COLLATION OF RUDIMENTS FOR BOTTESFORD BECK, ITS HINTERLAND, & ITS DOMAIN.

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1. Bottesford Beck Watercourse & Corridor.

1. 1. Route. (Maps P27, P28, P29)

In total, Bottesford Beck is 15.75km long & joins the River Trent about 17km upstream of its Humber confluence: the Beck watercourse type is mostly lowland, low gradient, high alkalinity, & designated as heavily modified when considering physical & hydrological characteristics.

Arising from Risby Warren, a Site of Special Scientific Interest on the high ground of the northern part of the Lincolnshire limestone ridge, the channel is relatively narrow as the Beck flows from this 'Edge' escarpment.

The conveyance of the Beck is increased by drainage from abandoned underground iron ore mines on the north eastern periphery of Scunthorpe.

Originating within an older settlement area of Scunthorpe, Brumby Beck is a tributary; both Becks flow through the Scunthorpe Steel Works prior to combining at the southern works perimeter, noting that the Bottesford Beck leg has been diverted from its natural line into a newly cut channel for accommodating the Yarborough Ironstone Quarry (Before the reroute, this stretch had been known as Emanuel Beck).

After the Steel Works, with much raised banking, the surrounding ground is tending to flat & Bottesford Beck broadens but then enters a stretch of gentle sloping low profile valley with Scunthorpe & Bottesford on one side & countryside on the other; the A18 Emanuel Roadbridge crosses Bottesford Beck at the Steel Works boundary, whilst the A159 Messingham Road crosses further downstream & this stretch is bisected by the Holme Lane crossing.

The Beck watercourse then meanders past Yaddlethorpe, a ward of Bottesford, to lower embanked reaches & acts as a higher level conveyor of drainage across flat land before discharge into the River Trent via a flapped tidal gate at East Butterwick: this gate operates using gravity alone, enabling it to let water flow out when the Beck is higher than the River Trent. This stretch is crossed by Scotter Road South &, within close proximity, the M180 Motorway.

1. 2. Bank Walk.

Prior to leaving the Steel Works, access to the watercourse is difficult.

Between the A18 & the A159, access to the Scunthorpe & Bottesford side of the Beck is mostly first-rate.

After the A18 Emanuel Road Bridge, there are two dormant fields identified as high technology employment land with expectations from early 2020 to attract a National Flood Resilience Centre (a project called ARK by Hull University & Humber Fire & Rescue): this land is now available on an open sale. A homegrown business inspired by nature, dedicated to a wilder future, Wrendale Designs is progressing plans for a new purpose built headquarters on this land. A wooded part of the Ashby Ville local nature reserve (LNR) follows to the sharp Richmarsh Bend. This stretch is Emanuel Strip. The perimeter of the Ashby Ville LNR continues as wild self set flora, incorporates three wetlands (East, Middle, & West), noting that part of this stretch has now developed dense bank vegetation growth which can be circumvented within the LNR. The commencement of the Bottesford Beck Linear Park (BBLP) Bridleway follows the West Wetland & ends at the A159.

The BBLP consists of a village green open space, the Redwist Community Wood, an oxbow bend, a demonstration rain garden, Vale Wood, three ponds, spinnies, & the Cafe Natura & Visitor Centre. Two of the ponds are in natural succession with one contaminated by an invasive plant, whilst the third was instigated as a dipping pond; its associated outside classroom, together with two further ponds, appear to be in limbo. The last spinnies have been named Beech Tree Wood, Oak Tree Wood, Maple Tree Wood, & form a nature trail.

Access to the opposite bank side is limited. The stretch to the Richmarsh Bend is bounded by the A18 to Holme Lane public footpath & a solar farm with a projected life to 2070; by this time, global solar panel waste will be a staggering 100million tonnes! (This soft & plashy land

had become difficult to farm & it had been identified as high technology employment land prior to the solar farm succession). Following the Bend, with crops, pig housing, sheep grazing, & a minor return to meadow, this field boundary is interspersed by the Twigmoor Drain &, having absorbed Skegs Plantation, Holme Hall Golf Course, a manmade irrigation reservoir within the Willows Plantation, a leaning obsolete bridge abutment, Beck House (Grade 2 listed), & Holme (Bluebell) Wood, with Wood access from the BBLP via St Peter's Foot Bridge.

