The Great Dyke: priorities regional and local

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The Great Dyke illustrates the tension in the Black Fens, since the mid 1600s, between flood defence for the district as a whole and the interests of farmers in particular places. The issue was negotiated in complicated relations between the Bedford Level Corporation and two internal drainage boards. The dyke was a canal. It was cut across the Hundred Foot Washes between 1658 and the mid 1750s. A turf lock was inserted in about 1810 and its sluices were renovated in 1837–8. The dyke fell out of use in the late 1800s. Dyke and lock are explained with reference to the literature in regional and local history, to archives, and to archaeology.

The Great Dyke is a canal across the Hundred Foot (or Ouse) Washes, near Mepal, in the southern Fens. About 230m long, it crosses the narrows where the New Bedford River curves into the Washes to skirt the Isle of Ely (Fig. 1). Sluices and a lock were fitted to prevent the New Bedford from flooding into the Washes as boats entered or left the canal (Fig. 2, Plate 7). The lock illustrates a telling dilemma over land use that has been played out across the landward Fens since the 1600s.

Although blocked at one end now, heavily silted up and overgrown, the Dyke remains plain to see. The lock and one of its sluices are exposed and largely intact although the lock too is overgrown and the exposed sluice very fragile (Fig. 4, Plate 6). The lock is a turf lock. We seek here to describe the Great Dyke's earthworks and masonry and to account for its history.

Dilemmas

For farmers, the Fens offer two soils: the silts of the Marshland around the Wash; and peats, inland and now lying slightly lower than the silts (Fig. 1; Darby 1974: 1–2). The peats, the Black Fens, formed as river waters were held back by the silts. Only interrupted in places by alluvia and isles of clay, the peat was the agricultural prize sought by the great scheme of draining in the mid 1600s; but, although very fertile and easy to plough, it remained a doubtful resource until the second quarter of the 1800s seemed, at last, to settle the struggle for a workable balance with the water. Farming then surged. The national condition for that turn of events was the growth, integration and intensification of the economy and the controversy over the Corn Laws protecting British producers from foreign competition. The regional condition was engineering: on one hand, control of the rivers from fen edge to estuary; on the other, draining of the fens between them.

The Great Dyke helps to illustrate both river engineering and local draining. For farmers' priorities proved at odds here with protection of the district as a whole from the River Great Ouse's floods.

The Dyke was cut to deliver clay from near Mepal to flood defences for the fens of Huntingdonshire and the western parts of Sutton and Mepal. The principal defence is the Middle Level Barrier Bank (or Old Bedford Bank). The Dyke was cut probably in 1658 and certainly by the mid 1750s. The lock was fitted as a concession to the farmers in about 1810 but the Dyke fell out of use in the later 1800s.

The Hundred Foot Washes, that the Dyke crosses, were created, in the early 1650s, to hold floods diverted from the Ouse between the Middle Level Barrier Bank and the corresponding South Level Barrier Bank which protects the fens to the east (Fig. 1). While acknowledging the Washes as a feature of engineering, owners of plots lying between the two banks valued their land as 'summer ground' for grazing. So, by letting water in in spring and summer, the Dyke became a source of conflict.

From the 1700s to the 1900s, conditions in the Black Fens depended on coordination between the organizations responsible, respectively, for regional management of the water and local management of drains between the fields (Darby 1983). We are now learning that the articulation was complicated.

With the Modern period, the Black Fens' economy had shifted from diverse pursuits, among which herding was, over all, the most lucrative, to a concentration on farming, mainly still pastoral at first but, from the mid 1800s, mostly arable (Darby 1974: 67–81; Darby 1983). The shift strained the links between regional management and the local organizations. The tension sprang from both the expansion of the economy and the extension of private ownership, especially in smallholdings.

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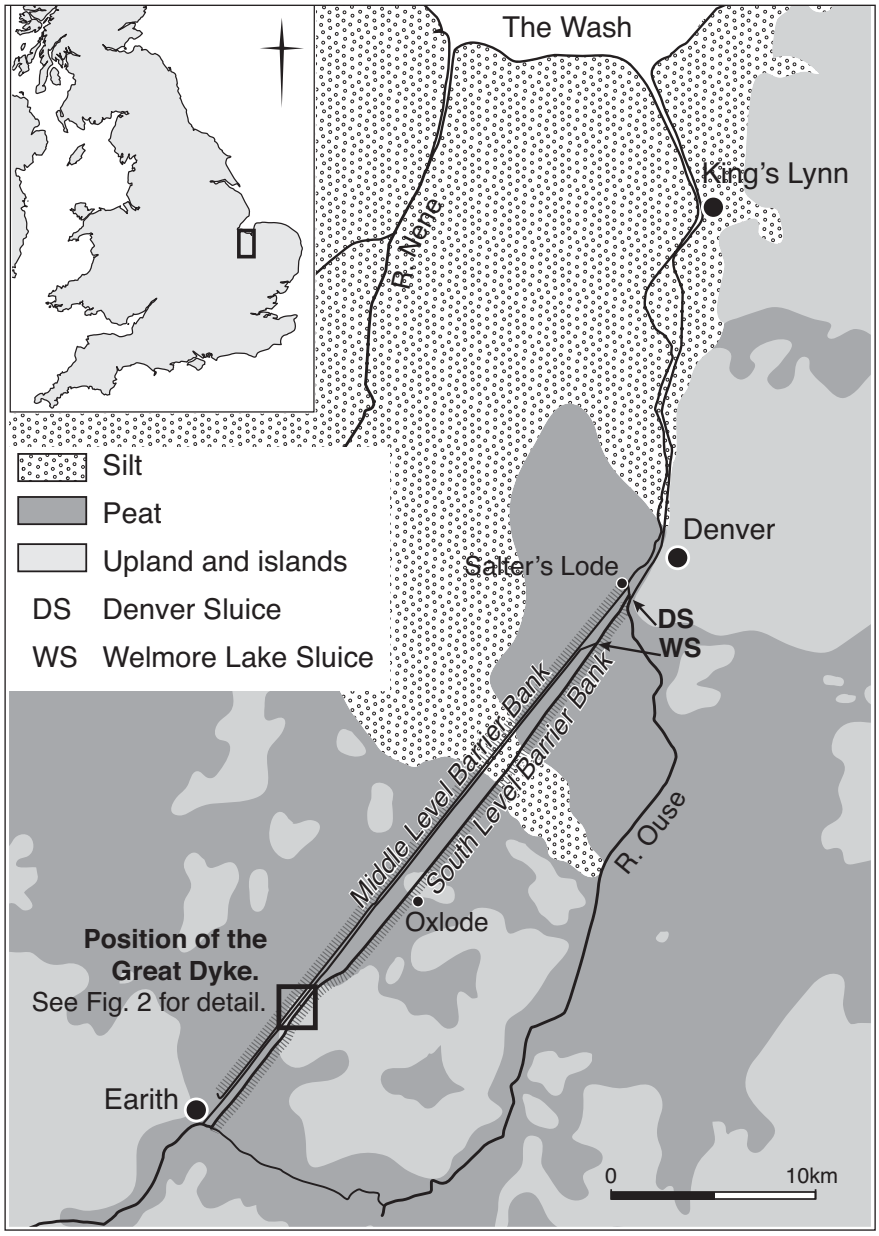

Figure 1. *The Hundred Foot Washes crossing the Black Fens, showing the location of the Great Dyke.*

The problem was (and remains) that, across the Black Fens, altering drainage in one place necessarily affects others. Medieval farmers had enjoyed tracts of common on which herds could usually be led away from a flood to drier ground (Ravensdale 1974: 64–8). In the Modern period, the "rich grass […] enabled peasant, lord or farmer" and also part-time herders—"craftsmen, publicans and shopkeepers"—"to exploit market conditions" (Ravensdale 1974: 63; Summers 1976: 188–9, 198–201); but, unlike the commoners of old, the smallholders counted on draining their plots without delay (Bowring 2011).

The Great Level, the southern part of the Black Fens, was declared secure from flood in 1653, following the Earl of Bedford's campaigns of drainage works (Darby 1983: 75–81). The district then became commonly known as the Bedford Level. The Bedford Level Corporation was confirmed as the statutory authority for managing the new system of drainage in 1663 (15 Charles II ch. 17; Willmoth and Stazicker 2016: 7–9).

Almost at once, the gains proved difficult to preserve. On drying out, the peat shrank and wasted away; the ground surface began to sink; and, since the rivers could not sink with it, new floods threatened. The Corporation was unable to respond effectively, for, by 1700, it was clear that it was hobbled by inadequate provision for its finances (Cole 1803: liii–v). From 1727 onward, land owners set up their own boards or commissions to manage the fens between the rivers (Darby 1983: 113–8, 121; Summers 1976: 85–91, 119–21).

Amidst these developments, the Hundred Foot Washes came to be regarded as the most "valuable […] part of the Fens […] by the White Waters having their Passage" held up enough, in late winter and early spring, to let the pale silt from upstream settle there and nourish the grasses (Armstrong 1766: 72). Herders had thrived on that basis all over the Black Fens for a thousand years before modern engineering produced patches of concentrated pasture. The Washes were the biggest of those grounds. Their economic value was highest at the north, where farmers let silts pile up as arable; but, of course, that reduced the capacity "of the common Receptacle" for flood water.[1] Owners of Sutton and Mepal's Washes, to the contrary, complained that the Great Dyke impeded drainage in spring and summer, when their herds could gorge on the new growth. The issue, then, was as to whether, or to what extent, the Washes should be either farmed or reserved for water.

Responsibility for the rivers and flood defences remained with the Corporation and, from 1862, the Middle Level Commission, up to the 1900s. The issue of the Washes was negotiated among and between these authorities and the local boards. It was an instance of the general struggle, in that era of laissez faire, "to establish […] ratepayers' rights to determine […] expenditure in their localities" (Eastwood 1997: 160; Darby 1968: 121, 123).

