several of the remaining ancient wells and springs around the Beck had acquired far smaller or less regular flows over the previous decades because of all of

the drainage works that had occurred in the area [9]. Bradford had suffered regular problems with flooding during the 19th Century and into the 20th Century with a major flooding event occurring every decade. The last major flooding event of the city centre happened in 1982 when a wall of water and sewage came down Thornton Road, pouring into shops and offices. A mile long stretch of Bradford city centre was submerged under 100,000 cubic metres of water [10]. In November 1993 a new flood alleviation tunnel was opened, which was designed to take peak flow events away from the city centre.

Figures 10 & 11: The caged over stretch of Westbrook in the north western pocket of Bradford University.
Source: Michael Canning 2012

In the last 20 years as the world economy has changed and new laws have come into place the conditions for some rivers across the UK have changed concomitantly. It is likely that all rivers that used to suffer from sewage and industrial pollution have improved since 1990 however there is still a long way to go to bring the water quality in Bradford to a 'good' ecological status. The European Water Framework Directive, which came into force in 2000, is the current legislation that is helping shape the future of the beck, which amongst other aims seeks to achieve a good status for groundwaters and surface waters in Europe. To assist in the cleanup process Yorkshire Water invested £20 million in 2004 to improve the sewerage system in Bradford, which reduced the number of combined sewer overflow outlets on the beck.

In 2003 a new regeneration strategy, the Alsop plan, was published by the Bradford Council. At its heart lay water as a fundamental feature for the regeneration of the city. It had ambitious ideas of opening up the western side of the beck with a walkway, cycle route and an orchid lining the paths, as well as the idea of reopening the Canal. The latter idea has become far less popular and nearly abandoned as the effects of the financial crash of 2008 have weaved their way through the property market and the public purse for large scale urban regeneration schemes. However a significant water feature in the middle of the city was realised from the Alsop plan and in early March 2012 the £24 million Mirror Pool opened as a large high tech water feature with a small lake, a multiplicity of fountains and lights and an extensive and open public realm design of seating and restaurants [11]. The beck effectively skirts the Mirror Pool as it winds its way underneath Aldermanbury towards Market Street. The beck will always define Bradford's history and geography and it is hoped that the history of the late 21st and early 22nd Centuries will discuss its restoration as a beautiful natural feature in the city centre and elsewhere.

[9] Shepherd V. (1994) Historic Wells in and around Bradford. Heart of Albion Press, Loughborough

[10] Telegraph and Argus 9th November 1993

[11] http://www.bbc.co.uk/news/uk-england-bradford-west-yorkshire-17499060