With no natural predators in England, an attempt to reintroduce otters failed but a tube tunnel within the Footbridge rural abutment exists to host a future holt!

An underground oil pipeline crosses the Beck below its bed at the west end of Bluebell Wood.

Across the A159, close access to Bottesford Beck from Yaddlethorpe is limited to a short path extension of the Bridleway. A detour via Gravel Pit Lane bypasses farming. At the end of the Lane, a permissive path commences at a step way, bisects a horse paddock, & arrives at the Yaddlethorpe Foot Bridge. Across the Beck, the path enters a short length of Cook's Tiny Forest, then rises & skirts the forest to follow the M180 Motorway boundary. The permissive path ends with the Motorway boundary remaining on one side & a large pond on the other, then connects to Croft Lane & Scotter Road South: the pond accepts drainage from the Motorway prior to overflow into a culvert which allows Bottesford Beck to flow under the Motorway & Scotter Road South.

The Yaddlethorpe Foot Bridge had been installed by November 2024 following extensive wet weather delays. The connecting paths were completed during 2025.

Prior to Scotter Road South are extensive horse paddocks & the remnants of the Messingham Water Mill & Bleaching Yard, with visible foundations of a derelict house & outbuilding.

After Scotter Road South, flat land, with Bottesford Beck revetment banking, allows access to East Butterwick. The Scotter side has fields alongside the Yaddlethorpe Sewage Treatment Works (STW) & a chicken rearing factory farm. Upstream of East Butterwick, the Butterwick Foot Bridge affords access to Butterwick Common & an alternative path to the village. This path precedes the Bottesford Moor bank of the Beck, bordered by Butterwick Hale (a bird-watching site), crop fields, & Snake Plantation.

1. 3. <u>The Bridleway.</u>

A dual funded project by North Lincolnshire Council (NLC) & the Paths for Communities Fund of Natural England for improving access to the BBLP was completed during 2013. Natural England insisted that only a bridleway was acceptable rather than just a path. Where practical, the Bridleway is formed by a manmade path edged with adequate grass verge(s). Resurfacing Vale Wood car park was included in the project.

With the Bridleway path surface starting to crumble in many sections as early as 2015, footfall fell to a low level in sympathy with accelerating degradation. After resurfacing during late 2018, footfall eventually recovered.

Severe precipitation events are water logging some stretches of the Bridleway towards the A159 crossing: adding path spoil & de-silt tailings to the Beck bank top is land locking surface water within the flood plain & swamping sections of the BBLP Bridleway: during early Jan2024 & towards the end of an extensive period of rainfall, several small drainage gullies were dug from the Bridleway path to the bank edge.

Resurfacing of the path from St Peter's Foot Bridge to the Valley View linear park entrance for repairing/mitigating damage from surface water swamping was began by NLC as planned during late September 2024: after completion of a short section, about 75m, the project appears to have been abandoned with a degraded surface.

Within some sections, canopy clearance reduced by overhanging tree branches & side encroachment from trees, bushes, nettles, & brambles have been causing the BBLP Bridleway to lose its definition.

In particular, planted with grant support by a volunteer group & bordering the Bridleway, the outer tree line of the Redwist Community Wood was initially flailed during 2010 resulting

in a poor finish of unsightly macerated branches. During 2015, most of the outer line of trees was cleared by NLC, sawing at ground level to increase clearance for the Bridleway, with branches chipped & blown into the wood: there was insufficient proceeding actions by stake holder(s) to prevent regeneration of saplings & brambles &, again, the Bridleway path lost much of its verge to the Wood.

Preparation by the Environment Agency (EA) for a 2024 project to de-clutter the aquatic vegetation of the Beck channel from west of the golf course to the Vale Wood car park included the requirement for adequate machine access to the channel & defining the bank edge; bank-side obstructive tree, branch, & ground overgrowth was removed which reinstated the verge(s) of the manmade path. With the Bridleway & channel edge redefined for this section of the BBLP, there was a dramatic increase in full view openness with a reduction in security & safety risks, resulting in a perceptible increase in footfall.