Sources and methods

The national context for investment in draining and farming the Black Fens between 1600 and 1900 was complicated and historians have yet to trace the whole chain of cause and effect (Thirsk 1984; Holderness 1984; Williamson 2002). Darby (1968, 1983) remains the key for the Fens in particular. He explained how engineers drained most of the fens in the mid 1600s and he traced the ensuing struggle to keep them dry. Building on him, Summers (1976) elucidated the Corporation's economy, both its chronic weakness and its one phase of prosperity, *c*. 1810–50. Neither historian mentions the Great Dyke but they provide the regional background for understanding it.

Working on particular villages, Ravensdale (1974) and Hall (1992) have helped to reveal the way of life in and around the Black Fens, with implications for local priorities. Murphy (1977) puts those priorities into perspective by explaining the politics of some of the figures guiding the Corporation during its heyday, such as Cambridgeshire's leading agricultural 'improver', the Earl of Hardwicke, "popular Huntingdon radical" Samuel Wells (Murphy 1977: 62), Ebenezer Foster, the Cambridge businessman, and Prof. Pryme, economist and Member of Parliament for Cambridge, and R G Townley, Member for the county, both Whig.

The Cambridgeshire Historic Environment Record revealed no archaeological associations with the Great Dyke. So we studied the course of the Dyke itself and its dimensions (Fig. 2, Plate 7). In 2003, the first author sketched and photographed both sluices, measured the north sluice in plan and elevation, and recorded the larger detached fragments of masonry, ironwork and timber. In 2017, we measured the lock and sluices with plane table & alidade and dumpy level (Fig. 3) and we photographed the north sluice again in 2019 (Fig. 4, Plate 6). To record features at the north sluice's base entailed some clearing of weeds and mud. We probed the bed of the dyke with a steel rod. We tried to detect the north sluice's foundations by the same technique but, without exposing the structure's base, measurements of its height or depth must remain provisional. What can be seen of the south sluice was recorded too. We identified the source of the sluices' stone. The results of the investigations in 2003 are deposited with the Cambridgeshire Historic Environment Record along with the full data from 2017's survey and 2019's photographs.

The first author also undertook preliminary assessment of documentary evidence in 2003. In 2016, we resumed research among documentary sources, published and unpublished. The Great Dyke belonged to the Bedford Level Corporation. Two of the Corporation's registrars wrote extensively about their organization's history: C N Cole, in office from 1757 to 1804, and then Samuel Wells, from 1824 to the mid 1840s (Wells 1830: 554, 556; Commons 1844: 352). Both help to make sense of the Dyke. Archives took us much further than publications. The Corporation's records are very extensive and we also found evidence among the records of the two local drainage boards with interests in the Great Dyke, the Hundred Foot Washes Commission and the Sutton & Mepal Commission. These records are held in the Cambridgeshire Archives. We had completed most of our research, but not all, when the archives were closed for moving them to Ely.

For the Corporation, we relied mainly on the Proceedings, Minutes, Order Books and Petitions. We did not find detailed documents for 1837–8, which were important years for the Great Dyke. We made a start on exploring the Corporation's detailed Accounts, working back to 1746 before the Cambridgeshire Archives closed. For the Washes Commission, our source was the Minutes Book for 1832–61. Of the Sutton & Mepal Commission's records identified so far, the principal documents from the period that concerns us are copies of its minutes for 1749–77, its orders from 1791 to 1861 and the accounts for 1801–51.

The term 'lock' was rare. We did not encounter it once. In the southern Fens and along the River Cam, both sluice and lock were long termed 'sluice' (Chisholm 2003: 196–7; 2005: 306–9). Rolt (1969: 9–10) suggested that such was the usage all up the Ouse to Bedford. Locks were sometimes distinguished as 'pen sluice'. Otherwise, meaning evidently depended on context. When, for instance, as late as 1882, we hear of "Draining the Sluice & Washes […] over […] the present Sill of the Sluice", the first 'Sluice' means a lock but the second what we now call a sluice.[2] This solution works for the Cam (Hinde 2009).

There are certain ambiguities over names. The

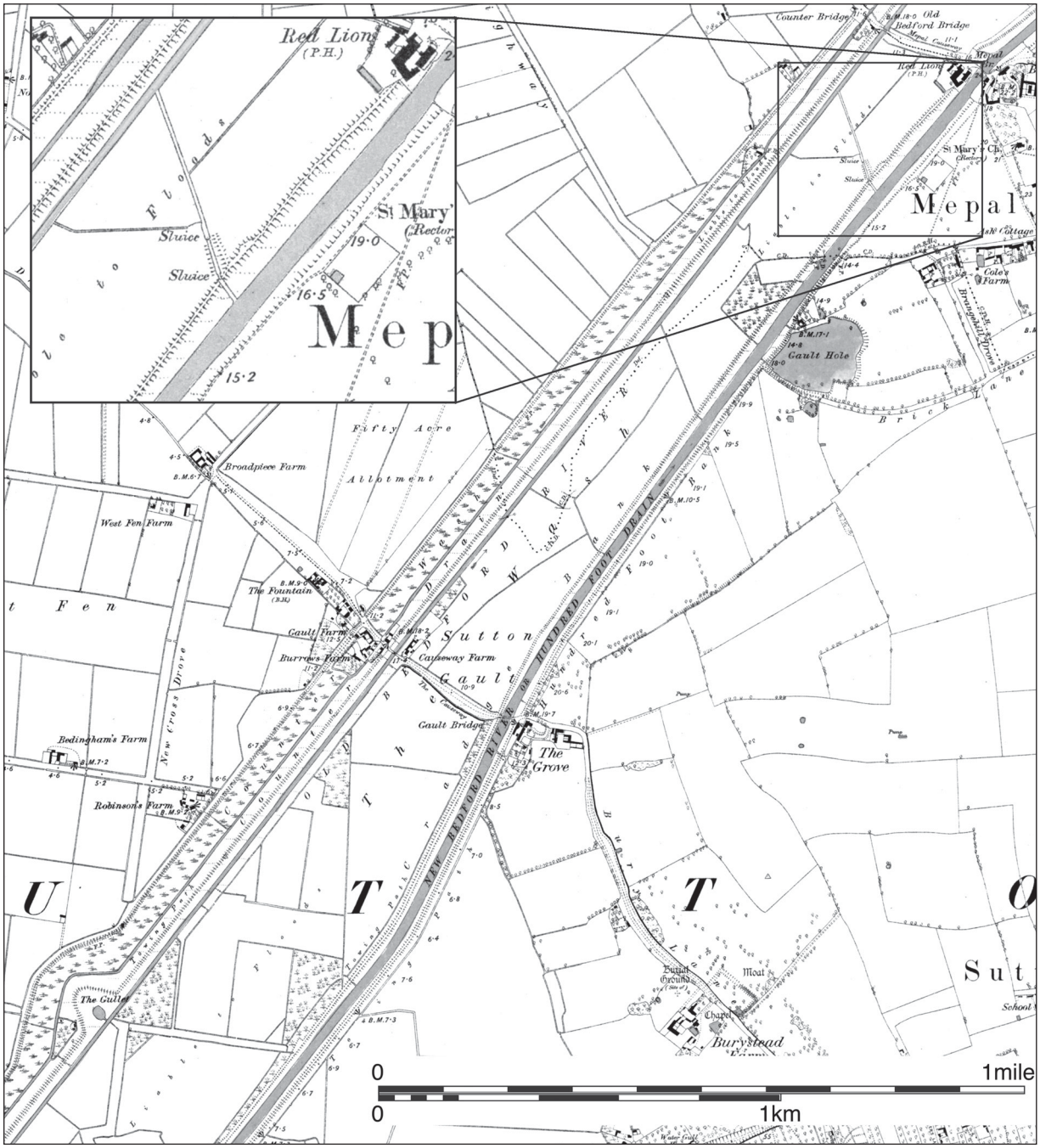

Figure 2. *Ordnance Survey 25 Inch survey of 1885-6 with The Gullet at lower left. The enlarged inset shows the Great Dyke across ground "Liable to Floods" between the Gault Hole and Mepal Causeway. The lock marked between its sluices at the south end of the Great Dyke is shown in Fig. 3. Reproduced with the permission of the National Library of Scotland. See also Plate 7.*

Corporation seems sometimes to have referred to the Washes Commission as the 'Sutton & Mepal Wash Commission'. We settled our own doubts by reference to the contexts of reporting. Then, the naming of both dyke and lock varies. As well as Great Dyke, the canal was known as the Corporation Dyke, the Twelve Foot Dyke, the 'Dyke above Mepal' and variants on those names. For our part, in deference to local usage, we shall refer to the Dyke mostly as 'dyke' rather than canal. The sluices and lock were called, among other names, the Sluice in the Great Dyke, Mepal Sluice and Sutton Wash Sluice. The pit near Mepal too has had various names: first, the Brangehill Pit or Pits, later, Sutton Pits; and, more recently, the Gault Hole. As to Pit or Pits, a little downstream, by Mepal, is the small Old Quarry, as the Ordnance Survey recorded it (Fig. 2, Plate 7) but, since it is not marked on the apparently very accurate tithe map of 1840, we presume that it

dates from between then and the Survey's survey of 1885–6.[3]

Turf locks are rare (de Salis 1904: 9). The earthworks of one are preserved at Mildenhall (Alderton & Booker 1980: 70); and Mr Hinde (2009) has inferred one at Upware. A very good source of comparison is Monkey Marsh Lock in Berkshire, dating from the 1700s (and now restored; Harding *et al*. 1997).

The following report is in five parts. First, we consider the technological and organizational background for the Great Dyke's history. Next, we discuss evidence for the Great Dyke in publications and in archives. Then we describe the topography and, in particular, the sluices. We finish with some assessments of how the documents complement the archaeology.

Engineering

Design

The Great Dyke was part of the effort to maintain the works of the early 1650s. The Washes themselves were the most striking feature of the scheme. They are bounded by the Old Bedford or Seventy Foot River and the New Bedford or Hundred Foot River, created in 1636–7 and 1650–1, respectively. The twin Rivers were designed to prevent floods in the greater, southern, part of the Level by hastening much of the Ouse's water straight from Earith, where it enters the Fens from Huntingdonshire and Bedfordshire, to Denver, in Norfolk (Darby 1983: 79–80; Fig. 1)). The Rivers divide the southern part of the Bedford Level between the Middle Level, to the west, and the South Level, to the east.

The New Bedford River once opened, the Old Bedford was reserved to take discharge from upstream after wet weather or when higher tides impede the Ouse downstream. The Washes, then, contain that water from the Old Bedford until conditions beyond Denver allow it to reach the estuary at King's Lynn. The River Nene was provided with washes too and smaller ones were created elsewhere. The method can be admired every winter.

The Middle and South Level Barrier Banks soon proved difficult to maintain, however. It was partly because much of the earth in which the first stages were built or repaired was simply local peat and partly too owing to the periodic pressure of water in the Washes.[4] Pressure is exacerbated where the Washes are constricted (Fig. 1). The worst impediment is the silt at the north end. The second problem is that, where the New Bedford River curves in around the higher ground at Mepal, it makes for pressure upstream, to the south (Palmer 1938: 102; Rennie 1810: 4, Fig. 6). Moore's map of 1658 shows The Gullet, the twist or 'gull' in the Middle Level Barrier Bank, made in repairing a breach, probably in 1655 (Fig. 2, Plate 7; Willmoth and Stazicker 2016; Darby 1983: 127). More breaches were reported in 1674; and, in 1696, the bank collapsed again near The Gullet (Palmer 1938: 104; Darby 1968: 110). At the same time, it subsided, all along, into the underlying peat (James 2009a: 7–8). While, from the later 1600s, the surrounding fens' peat wasted with draining, grazing and higher water table did preserve the soil within the Washes.

Some of the ground converted to washes when the New Bedford River was cut had already been divided into private properties by ditches running across to the Old Bedford. There is one hardly 300 m west of the Mepal Gault Hole (Fig. 2, Plate 7). With the villages so near, it is not surprising that most of the fens near Sutton and Mepal were private by the mid 1650s (Willmoth and Stazicker 2016). Counting on them for pasture and probably also hay, the new owners were anxious to drain the waters of spring and then prevent floods in summer. Prof. Oosthuizen (2017: 112–6) explains the age-old ecology, emphasising that graziers wanted seasonal draining only.

The conflict over land use emerged by the mid 1700s. For, in the Fens, engineers too depend on seasonal conditions. In the eighteenth and nineteenth centuries, maintenance of the dykes and banks was normally undertaken in the drier months from mid spring to mid autumn (James 2009b: 116–8).

Development

For the period that concerns us, five phases can be recognized in the Washes. The first, from the mid 1600s to the mid 1700s, sees the creation of the Washes and the Corporation's management of them. The second is the period of the local commissions' prevalence, in the mid and late 1700s. The third, the earlier 1800s, is marked by the Corporation's fresh strategy for the southern Fens as a whole, envisioned by a progressive board and its consultant engineer, John Rennie the Elder (Wells 1828: xi–xii). A generation of prosperity in mid century was then followed by the agricultural depression, when the Great Dyke lapsed into decay.

By 1675, the Corporation had two men "mending the South Bank of new Bedford river from Brangehill to Midlemore with Galt by Lighters". ('Gault': "provincial" usage, explained Lyell (1833: 69), "for a series of beds of clay and marl".) Within another five years, "Ditchers" had dug so much of the "strong earth" by Brangehill "for the reparacion of the Old Bedford banke", that the ground seemed "likely continually to lie under water".[5]

That was adjacent to where, 15 years later, the Corporation opened the Gault Hole, the clay pit that it was to rely on for nearly two centuries. By good fortune rare for Fen engineers, Brangehill was the slope right beside the South Level Barrier Bank, near Mepal but in Sutton parish. For the South Level Barrier itself, the clay would simply have been delivered along the New Bedford River. For the Middle Level Barrier Bank, unless (as we suspect and will explain below) the Dyke was already in place, the clay must have been boated first along the New Bedford to Earith for transfer to the Old Bedford.

Can the clay be found in the Barrier Banks? Engineers have investigated both and, latterly, they

obtained a sample for the purpose from the Gault Hole (James 1994). Clay of the kind was recognized in the banks but not identified with geological precision. Nor were datable finds recovered with it, so stratigraphic dating must suffice. Consistent with both the Great Dyke's purpose and the Corporation's reports of repairs in the later 1700s and the 1800s, the clay is distributed irregularly. There is more in the southern stretch of the Middle Level Barrier than elsewhere. The Corporation's engineer, John Dyson, did confirm that this was "the weakest and most imperfect part".[6] Yet, without better control for both chemistry and dating, it is difficult to confirm the Dyke's function from the bank itself.

In 1713, the sluice across the Ouse at Denver collapsed (Darby 1983: 119). The ensuing floods were a main stimulus to setting up the local boards by Act of Parliament. Owners of Sutton and Mepal's fens were authorized to form a Commission in 1749 (22 Geo. II c. 11). Seven years later, proprietors of the Washes won approval to form the Hundred Foot Washes Commission (29 Geo. II c. 21; Darby 1983: 122). Tacitly acknowledging the Washes' function, their Act left oversight of the engineering and management of sluices to the Corporation. As usual since 1727, the latter simply noted preparations for the new board without demur.[7] The local boards then progressively took the initiative as the century wore on; but more or less in cooperation with the Corporation (Wells 1830: 579; James 2009b: 117). The 1663 Act's provision of voting rights in the Corporation for anyone owning 100 acres of the Bedford Level (s. 13) may help to explain the process.

Yet deterioration continued. By mid century, not only was more water being drained from the fens but also the rivers were carrying ever more from fields and new roads in the Midlands (and, no doubt, East Anglia too).[8] The stakes in the balance of interests brought the Bedford Level repeatedly to Parliament's attention.

Private interest certainly made for difficulty with the Great Dyke. In 1753, the Corporation let the Washes' proprietors build a 'cradge' of silt dredged from the New Bedford River to protect themselves from all but that channel's heaviest flows (Darby 1983: 125).[9] (Cradge, explains Wells (1828: 8) is a "term […] in the Fens" for "an old bank […] on the flood side to prevent the water running over […] the adjacent country"). The Act of 1756 then enhanced the Cradge Bank's status. Yet, of course, the bank had to let the Dyke through (Fig. 2, Plate 7). At first, that seems to have been managed by the same technique as the procedure near the northern end of the Washes before the Welmore Lake Sluice was installed: cutting the cradge and then restoring it each time (Wells 1830: 730–1).

Both Barrier Banks broke down repeatedly, notably in 1773.[10] Then, in the mid 1790s, rising farm prices stirred a sense of urgency. Many parts of the Bedford Level saw renewed investment in flood defence and draining (James 2006: 458–9). The River Cam was improved likewise (Chisholm 2003: 188).

Reforming its finances, the Corporation recovered the initiative from the local boards (Wells 1830: 651–3; Summers 1976: 177). Deflation and cheap labour after the Napoleonic wars proved timely (Summers 1976: 153–4). 1808–12 had brought exceptional rains, loss of livestock and "Distress" (Stratton & Houghton Brown 1978: 95–6; Times 1809; Rennie 1810: 3, Fig. 9).[11] On 28 January 1809, Mepal Causeway lay under almost two metres of water and then both Barrier Banks failed again (Cambridge Chronicle 1809; Rennie 1810: Fig. 6). Starting with Rennie (1810) as consultant, the Corporation invested heavily along and around the Ouse between 1810 and 1840. The biggest scheme was the Eau Brink Cut, downstream of the Washes, in 1818–23; and, from 1825 to 1838, the New Bedford River was dredged and widened (Darby 1983: 123, 154–5; Wells 1830: 732–6). As conditions improved here and beyond, the Cradge was reinforced for horses to haul the growing traffic of lighters (Wells 1830: 735–6; Summers 1976: 179).

The Fens then weathered the repeal of the Corn Laws (1846) comparatively well. A generation later, however, although the Marshland and some of the fen edges adapted to the general agricultural depression, profits shrank in most of the Black Fens (Summers 1976: 198). Revenue dwindling, the Corporation slipped into terminal decline.

Features

There were Roman and Medieval canals in the Fens (Hall & Coles 1994: 105–8, 136–7). In the early 1820s, one was cut at Swaffham Bulbeck, only slightly longer than the Great Dyke (Royal Commission 1972: 109–10). Otherwise, for transport, the Modern period tended to rely on the rivers and its new drainage ditches, notably the Bedford Rivers (Darby 1983: 119).

The Dyke and then, in particular, its lock must have been designed for lighters. As elsewhere in England, those trading from Lynn to Cambridge were built steadily larger up to the later 1700s (Harding *et al*. 1997: 33; Commons 1748: 787; Commons 1777: 298). The Corporation's accounts distinguish two or three types and sizes.[12] In the mid 1800s, the usual 'Fenland' lighter, double ended and flat bottomed, carried 20 to 25 tons in a hull about 13m long by 3.2m in the beam at deck level (a bit over ten feet wide) with draft of up to 1.7m fully laden (Cory 1977; Jenkins 1993; Wilson 1972; Clark 1955: 212). That was probably about the same size as those of the late 1700s (Summers 1973: 116, 130, 137). As we shall show, the dyke and its lock were suitable for such craft.