This BBLP project was re-commenced by the EA in October2025 for the section between the Vale Wood Car Park & the Cafe Natura, but with NLC inputting much tree lopping & Beck machine access for aquatic vegetation manicure deemed not required.

1. 4. <u>Sense of Place.</u>

To enhance the appeal of local trails, three education & visitor centres were envisaged; Belton, Bottesford & Yaddlethorpe, & Crowle. The first two are complete, but the Crowle proposal appears defunct following finance budget depletion (A near attraction for the Crowle proposal would have been the NLC goat herd, now culled due to health problems).

Although a trunk sewer is below most of the BBLP & serves as an obstacle for constructions, the Bottesford & Yaddlethorpe Education & Visitor Centre was completed during early 2019 but within a cramped location, protracted build, no captive parking, adjacent residential neighbours, but nonetheless, edging the BBLP Bridleway.

The planning application of 2017 proposed a building having an engaging style, with large glass viewing areas, a clean roofline, & oriented towards the Beck. From, maybe, original landscaping of the A159 peripheral banking &/or reclaiming an old farmyard, poor consolidation of the ground had necessitated the incorporation of screw piles to the building foundations. A ring beam & pile arrangement was also utilised so as not to interfere with a live drain. Due to the complication of below ground services, the block plan had to be modified by foreshortening the building & thereby reducing the overall floor area: the change was accommodated within a revised planning application of 2018, issued during the build. The finished appearance has a Belton facility style & the reduced floor area compromised a distinct lecture &/or exhibition area: the Bottesford & Yaddlethorpe Coffee Shop & Visitor Centre was thus the rename. With the opening days & hours below expectations &, together with a period of closure, the employment opportunity had been less than forecast. With part of the internals altered for a more catering friendly surrounding & opening hours extended to all week, the centre re-launched during early February 2020 & now houses the Cafe Natura.

Since the reopening, the local A159 parking lay-by has been extended.

1. 5. <u>Flora & Fauna.</u>

Vegetation & wild life observations are mostly concentrated in & around the BBLP.

There are areas of native & ornamental species. Besides daffodil, snow drop, & tulip, any introduced flora has mostly been native & sympathetic to the vista; violet may have originally been planted, together with bluebell. The BBLP is populated with self set elder & bramble. Ground flora consists of largely uninteresting species such as broad leaved dock, cow parsley, nettles, ivy, hogweed, & cleavers. There are patches of moderate interest with lords & ladies, hedge woundwort, & lesser celandine. Grassland areas are dominated by coarse grasses such as false oat grass.

Sago pondweed (or fennel weed & sometimes called ribbon weed) is the dominant submerged plant of the Beck. Filamentous green algae can be abundant when conditions are favourable. Emergent plants are becoming more prevalent. Simple stem & branched bur reed were thought as paramount. Of late, bulrush (or reed mace & sometimes called cat tail)

& common reed are becoming more prevalent. Fools water cress is spreading & new colonies are being established, whilst aquatic flowering plants are selectively pollinating.

An invasive bank side plant (Himalayan balsam) has begun spreading from the River Trent into the lowest reaches of the Beck.

The fauna is reflected in a Bottesford poem by Stargazer, 2012.

They're gone,
You used to get rabbits here,
They're gone,
Hares ran here,
They're gone,
Birds sang here,
They're gone,
Empty country side is here,
Well done!

Nevertheless, amongst the birds in incidental records for the whole BBLP are mistie thrush, magpie, blackbird, robin, chaffinch, & long tailed tit. Sensitive to human noise, visits by heron & egret (part of the heron family) during winter are sporadic. Pipstrelle, brown eared, & daubenton are recorded as bat species.

Of late, along & from the BBLP, sightings of kingfisher, buzzard, weasel, stoat, mink, hare, vole, & fox are becoming rarer or nonexistent, but mole & deer numbers appear to be stable & the squirrel population is expanding.

Mallard ducks & moorhen are Beck water fowl, while visits of swan are rare.