The lock is a turf lock, its sloping banks left grassy. Locks of any sort were unnecessary in the Fens before the draining scheme of the mid 1600s but then turf locks would have been expected since they need a lot of water and seepage is comparatively slow in damp ground.

For sluices to control locks, there were two options: a staunch or guillotine, moved vertically; or lateral double doors. The former type was rare, used mainly for small locks with a shallow fall (de Salis 1904: 9, 12). The Great Dyke's last sluices used doors but, as we

shall explain, a staunch may possibly have been tried previously. To prevent boats from grounding on the sloping banks, turf locks depended on fenders.

Documentary sources

1658–1813

The sole published references to the dyke are by Wells (1830: 697, 729), who explains that "the great dyke and sluice opposite the Gault Pits" were "for boating silt and high-land earth from Brang-Hill Pits […] for the repair of the banks on the opposite side of the Wash", especially the Middle Level Barrier Bank. Archives, in contrast, have yielded plenty of information. There, for a start, we find John Dyson, protégé of Rennie, and the Corporation's "able, intelligent, and assiduous" engineer for the district since 1824, confirming that "The sluice at the Great Dike above Mepal" was for "procuring Gault from the Sutton Pits" (Wells 1830: 572–3; Chrimes 2002: 201).[6] The archives show that the dyke was designed first without a lock; but that that proved frustrating.

The first reference to the dyke may be as early as 1658. In April and May, that year, the Corporation paid £635 and £124 14s 7d "for making navigable dykes in the wash at Mepal and carrying earth to the […] North banke".[13] That bank must have been the Middle Level Barrier. The suggestion is that a canal was dug almost at once. That Jonas Moore did not mark the channel in his map of the same year could have been because the surveying was completed before the canal was cut or because an incidental feature of engineering was irrelevant to his purpose (Willmoth and Stazicker 2016). The reference to more than one channel and the high cost are puzzling.

Just where 1658's "earth" came from is not clear. The Gault Hole seems to have been started in the later 1690s. In the July following the collapse of the Middle Level Barrier in 1696, the Corporation decided to "Imploy all the Boats […] for bringing Galt and Gravell from […] where the same may be best and cheapest taken" to fill the breach (Darby 1968: 110); and, a few weeks later, it was agreed to buy "one Acre […] neare Mepall to digge Gault for the Corporacion's Bank".[14]

It must have been obvious that Brangehill was, indeed, 'best and cheapest'. To match those records with Dyson and Wells could imply that the Great Dyke was not cut before 1696; but how well did Dyson and Wells know the story? Nor is the subsequent relation of the Gault Hole to its canal simple. The pit was extended in 1703 and thereafter but Cole remarked that "scarcely Half what hath been purchased is made use of" before the pit would be enlarged.[15]

Moore does seem to show why the Dyke lies downstream of the pit: his map marks property boundaries in the Washes down to where the canal was cut (Willmoth and Stazicker 2016). By 1833, all the flanking land was private (Lenny 1842).

Like other local boards, Sutton & Mepal ordered a map soon after establishment but we have found none for the Washes.[16] Perhaps a map has been lost with the rest of the earlier parts of the Washes Commission's archive or perhaps the Commission considered their topography too simple to require one.

Our earliest map to mark the Dyke is the Ordnance Survey's draft for its One Inch survey in 1811; but that shows it winding (Hodson 1989: 109). The draft for Cambridgeshire was, indeed, notoriously rough; but then Baker's survey, about seven years later, also shows a curve (Hodson 1989: 18; Baker 1821). Are these conventionalized depictions for want of close observation in working at small scale? The Ordnance Survey's first published map, at an inch to the mile (1836), does not mark the Dyke at all.

Perusal of the Corporation's Order Books from 1696 to 1703 and careful search of those for 1703 to the later 1750s yielded no further clue about the Dyke's history. Few of the engineers' reports are preserved. However, there is a lot of detail among the Corporation's accounts.

In the account for 1748 is a note of "making Dams over the Ditch Ends in the Wash", apparently in connection with repairs to the Middle Level Barrier Bank, using "Golt". That ditch may have been the Great Dyke, with "Ends" at the New and Old Bedford Rivers. Our next reference is less ambiguous. It is from 1756, for "3 Days Work of 4 Men roading a Dike from the Gault Pits across the Washes" (clearing weeds, that is). These entries do not state times of year but the latter job was probably in early spring and the damming in autumn.[17]

For 1758, we have a clear reference to the Dyke. On 18 May, the Corporation complained that "the Commissioners of Sutton [*sic*] had made a large Damm or Bank over the end of the Corporation Dyke"—presumably at the Cradge.[18] It complained again, in April 1766, that the 'Sutton & Mepal Commissioners' (presumably, again, the Washes Commission) had driven piles into "the 12 foot or great Ditch".[19] For the Corporation had explained from the first that "free passage of the […] Dyke is absolutely necessary for […] the works of the great Level". It went so far as to indemnify its men should they have to clear the obstruction themselves. However, it also declared that it would "be satisfied" were the Commission to build a "sluice […] sufficient to penn in one of the largest Gault lighters".[18] That was the first reference to a lock; but a good 50 years would pass before it was built.

In 1786, an order was issued to widen and deepen the Dyke on a budget of up to £40.[20] Perhaps partly owing to enlargement, the idea for a lock persisted. In (or about) 1798, the Washes Commissioners complained that, "repeatedly opened for various purposes", the dyke jeopardized their "wash Bank", the Cradge; but pleaded that they were "unable as well to erect a Sluice […] as to support the […] Bank".[21] This time, the Corporation proved more sympathetic; but its superintendent stated (without troubling to bring a written report) that a sluice could only work were the Cradge raised along ten miles "above & below" the Dyke and that that would cost more than £450,

not counting ancillary works.[22]

In April 1805, 'Sutton & Mepal' (or their neighbouring colleagues) protested again that "the great Ditch" was "repeatedly opened to the Damage and frequent loss of the Washes"; and, taking care, like their colleagues in 1798, to aver that they did understand the value of "Works for general Drainage", they asked the Corporation to insert a "Sluice (or other works)". Now, at last, its "Superintendent having reported thereon in obedience" (if not still scepticism), the Corporation reserved a fund for, among other works, "a Sluice with two Pair of Doors".[23] The Washes Commissioners confirmed much later that the lock had been designed "for […] preservation of their Bank".[24]

When, then, was the lock built? Scanning the Corporation's Minutes for 1805–10 revealed no direct reference. There could possibly be an implication that it was installed by 1806 in the prohibition on cutting the Cradge to let "Water from any River into the adjoining Lands or for any other purpose"; but the lock is not mentioned among the accounts for 1807–9. A little later in 1809, however, £45 was put aside to "scour out Mepal Gault Pit drain" and, the following year, the pit itself was extended by an acre.[25] It was about then too that the proposal for a sluiced cut to bring clay across the Washes near Oxlode was promoted by citing "great advantage" from a scheme at Mepal (Wells 1830: 723; Fig. 1). So the lock must have been made in about 1810, perhaps in connection with enlarging the pit.

In 1813, there was reference to the "sluice leading from the Old Bedford to the pitts at Branghill" (Wells 1830: 697). It let water ebb, that is, from the Washes into the New Bedford River. The next year, its keeper was the cheapest of the Corporation's eleven (Table 1).[26] Some of the differentials marked the respective amounts of work (Wells 1830: 582).

Table 1. Selected sluice keepers' annual salaries (£ s d).

Site	1814	1830
Denver	45 0 0	45 0 0
Salter's Lode	10 0 0	40 0 0
Stanground	15 0 0	20 0 0
Sixteen Foot	5 0 0	5 0 0
Welches Dam	2 2 0	2 0 0
Sutton	1 1 0	5 0 0

1814–38

The lock's 'advantage' did not last long. In April 1814, the Washes Commission urged that "the Sluice" was so "ruinous […] that unless […] substantially repaired or secured before the Summer floods, the Washes must inevitably be lost to the Proprietors".[27] Repairs were needed again, or still needed, in 1816.[28] These reports imply either inadequate building in the first place or much wear and tear. We have found nothing to show how the Corporation responded to them. In April 1822, the Washes Commission declared that it was getting no benefit from the sluice; and, the following month, the Corporation provided for repairs at up to £200 if the local commissions would pay the balance. Dyson directed rebuilding soon after he took office in 1824 (Wells 1830: 572).[29]

In 1823, the Corporation ordered that "a New Dike be dug to be used as part of the Corp^{n} Dyke across the Wash […] according with Plan laid before the Board at an expence not exceeding £25".[30] As with the reference in 1658 to more than a single channel, this instruction about elaborating the Dyke is perplexing. We found no other record of it. Does it refer to the ditch from the Mepal Causeway to the Great Dyke (Fig. 2, Plate 7)? It is shown on the map for original apportionment of tithes, made in 1840.[3]

By 1827, the sluice doors were "getting out of the upright and the walls and Land Ties giving way". That confirms that the sluices were not staunches. £30 was set aside to remedy the defects.[31] Again, we found no record either of how much was spent, in the event, or of the work done. However, a feature remaining to be explained is the sluices' bulky earthen abutments (Fig. 3). They must have been designed for the problem of subsidence. There was no record of them among the references to extensive work undertaken in 1838; but there was mention, much later, of so much work *circa* 1830 that it was described as the "original construction" of the sluice.[2] Perhaps they were built with the fund of £30.