Chubb & rudd are amongst fish species supported by Bottesford Beck. Stone loach & eels have in more recent times been recorded along the stretch of Beck within the Trent flat lands; increasing the lateral connectivity to the Trent would increase fish varieties & stocks for Bottesford Beck.

Within most channel stretches, the invertebrate population of the Beck has increased from a low level &, at least stabilising or increasing, with snail & louse, amongst other families, in evidence.

1. 6. <u>The Steel Works & the Beck.</u> (Map P29)

Steelmaking in Scunthorpe has utilised various water supplies, differentiated by process application; the sources include tidal Trent, potable bore-hole, River Ancholme, & Crosby Quarry.

Whilst waste waters from the Normanby Park Steel Works had historically been discharged directly to the River Trent, effluent discharges from the Appleby-Frodingham & Redbourn coke plants & a site tar distilling plant were being discharged into the Bottesford & Brumby Beck watercourses at unacceptable pollution levels. With the commencement of commissioning during 1974 & several kilometres from its feed sources, the Biological Treatment Plant of the Scunthorpe Steel Works had processed effluents plus waste waters from the Appleby-Frodingham Coke Plant, Dawes Lane Coke Plant, the tar distilling plant, & the demolished Redbourn Coke Plant site, with the treated waters discharged direct to the high flow River Trent.

During the contraction & cessation of the coke making & production of associated by-products within Scunthorpe, the Biological Treatment Plant facility has been shared with others, & the Steel Works now only feeds contaminated site drainage waters for processing.

To demonstrate its commitment to safeguard the environment, the Steel Works sponsored removal of scrap metal & rubbish from the out-by channel of Bottesford Beck during 1993.

With a feed of treated waste process waters (permitted trade effluents), &, with site outfalls consented for rain water discharge, the Steel Works introduced measures commencing in 1994 for continuous & added protection to both Bottesford & Brumby Beck in order to reduce or eliminate the impact of contretemps.

Stations for continuously monitoring water quality were strategically located with measurements instantly transmitted to the works plant condition network: any deviation in the quality of discharged waters was observable together with out of compliance alarming &

back dated trending, all of which prompts either immediate or planned corrective action(s). Complete with oil extraction & water quality monitoring, a capture weir was installed in the Bottesford Beck channel just prior to the Steel Works boundary. Oil absorbent booms were routinely applied to consented outfalls rather than as an exception. Self contained oil skimmer equipment was installed at selected locations. Frequency & effectiveness of dust cleaning from roofs was incorporated to reduce the particulate loading on rain water settlement sumps during intensive precipitation. Via plant enhancements, the rogue process water elements of consented discharges were eliminated or at least dramatically reduced.

Since 2000, process plants have been installed for the reuse of waste materials produced by iron-making & steel-making via the dewatering of process slurries: this provides the potential of reduced loading on settlement ponds, beneficial for the compliance of licensed process water discharge to both Brumby & Bottesford Beck.

During 2020, the Steel Works invested £800K to further monitor its drainage systems: this investment was centred upon oil detection & updating skimming facilities, noting that plant oil leakage rates had already been reduced across the site.

The Scunthorpe Steel Works initiative has established a freshwater intensity per tonne of steel below most other European integrated works manufacturing VIRGINSTEEL.

1. 7. The Synthetic Beck.

1. 7. 1. Pollution, State of Play.

Rather than being highly discoloured, now, during clement weather, Bottesford Beck has clear water with ‘Good’ ecological water quality; an improvement on historical poor & then moderate water quality. With most feed waters classed as polluted, the catchment is a Nitrogen Vulnerable Zone under the Nitrates Directive.

Amongst springs & streams, there are 6 surface water sewers & numerous road runoff outfalls discharging to the Beck watercourse: the road runoff contains contaminants of spilled fuel, lubricants, metals, & micro plastics. Pollution from roads also occurs within the winter runoff of de-icing chemicals & road salt.

There are over 18,000 combined sewer overflows (CSOs) within England, designed to release excess wastewater during storm events to prevent flooding, but these overflows to watercourses contribute to elevated biological oxygen demand (BOD) & pollutants: there are six outfalls intermittently discharging directly to the Beck watercourse (common outfall to Brumby Beck for 5 CSOs, common outfall to the upper Bottesford Beck for 6 CSOs, Queensway CSO, Arkwright Way CSO, South Grange CSO, & Rochdale Road CSO).

When these CSOs spill sewage, albeit much diluted, it contains bacteria as pathogens, fats as protein, organic matter as carbohydrates, chemicals (pharmaceuticals, cleaning agents, etc), & sometimes visible trash.

Grange Lane North, which had a quality driver, & South Grange with an aesthetic appearance driver were CSOs that had Unsatisfactory Intermittent Discharges towards Bottesford Beck. A holistic approach for the delivery of these discharges included increasing the through flow at Grange Lane North, &, acting as extra downstream storage, installing a parallel sewer to existing, together with increasing the sump size at South Grange & incorporating a new CSO chamber equipped with a mechanical screen & remote monitoring. The final works were completed during 2008.

CSO activity is monitored using event duration monitors which track the frequency & duration of discharges which, in turn, influence water quality. In particular BOD & soluble reactive phosphorous had historically prevented the Beck from achieving a ‘Good’ status under the Water Framework Directive.

Other discharges to Bottesford Beck include consented & permitted industrial outfalls such as final effluent (now diverted directly to the higher flow River Trent) & settled storm tank overflow (SSO), both products of Yaddlethorpe STW.

Connected to the Beck are open channel drainage ditches which transport rural runoff together with agricultural & country road pollutants: excess nitrogen & phosphorous can leach into ground water or run-off into surface waters, contributing to water pollution & algae blooms. This happens when fertiliser application exceeds plant uptake capacity.

1. 7. 2. Pollution, Some Tales.

For many years, Brumby Beck & Bottesford Beck had been grossly polluted by effluents from, primarily, the ferrous industries of Scunthorpe: one outfall to Brumby Beck exceeded the base flow of its accepting channel & it was compared in quality to Discworlds River Ankh which was described as soup-like within Terry Pratchett's novel.

After 1974, coke-oven effluents were redirected to the River Trent following treatment at the Biological Treatment Plant for Scunthorpe Steel Works. This generated reductions of suspended solids, phenols, & cyanides to localized watercourses. Nevertheless, Bottesford Beck still achieved 2nd prize in a 1985 competition to find Britain's most polluted watercourse!

Even at 2000, there were no macro-invertebrates present at, or near, the A18 crossing of the Emanuel Road Bridge: in the absence of proximate sources of macro-invertebrate organisms to act as colonisers, the potential of a historically polluted Beck to support a richer macro-invertebrate fauna was constrained, not only by water quality, but also by colonisation processes.

At dawn, during a morning of 2013, a fish massacre was witnessed downstream of the Richmarsh Bend. The floating bodies had become ambushed on the extensive amounts of submerged aquatic vegetation from 60m below the Bend & to the Golf Course. The body count was abandoned after the first 100. The dissolved oxygen content of this local impeded Beck water had dipped below the minimum amount for sustaining fish life: localised insufficient dissolved oxygen levels were aggravated by a combination of low flow velocity, high air temperature conditions, low grade heat energy from industry, the dense in-stream vegetation, & an over-night storm.

There have been Beck pollution incidents during the 2011/20 decade involving, amongst others, a sauce factory & the Immingham/Manchester fuel pipeline. The asset owners have generally reacted quickly & financed the resulting clean-ups. Measures to prevent the repeat of these individual incidents have been incorporated with guidance & monitoring by the EA.

During this period, Severn Trent Water dealt with at least two cross connections (foul drainage sewer connected to surface water drainage sewer): the first at the Mulberry Gardens outfall from Wisteria Way house build & secondly at the Holme Lane outfall from the local pub area.

A pollution incident of January 2020 resulted in gasping & dead fish from the Mulberry Gardens outfall to St Peter's Foot Bridge: there was a light surface film flowing along the urban side banking & a strong smell similar to heavy oil.