Indeed, the keeper was paid much more in 1830 than in 1814 (Table 1). The Corporation was told that the Brangehill pits were busy (and the proposal for Oxlode was repeated, again with reference to the Great Dyke (Wells 1830: 729)).[32] The keeper at Salter's Lode had enjoyed a similar rise after that sluice was rebuilt to Dyson's design for a staunch in the later 1820s (Wells 1830: 724);[33] but there was no such correlation with the substantial improvements at Denver and Stanground since 1825 (Table 1; Wells 1830: 724; Summers 1976: 177).

Had the type of sluice been changed, then, at both Salter's Lode and the Great Dyke? That would have depended on any of three factors: engineers' preferences; the amount of traffic; change in the water regime. There is weak and indirect evidence for a change of mechanism and for change in traffic; and good evidence for change in the water.

Dyson had argued earlier, for Welmore, that a guillotine would be much cheaper than doors; and Salter's Lode has had one, evidently since Dyson's work if not before (Fig. 1).[34] Then, in April 1834, the Washes Commission formed a committee to ask Sutton & Mepal about "the propriety of erecting a pair of pointing doors at the Pen Sluice at the Great Dike". One of the committee, John Owen, was told to obtain an estimate from a Mr Warwick for the cost. For Owen was both a commissioner and the Corporation's sluice keeper (Wells 1828: xiv; Wells 1830: 583).[35] As for Warwick, he, no doubt, had been that boy for whom, among many other dealings with Sutton & Mepal, "Richard Warwick of Chatteris millwright" had stipulated a wage—but no ale—in 1807.[36, 37]

Evidently persuaded, Sutton & Mepal, in turn, asked the Corporation to let the two commissions fit "Ebb doors to the sluice in the great Dyke" at their own expense.[38] That could imply that a staunch was failing or else, simply, that new doors were needed. By analogy with the conflict of the mid 1700s, the proposal may, indeed, reflect increasing use of the dyke.

As for the water, the levels of the Bedford Rivers were falling in the 1820s in response to the engineering both along the New Bedford itself and downstream. In 1832, Denver Sluice's sills were lowered by all of six feet (Darby 1983: 155). For the Great Dyke, by April 1837, Dyson was recorded as stating that its sluices had become "useless by the sills being laid too high".[6] Yet, 45 years later, John Waters, fisherman, claimed that there was a lower sill. The Corporation recorded his statement:

> *1. I was born at Mepal […] in […] 1815 and have resided there all my lifetime*
>
> *2. I […] was from time to time present at the Great Dyke Sluice during […] construction in or about […] 1830*
>
> *3. […] a lower or false sill was placed 2 feet below the Sill […]*
>
> *4. I was informed […] that such lower Sill was […] to admit of the Sluice being altered […] in the event of […] Water being lowered in the Rivers […]*
>
> *5. […] the original doors […] have […] always been used for Draining the Sluice […] over the Upper […] Sill […] and at no time […] has the lower […] sill been used […].*[2]

As to "sill" or Dyson's "sills", a lower sill may have been needed only for the south sluice, by the New Bedford.

We found no other evidence for work in about 1830 but there is plenty to show that the Corporation rebuilt the sluices in 1837. That May, the Corporation advertised for tenders to build "a pen sluice", "plan and specification at the office of Messrs Dyson and Son, Civil Engineers, Downham Market" (Cambridge Independent Press 1837).[34] That does sound like more than just exposing a lower sill, but a committee met on the Corporation's barge at Mepal Bridge in the following month, inspected both "the Black Sluice or Great Dike sluice" and the Gault Hole, and assessed three tenders for "lowering of the sills". They were for £850, £635 and £460.[38] The third was accepted, from Adam Chapman, carpenter in Nordelph, near Downham Market. He had been Dyson's builder at the Welmore Lake Sluice (at a loss, he claimed, of some £200, not his fault).[39] Owen was instructed to oversee the work.[40]

We have not found the specifications. Perhaps Dyson kept them at his office. The Corporation's 'Account of Works ordered' on 16 May 1837 leaves blank its entry for "Mepal Sluice altered" but Dyson's 'Account for Works' in the same month includes an estimate of £400 for "Works to be done" on the "Sluice at Great Dyke".[41] Our sole record of exactly what Chapman did is a note of 16s 4d spent on land ties and staples.[42] Dyson's 'Balance Sheet' shows payments to Chapman, or due to him, of £241-2-0½ but none that relate to the Great Dyke. "Thos & Wm Lemon of Chatteris" supplied Dyson with 2050 bricks in the autumn but their voucher does not state what the bricks were for and, in any case, the sluices used far more than that (see Table 2; Fig. 4, Plate 6).[43]

There is one other reference. It is a request from Chapman to the Corporation, in April 1838, for "an allowance beyond his contract for Building the Sluice".[44] A plea filed elsewhere explains that, although he had "executed the […] work to the satisfaction of Mr Dyson", "from the great quantity of different kinds of work that was going on last Summer both Materiels and Labour were much Above the rate […] estimated for".[45] That must refer to the last phase of the improvements along the New Bedford. His plea failed.[44]

None of these documents refer specifically to sills. Had the Corporation's minute of Dyson's criticism failed to note that he mentioned a lower sill; or had Waters muddled two distinct memories? The archaeology, as we shall see, shows that there could have been a lower sill; but, 18 years later, the Washes Commission proposed that the lock should "be lowered to the false sill now constructed", as though the latter were only inserted recently.[46]

The sluice doors were fixed separately. The Corporation had obtained from Owen an estimate of £58 for repairing them.[40] As he was working, at the time, for the Washes Commission, his advice was hardly independent but, evidently, the Corporation did then accept the proposal from the Commissions. In the event, the doors cost £56 12s 9d (Table 2).[47] The Washes Commissioners agreed to contribute £19 9s of that to Sutton & Mepal; and Sutton & Mepal, in turn, recorded receipt of that sum "for Ebb Doors in Mepal Washes being ⅓ of expenses, as apportioned by the Wash & Sutton & Mepal Level Commissioners" plus, earlier, half a crown (probably a solicitor's fee) for "Presenting Petition to Bedford Level Corp^{tion}". (The unannotated shilling and tuppence was probably another wage.) In fact, £19 9s is slightly more than a third of the sums recorded by the Washes Commission itself. Sutton & Mepal's accounts do not specify the jobs; nor are the vouchers preserved. Each of the contractors listed by the Washes Commission (Table 2) does appear among Sutton & Mepal's accounts but with higher charges so, evidently, they worked on or supplied more than one job or site.

Table 2. Hundred Foot Washes Commission costings for the sluice doors in 1838.

Item	Payee	£ s d
petition		0 2 6
daily wages	Thomas Hadden	0 2 6
		0 1 2
bricklayer	William Lemmon	5 10 11
blacksmith	Joseph Angood	6 6 0
carter	Ann Hutchinson	0 5 0
carpenter & wright	Joseph Warwick	43 13 4
lime	John Owen	0 9 4
sand	William Roberts	0 2 0

1838–1900

The new design evidently worked well at first. The Dyke was cited in 1843 in a request to the Corporation for a sluiced channel to bring clay from Mepal through the Washes at Oxlode (the third attempt).[48] Of course, maintenance was needed. In 1838, Owen authorized payment of £1 for "Work on the Great Dike 4 weeks" and, the following year, £2 3s for laying "Golt on the bank of the pen sluse" (as well as £3 8s 9d to Chapman for jobs and materials at sites unspecified).[49]

Yet, by the mid 1850s, the Washes Commission complained that both dyke and "Sluice"—"of great importance, to the Corporation […] as well as […] the Washes"—were failing. The main reason seems to have been that the New Bedford River was still falling. So the dyke was scoured again at their behest and expense in 1854; and it was then, the following winter, that they offered to contribute half of the cost if the Corporation would lower "the present cill […] to the false cill now constructed in the […] Sluice so as to adapt it to the improved state of the River". Evidently, little or nothing was done, for, by spring 1856, they declared that the sluice was "so much out of repair that it cannot be used"; and that, "well aware of the great expence such works are, if done by" the Corporation itself, they had obtained an estimate of £20 to fix it.[24, 50]

Perhaps that work was undertaken, for, in 1862, the Middle Level Act ('Separation Act'; 25 & 26 Vict. c. 188 s. 17) required the Middle Level Commission to pay the Corporation an annual fee for maintaining the Dyke and its 'pen sluice', which suggests that it was in order by then. Yet, in 1873, that commission reported that the lock needed attention again; and, six years later, they requested repairs as a matter of urgency.[51] By November 1881, they declared that the sluice was preventing work on the Middle Level Barrier Bank and called for "the upper parts of the Walls on each side" to be rebuilt in the spring.[52] Yet, to judge by John Waters' declaration, the lock remained defective after the summer; and, evidently, 1856's estimate of £20 had not been enough to expose a lower sill.[2]

It was suggested, some years later, that the Dyke could be used for bringing hay across the Washes (Delanoy 2005: 25). By then, whether or not on account of neglect of the sluices, the Gault Hole was largely superseded. Yet it was exploited again for repairing the South Level Barrier Bank after the floods of 1947; and, in 1952–6, it was used for the Middle Level Barrier, with a light railway over the Washes.[53]

Dyke and lock

The Great Dyke starts from the New Bedford River, some 440m downstream of the Gault Hole. It lies between 450 and just 250m upstream of the strait between the New Bedford and the Old. A little north of its junction with the ditch that runs upstream to the Old Bedford, the Dyke turns very slightly westward (Fig. 2, Plate 7; and now see Google Earth; from the ground, the anomaly is obscured by the scrub along the ditch). The Ordnance Survey, in the late 1800s, noticed that the Dyke is slightly wider between the lock and the ditch that runs west to the Old Bedford.

The banks of the lock and the blocked south sluice protect the Washes at the same height as the Cradge Bank. Both the tithe map and the Ordnance Survey's 25 Inch survey of 1885–6 show the dyke cutting through the berm from the New Bedford to the Cradge at 70 degrees but then crossing the Washes at 55 degrees (Figs. 2, 3).[54]

Of course, the dyke's profile has deteriorated since 1854. Today, the width from lip to lip varies from about 8.25m near the north sluice to about seven some 150m from the Old Bedford. About 50m from the Old Bedford, the east bank has slumped, reducing the ditch to about sixm wide. At the junction with the Old Bedford, the sides have been degraded, partly by cattle trampling, and the width is only about 6.50m. The sides slope at about 30 degrees along much of the ditch but the west bank lies at about 45 degrees on approaching the Old Bedford. The depth varies from about 85cm north of the north sluice to about 1.35m at 50m from the Old Bedford. Silting has made the dyke much too shallow for a laden lighter.

1838's reference to "Golt on the bank" implies a lining of clay to impede seepage into the peat. There is pale clay on the dyke's east bank at the junction with the Old Bedford and about 30 and 50m to the south of that. Probing the bed between there and the north sluice, we felt nothing but the peat to a depth of about 1.25m; but there we encountered an impenetrable layer which may be clay.

As the junction with the Old Bedford shows, the soft ground would have been susceptible to trampling by livestock. Yet we noticed no sign of a tow path between the lock and the Old Bedford. Along the west bank, which is less overgrown, it looks, in one stretch toward the north, as though the lip of the dyke is raised a little by upcast from the channel but the angles of the junctions with both Rivers suggest that a path was likelier along the east bank (Fig. 2, Plate 7). The hard layer that we encountered does not feel like the kind of path of stone or timber laid at some other sites for horses to pull lighters. Perhaps the banks were firm enough unmetalled, in spring and summer, when most of the work along the Barrier Bank would have been undertaken.

The Dyke is joined by two channels, now largely dry (Fig. 2). One runs between its west side and the Old Bedford, upstream. Moore's map (1658) features a faint line that corresponds to this ditch but it is shown continuing to the causeway on a line east of the other channel where, today, there is no such feature (Willmoth and Stazicker 2016). It is about 4.75m wide. It has two slight bends, one near the Dyke, the other by the Old Bedford. Its bed (which we did not measure precisely) is roughly at the level of the Dyke's bed but it has been largely filled in next to the junction with the Dyke. Comparison of the tithe map (1840) with the Ordnance Survey (Fig, 2) suggests that that

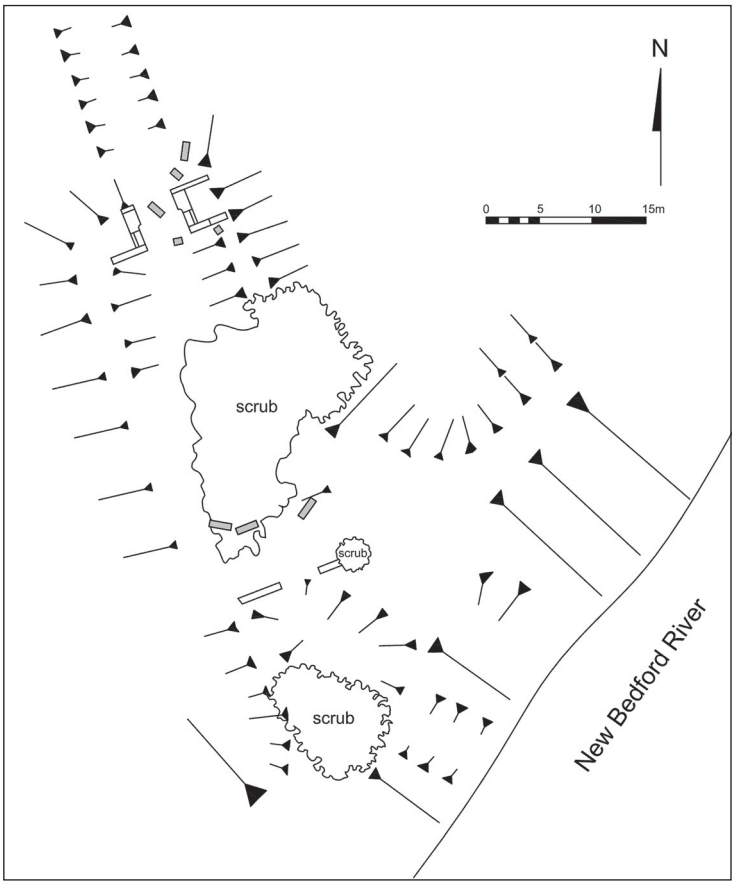

Figure 3. *Plan of the lock and sluices; detached capstones in grey.*

was done in the mid 1800s. The other channel runs from Mepal Causeway to join the Dyke north of the lock. It is marked on the tithe map and the Ordnance Survey's survey. Its bed distinctly higher than that of the Dyke, it is unlikely to have been a canal. It is even more heavily overgrown than the Dyke.

The lock was formed simply by appropriating a length of the Dyke (Figs. 2, 3, Plate 7). Defined by the sluices, it stretches about 32m between the end of the brickwork of the north sluice and the mound that marks the south sluice. Its sides lie at about 35 degrees, about the same as those of the dyke but, at about 11.5m from lip to lip, it is wider because its banks maintain the height of the Cradge.

There are three fragmentary timber posts lying in the lock. They have traces of tar. The diameter of the larger one is similar to the north sluice's remaining door post (see below). The other two could have been for supporting fenders to guide lighters. Hinde (2009: 126) infers this technique at Upware.

Sluices

The north sluice is exposed and remains largely intact but the south sluice has been filled in with earth, leaving exposed only the tops of the capstones and door brackets and the brickwork facing the New Bedford River. Both sluices are buttressed by earthworks—a distinctive feature in the Washes (Fig. 3).

The north sluice is about 4.10m long (16 ft 5 in). Its channel is about 3.25m wide (10 ft 8 in). Flooded for much of the year, the bed is deep in mud. Probing the bed, we struck an impenetrable layer 1.22m down. That must be the foundation. It is about the same depth as the layer under the ditch to the north. The sluice is 4.27m high (14 feet) from there to its top. The base is 25 mm higher on the north than on the south. The masonry is designed to let the opened doors align with the sides of the gateway (Fig. 3).

The north sluice is built of unfrogged hand-moulded nine inch bricks of the kind called 'White' in Cambridgeshire (228 x 105 x 60mm). A core of solid brick is exposed where the capstones have slipped off the east abutment. The bricks are laid in alternating courses of headers and stretchers (English bond) adapted, as necessary, to accommodate stone quoins. The slackers that controlled the flow of water were fitted into intricately laid recesses which would have let the opened doors lie flush with the masonry for craft to pass through (Fig. 4, Plate 6). The exposed face of the south sluice shows the same brickwork. Bricks and large fragments of brickwork lie around the buttresses of both sluices. The detached fragments have lime mortar but some bricks *in situ* are mortared in cement which survives, in places, where others have fallen out.

The tops and quoins of both sluices are in ashlar. A sample of the stone was found to match the oolitic limestone at the Holywell Quarry near Clipsham, in

Figure 4. *West side of the north sluice in 2019: brickwork with recess for slacker; hollow quoin in ashlar with rusticated panels and iron door bracket. See also Plate 6.*

Rutland (Building Research Establishment 1999).

The capstones are 'hollow' to accommodate the door posts (de Salis 1904: 9) and moulded to fit the slackers. The north sluice's capstones feature rusticated (roughened) panels, apparently on all four sides. So do those of the south sluice, to judge by the sides facing the channel and the River. The chiselling is distinctively diagonal but the panels' borders are lightly pecked.

The north sluice's capstones are too narrow to cover all of the brickwork. In places, several inches of it are exposed without protective slate, although there are traces of fillets. On the south face of the south sluice, in contrast, the capstones fit the east side of the sluice neatly but protrude a little over the west side's brickwork. Capstones from both sluices have been dislodged and broken (Fig. 3).

Were the capstones first cut and worked for another building? We took that question to Chapman's earlier project, the Welmore Lake Sluice across the River Delph. Part of its north side remains. The structural details are complicated. It does have capstones above brickwork and it has the hollow quoin for a door in rusticated ashlar; but, since the Delph is bigger than the Great Dyke, the hollow is wider than the Dyke's. The rustication is less insistently diagonal and, also unlike the Dyke, some of the surrounding borders are milled. Welmore's visible evidence does not match that of the Great Dyke.

The slackers for letting water in and out of the north sluice were worked by a cranked rack & pinion of iron. That was the normal mechanism (de Salis 1904: 12). The slackers have fallen out and into the lock (Fig. 4, Plate 6).

As usual for locks, the iron door brackets are splayed outward on the capstones. They are of the same design and size on both sluices. One of the brackets on the north sluice retains the adjustable clasp around the top of the inner gate post. The bracket for the east leaf of that door is fitted with a one inch eye for a boat hook or similar tool to crank the door open or shut (de Salis 1904: 12).

The gate of the north sluice was timber. It was 3.45m (11ft 4in) high. Double-leafed and pointing inward, it let water ebb toward the New Bedford River. The base of the frame is fitted with stout posts for guiding the slacker that controlled the flow. Part of the west leaf has fallen into the lock. The east leaf was 23cm (nine in) thick. It preserves the mortice for a bar's tenon. Both leaves' bottom rails are preserved.

Iron stirrups secure the corner posts to the rails. The east leaf's inner post is both rotted and charred but still attached by its bracket to the iron hinge that fixed the leaf to the masonry. It is 203mm square (eight in^2). It survives to within 30cm of the frame's base. By the sill, below, lay the fragment of a small crucible—dropped, perhaps (possibly by Angood: Table 2), in melting the lead for fixing the hinges to the wall.

We discovered the sill by probing the north channel's bed. Its top is 3.33m below the top of the masonry. Exposing the west end showed that it is wooden. It is bevelled for the doors to close onto it snugly.

Recesses in the north sluice's capstones face each other over the channel. 305mm wide (1ft) and 70mm (2¾in) deep, perhaps they held a plank bridge.

Beside the slackers, various other iron parts lie in or near the sluice. They include the brackets to stiffen the doors at their corners and in the middle. T-shaped brackets for the middle are a little larger than the corner pieces. Slightly irregular distribution of the holes for the brackets' nails or screws shows that they were made by hand (again, perhaps by Angood). More ironwork is scattered around the south sluice.

The north sluice's gate remained stout enough for boys to play on it in the 1930s.[55] Today, there is a crack by the south end of the west wall, 10cm wide at the top of the structure, and corresponding cracks in the slacker's recess (Fig. 4, Plate 6). Some of the brickwork has collapsed and the topmost masonry of both walls looks very fragile. Rubbish has been tossed into the channel and a small tree trunk pushed over the west abutment.

The south sluice was filled in with earth, allegedly by the Middle Level Commission, in order to avoid further expense of maintenance. Local word dates that to the 1920s.[56] The Ordnance Survey's survey for its Six Inch map, in 1925, found both sluices open and, whether or not they were then checked again, the edition of 1952 shows them still open.

There is a depression between the Dyke's mouth and the south sluice (Fig. 3). It would have made sense to provide a pool for turning lighters into the sluice. Yet neither the tithe map nor the Ordnance Survey records it (Fig. 2, Plate 7). Perhaps it was dug after the Ordnance Survey's revisions of 1925 for the earth to fill the south sluice and restore the New Bedford bank where the Dyke had been cut. The fill in the Dyke's mouth there appears to have subsided (Fig. 3).

Assessment

Our research stirred local interest and an information board was put up at the site in 2017. Awareness does tend to encourage sympathy; but the north sluice must be conserved or protected if it is to take visitors. Buried, the south sluice may survive in better condition.

Certain issues about the dyke's design and its history remain to be clarified. Yet we have traced in some detail the play of interests in how it was maintained and developed. That shows that the relationship between the typical priorities of local landowners and concern for the district as a whole was more complicated than has been recognized before.

Dyke

The dyke was cut before the Cradge Bank was built. The reference in 1658 to "navigable dykes" probably does give the date but it remains ambiguous.[13] Perhaps, respecting a boundary not marked on Moore's map, the slight westward bend in its course is another clue. The Dyke may be mentioned among accounts of the Corporation's from before 1748 that we have not seen.

The reference to more than one channel we are at a loss to explain. There may be a clue in the angle of the Dyke's junction with the New Bedford. It would have made it easier to turn downstream; and the mouth's downstream side opens slightly more widely, as though to help yet more. The tithe map records the same angle. Yet, as we have remarked, much of the banking was needed upstream. Was the channel that runs from the Dyke into the Old Bedford 150m upstream of the Dyke used for that purpose (Fig. 2, Plate 7)? Moore's map of 1658 marks a corresponding channel (Willmoth and Stazicker 2016).

Although that channel is about as deep as the Dyke, it is only some 4.75 m wide. Perhaps the Dyke itself, once known as "the 12 foot", was that narrow before it was enlarged in 1786. However, the channel meets the Great Dyke at an angle that would have been awkward for a lighter; and then come two bends, the first a little beyond the junction and the second on approaching the Old Bedford. To be sure, the Great Dyke itself turns through 15 degrees on meeting the line of the Cradge. In all, though, there is little to show that the channel was part of the scheme of 1658.

Yet, from any point of view, £635 was very expensive for dykes. We have pointed out that the Great Dyke appears to comprise two stretches on very slightly different alignments; but both are short. Could the reference to "dykes" be scribal error?[13] As for the expenses recorded, most of them must have been for "carrying earth": the dyke or dykes could have cost only a fraction of the almost £760 recorded.

"12 foot" will have referred to the dyke's width from lip to lip. That was a tight fit for lighters; and, no doubt, that was intended.[19] Enlargement in 1786 may have been for bigger craft. It was scoured in 1809 and 1854 but, if the lighters were no bigger after 1800, it should not have been necessary to enlarge the dyke again.

As for the channel between the Dyke and the Causeway, was it designed to bring run-off from the road and the ground between there and the Dyke (Fig. 2)? Was it the 'New Dike' mentioned in 1823?

Allowing for the sediment now clogging it up, the Great Dyke seems to have been a little over 2m deep. That would have been enough for a typical nineteenth century lighter fully laden.

A turf lock was the sensible option in the Washes'

peat. Perhaps the cost of walling the banks was regarded as excessive; or perhaps the worry was subsidence. The cracks and slight lateral tilt in the north sluice may mark just that, despite the buttresses. Other than the Welmore Lake Sluice, the Great Dyke's sluices must be the heaviest buildings on the peat of the Washes. As for whether dyke and lock were well lined with clay, an auger would show that better than our probe.

Lock

For the lock, the budgets indicate two main phases of development and two secondary phases. Perhaps built as part of the response to the floods of 1808–9, the first sluices cost about £200. The flaws in the sluices reported little more than ten years later and the cracks in the masonry today and the small disparity of levels at the base of the north sluice may indicate unstable foundations. A budget of £30 was allowed for additional works in 1827.

Was the sluice mechanism changed in 1837? Was it literally, as the original proposal recorded it, just one pair of doors that was fitted in order to manage the lock in combination with a staunch? The tithe map of 1840 distinguishes the south sluice with a mark that could possibly represent ebb doors but the north one with a line that could represent a guillotine.[54] Does that record a transition from one technique to the other? Or was the lock abandoned?

Since the door brackets of the two sluices are alike in design and condition, neither scenario looks likely. Perhaps the records mention only one pair of doors because the main task was to lower the sill. Yet, if the Great Dyke had a lower sill by 1837 and the requirement that year was only a matter of removing an upper one, why were tenders for the job so high and so disparate?

In principle, archaeology could elucidate the issue of the sills. The hard layer that we detected is about 53cm below the sill. We probed beside the sill, so, assuming that a lower sill would lie directly beneath the first, that layer is likelier to be foundations. A second sill, then, would lie less than 50cm below the first (a bit more than Waters' estimate). The sluice at Salter's Lode was fitted with four, the lowest 30cm below the third (Wells 1830: 724). Next to the falling New Bedford River, the Great Dyke's south sluice is the likely site for a lower sill.

Adding the Hundred Foot Washes Commission's £57 to Dyson's allowance for £400 produces a sum very close to Chapman's quote of £460. That Dyson's estimate was made four weeks before Chapman secured the contract may suggest that they had colluded; but Dyson must have explained to him that the local boards would fix the doors for £60. The design of the masonry implies that Chapman knew Joseph Warwick's specifications for the doors.

The two amounts were complementary, thus: Chapman "building the sluice" and the two commissions providing the doors or contributing to the cost of them. As for that cost, it would be surprising, considering the value of the lock for the Washes, had Sutton & Mepal paid two thirds and the Washes Commission only one. The Corporation had sought an estimate for the doors but we do not know whether it contributed to the budget, in the event.

The Separation Act's reference to the lock confirms that both pairs of doors remained in 1862. It is puzzling, though, that John Waters averred that "the original doors" had "always been used". Certainly, we noticed no sign of structural alteration in the north sluice. It is frustrating that the south sluice is all but buried.

The sluices could have accommodated the usual Fenland lighter of the mid 1800s with about 7cm to spare on either side. Again, no doubt, such a fit was desired. By then, presumably, the dyke was wider than the "12 foot" of a century before, adapted for bigger lighters, perhaps in 1786. With doors open, the lock could have held two of the nineteenth century lighters end to end. The smaller posts lying in the lock may have been for supporting fenders. Others could be hidden in the undergrowth but some may have been fetched away once the lock fell out of use (Hinde 2009: 125). The doors would have been more difficult to remove.

As for the stone, that the Building Research Establishment (1999) found that Clipsham's "strength is toward the lower end of the range for limestone" may help to explain the iron staples in the south sluice. Perhaps the staples are Chapman's.[41] Nor was that necessarily the only problem. The capstones may have been too heavy for the brickwork. The hint of instability in 1827 implies a problem of tensile stress even before Chapman's work.[31]

Clipsham, the Establishment found too, "may require […] careful design and detailing to shed water" in "the most exposed locations". That could explain the rustication; but such finished carving is surprising in a structure that, unlike the Welmore Lake Sluice, few would have been expected to see.

We deduced that Welmore was not a source for the stone; but the same workshop could have supplied both sites. We could not discover whether the Clipsham quarry had handled an order of the kind; and Rutland's archive for the quarry holds nothing from the 1800s (Leicestershire n.d.). An order would probably have come from the mason. Chapman, and Dyson too, may well have known John Balding, mason of Downham Market, whose will was drawn up in 1844.[57] Are some of the stones his, whether or not he made them for the Great Dyke?

We found no sign of the repairs demanded by the Middle Level Commission. The north sluice's cement mortar is more characteristic of the 1900s than the 1880s (Henry & Stewart 2011: 202). Perhaps the walls were repointed when the south sluice was filled in.

Monument

Darby and Summers show how the Fens' fate depended throughout on balances of power among the institutions. Summers (1976: 115) brands the internal drainage boards as a 'triumph of localism'. Both Cole and Wells adjudged the Corporation helpless at times amongst the local commissions.

Yet if, in one way, the right of more substantial farmers to join its general meetings was a liability (Wells 1830: 390–1), perhaps their attendance also helped the Corporation to promote its case. They could even serve on the Corporation's board as well as in their local commissions. They did sometimes acknowledge a sense of dilemma about the Great Dyke; and the lock seems to have been modified in 1837–8 at their behest and partly their expense. The Corporation's relationship with the local boards was not straightforward.

Among others recorded by both the boards and the Corporation was John Owen, whom the latter appointed as a superintendent in the Middle Level in 1816 and then, in March 1825, as keeper of 'Sutton Wash Sluice' (Wells 1830: 574). One of his first tasks at the sluices must have been to supervise the work for Dyson's improvements. Already, back in 1808, he had claimed for rebuilding at the Three Pickerels, the Corporation's pub in Mepal (Wells 1830: 632).[58] Sutton & Mepal settled large bills of his for supplies that year and in 1811 and were still buying from him in 1838–9 (Table 2). They paid him a salary in 1809 and, as an owner of eight acres, he became a commissioner in 1822.[59] Owen was both farmer and tradesman, thus, exploiting the fens as a substantial 'worker-peasant' (Hall 1992: 54; Ravensdale 1974: 63). Considering his instructions from Sutton & Mepal and comparing his estimate for modifying the lock with the cost of the new doors suggests a key role in the deliberations of 1837–8. He sought to retire as superintendent in April 1842 but remained keeper to 1848, when he died (no doubt at the farmhouse on Mepal High Street still named for him by the Ordnance Survey at the end of the century).[60] Wells (1830: 729) once even calls the Dyke 'Owen's sluice and drain'. Who could have sensed more finely than Owen the tension in the Washes between demands local and regional?

That tension was typical of the whole district but, where the technical issue in the surrounding fens was the wasting of the soil, in the Washes it was the level of the New Bedford River. Directly and indirectly, the lock relates to both. 'Great' is a portentous epithet for a comparatively modest channel but the Dyke was part of the epic struggle to prevent the Bedford Level from reverting to its former condition. It is a small monument to both local history and regional history.

Farmers of the Black Fens have balanced sustainability and immediate gain in various ways ever since the 1650s. In bemoaning the loss of the north end of the Washes, C N Cole could have conceded that the issue of land use was fudged even as the Washes were created.[1] Tolerance for water in spring and summer diminished accordingly. Wells (1828: 8) sighed that, by his day, it was too late to ask whether it had been wise to permit construction of the Cradge. Although their protestations eventually sounded hollow, the local owners, for their part, repeatedly took care to state that they did see the dilemma. It was not just a story of confrontation.

Further progress with tracing the Great Dyke's development would be likely once the Cambridgeshire Archives are reopened. There are other puzzles, however. In principle, two could be assessed by excavation: had either sluice a lower sill; and does the brickwork of the south sluice preserve signs of rebuilding in 1838 and, or, repairs in the 1880s?

There are also enticing implications for research further afield. Rediscovery of the Great Dyke reminds us how much archaeology of recent centuries remains to be recognized. The relationship between the internal drainage boards and the Corporation deserves to be studied throughout the Fens. The Corporation's voluminous and multi-faceted archive is a wonderful resource; and, although less well preserved, the internal drainage boards' records too remain largely unexplored.

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Notes

Abbreviations
BLC Bedford Level Corporation
CA Cambridgeshire Archives
HFWC Hundred Foot Washes Commission
SMC Sutton & Mepal Commission

1. C N Cole 1784, *Extracts from the report of a view of the South Level* p. 95 (BLC memorandum) CA R59/31/4/8.
2. BLC (leases & assignments), 9 November 1882 CA R59/31 Box 58 Bundle 1.
3. Ely Diocesan Records T/Mepal, 'Mepal' (Cambridge University Library).
4. BLC Order Book, *The report of the committee* […] *at the Whitsun meeting 1750*, 16 October (13 October) CA R59/31/11/25 (peat); C N Cole 1784, pp. 96–8 (as 1, above).

5. BLC Memorials & Petitions 1, 9 April 1679 CA S/B/SP112 (for 1675); BLC Memorials & Petitions 1, 6 April 1681 CA S/B/SP135.
6. BLC Minutes, 19 April 1837 CA R59/31/5/37.
7. BLC Order Book, 16 January 1756 CA R59/31/11/27.
8. *Bedford Level petition presented to the House of Commons, The 10th of February, 1777* p. 22 CA R59/31/37/5.
9. Rofe & Rafferty 1968, *Great Ouse River Authority report on the preliminary investigation of the Hundred Foot Washes reservoir site* p. 16 Bedfordshire Archives & Records Service Z447/125.
10. *The report of the committee to whom the petition from the Bedford Level was referred* pp. 78, 155–6 (as 8, above).
11. SMC Minute Book Copies, 9 December 1808 CA/R110/033 box uncatalogued.
12. BLC Accounts 1748 CA R59/31/19/87 pp. 40, 69 (for example); BLC Order Book, 18 May 1758 p. 45 CA R59/31/11/27.
13. BLC Accounts, 1658 CA R59/31/19/1.
14. BLC Proceedings, 25 August 1696 CA R59/31/10/7.
15. BLC Order Book, 10 December 1703 CA R59/31/11/17; C N Cole 1784, *Extracts* p. 69 (as 1, above).
16. SMC Minute Book, 24 January 1750 CA R110/033 box uncatalogued.
17. BLC Accounts 1748 p. 40 CA R59/31/19/87; BLC Accounts 1756 CA R59/31/19/95 ('Emergencies': John Drage for Middle Level under Thomas Cross).
18. BLC Order Book, 18 May 1758 pp. 44–5 CA R59/31/11/27.
19. BLC Proceedings, April 1766 CA R59/31/10/29.
20. BLC Conservators' Proceedings 34(LL), 19 April 1786 p. 71r, CA R59/31/10/34.
21. BLC Memorials & Petitions 9 CA S/B/SP785.
22. BLC Proceedings, April 1798 CA R59/31/11/35.
23. BLC Memorials & Petitions 10, April 1805 CA S/B/SP806 (protest); BLC Order Book, 5 June 1805, p. 43 CA R59/31/11/36.
24. BLC Memorials & Petitions 19, 10 May 1856, CA S/B/SP1791.
25. BLC Minutes, 16 April 1806 CA R59/31/5/11; BLC General Accounts Vols. 1–2 CA R59/31/19/A/1-2, R59/31 Box258b Bundle 2; BLC Minutes, 24 May 1809, 18 April 1810 CA R59/31/5/13.
26. BLC Minutes, 1 June 1814 p. 18 CA R59/31/5/21 (Stanground spelt 'Standground').
27. BLC Memorials & Petitions 12, April 1814 CA S/B/SP1014.
28. BLC Minutes, 27 August 1816 p. 97 CA R59/31/5/22.
29. BLC Memorials & Petitions 13, April 1822 CA S/B/SP1200; BLC Minutes 22 May 1822 p. 55 CA R59/31/5/40; BLC Memorials & Petitions 13 p. 3, CA S/B/SP1576 (sluice rebuilt).
30. BLC Minutes, 21 May 1823 p. 91 CA R59/31/5/26.
31. BLC Minutes, 7 June 1827, p. 177 CA R59/31/12/4.
32. BLC Memorials & Petitions 15, 1830 CA S/B/SP1404; BLC Minutes, 20 April 1830 CA R59/31/5/32.
33. BLC Proceedings, 25 May 1825 p. 54 CA R59/31/12/4.
34. BLC Minutes, 17 May 1837 CA R59/31/5/38.
35. SMC Minute Book Copies p. 1, 22 May 1822 CA uncatalogued.
36. HFWC Minutes, 25 April 1838 CA 283 uncatalogued.
37. SMC Book of Account, 3 January 1807 CA R110/033 uncatalogued.
38. BLC Memorials & Petitions 16 CA S/B/SP1509; BLC Minutes, 14 June 1837 CA R59/31/5/38.
39. BLC Memorials & Petitions 15 CA S/B/SP1341; BLC Proceedings, April 1827 CA R59/31/12/4.
40. BLC Minutes, 5 June 1838 CA R59/31/5/38.
41. BLC (bills & receipts) CA R59/31/20/154 Box 281 bundle 2.
42. BLC CA R59/31 Box 27 bundle 6.
43. BLC (bills & receipts) "Mr Dyson's Unsettled Bills" (as 41, above).
44. BLC Minutes, 19 April 1838 CA R59/31/5/38.
45. BLC Memorials & Petitions 17 (undated) CA S/B/SP1632; <http://www/ousewashes/info/sluices/mepal-lock/htm>
46. HFWC Minutes, 16 January 1855 CA 283 uncatalogued.
47. HFWC Minutes, 4 April 1839 CA 283 uncatalogued; SMC Book of Account, 23 April, 3 January 1839 CA R110/033 uncatalogued.
48. BLC Minutes, 6 June 1843 CA R59/31/5/40.
49. BLC Outer Works Vouchers 1838 CA R59/31/20/156.
50. HFWC Minutes, 5 April 1854, 16 January 1855, 4 April 1855, 2 April 1856 CA 283 uncatalogued.
51. Middle Level Commissioners' Minute Book 2, 21 March 1873; 24 March 1879 (Works Committee) CA uncatalogued.
52. Middle Level Commissioners' Minute Book 2, 3 November 1881 (Board) CA uncatalogued.
53. Rofe & Rafferty pp. 15–6 (as 9, above).
54. Mepal 4 (as 3, above).
55. T Atkin pers. comm. to E S, 2016.
56. Pers. comm. to E S, Mepal Village Hall, 2017.
57. National Archives Prob 11/1994/189.
58. BLC Minutes, April 1808 CA R59/31/5/12.
59. SMC Book of Account, 20 February 1808 CA R110/033 uncatalogued; SMC Minute Book, 8 December 1809, 30 April 1811 CA R110/033 box uncatalogued
60. BLC Minutes CA R59/31/5/40; BLC Proceedings CA R59/31/12/7; C Clapham & Cambridgeshire Family History Society 2010 'An indexed transcription of the parish registers of Mepal' p. 54 CA.

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