A minor pollution incident originating during autumn 2023 involved an abandoned & fired lightweight motorcycle laid on the gabion bank edge at the rural side of St Peter's Foot Bridge. During winter 2023, the carcass was dumped over the edge & became engulfed in a rising Beck level: in mid January 2024, leaching oil pollutants were arrested downstream via an absorbent boom & the vehicle was removed.

Early August 2024, waste from a leaking rising foul sewer entered a surface water drain & contaminated the Beck downstream of the Emanuel Road Bridge: fat/fungi were the residue(s) within the near water course. Coincidentally, during this contamination period & much further downstream, a localised multitude fish kill was experienced from the Winchester Drive ten foot to the Holme Lane crossing area.

During periods of much rainfall, litter & sanitary products had a tendency to become banked in captive areas towards the Holme Hall Golf Course, positively, now a rarity.

1. 7. 3. Pollution, Some Historical Prevention.

A M180 holding pond near to Croft Lane captures motorway drainage & reduces the impact of pollutants prior to overflow to Bottesford Beck.

To handle surface & road drainage arising from Lakeside, a replacement pumping station with overspill/holding pond was constructed adjacent to Lakeside Parkway. A NLC asset, the pond acts as a settlement for pollution & connects to the Beck via a throttled overspill,

primarily to ensure that the combined flow from pumping & pond does not exceed the original undeveloped land runoff rate.

To act as infiltration points for road drainage, with one on Manor Road & another on Olive Drive, rain gardens were established during 2016. Other rain gardens exist within the Burdock Road house build scheme, primarily to combat not only road pollution but impervious ground conditions.

1. 7. 4. Balancing Water Quality & Infrastructure of Drainage Network.

1. 7. 4. 1. Case Studies.

With the European Union Water Framework Directive as the driver for projects to protect water bodies from deterioration & improve water quality, the requirement existed from the EA to comply & improve the overall water quality status of Bottesford Beck to at least 'Good'.

With up to 10years of data, an initial case study of 2017 had correlated sampling results with flows, indicating that varying water quality classifications along the Beck were influenced by CSO spills, final treated water overflow from Yaddlethorpe STW, & East Butterwick tidal gate operation. Results highlighted challenges in meeting the EA 'Good' status, emphasizing the need for broader catchment improvements.

Specifically, the 2017 study assessed the relocation of the final treated water overflow from Yaddlethorpe STW to a proposed direct discharge into the larger River Trent, thereby offsetting the impact to Bottesford Beck of any traces of chemicals & micro-plastics within the recycled water.

A 2023 case study, interlinked with the 2017 event & inspired by the Wastewater Flooding Defense for Scunthorpe & the Severn Trent Drainage & Wastewater Management Plans for the Lower Trent, concentrated on the catchment drainage infrastructure & correlated ways of achieving 'Good'.

A final adopted solution included:

- Extension sewer enabling transfer from Yaddlethorpe STW to the River Trent of treated waste water
- Shaft tanks at Brigg Road/Station Road CSO, Grange Lane North CSO, & South Grange CSO
- Extra waste water storage capacity at Yaddlethorpe STW with overflow transfer to the River Trent.
- Telemetry to integrate the three Scunthorpe out-by shaft tanks with Yaddlethorpe STW waste water storage.

The adopted approach had considered minimising construction impact whilst optimising CSO storm drainage tanks & network performance, but, although increasing the carbon footprint of Severn Trent Water via pumping power consumption, the project has raised water quality throughout the Beck watercourse to 'Good'.

1. 7. 4. 2. Hardware Progression.

Installation of a 3.7km final treated water sewer from Yaddlethorpe STW with outfall into the River Trent at East Butterwick was operating by early 2025: the conveyance of the Trent is much greater than any flow of Bottesford Beck, the original disposal watercourse.

Tasked with reducing storm discharges to the local watercourses, shaft tanks were installed by the end of 2025 for attenuating discharges from the selected CSOs: during periods of heavy rainfall, overflow of diluted sewage from a named CSO is retained within its associated shaft tank & only released back into the foul sewer system as conditions allow.

The CSOs & capacities of the associated underground shaft tanks are Brigg Road/Station Road 1040m^3(12.5mdiax14mdeep), Grange Lane North 3120m^3(20mdiax15mdeep), & South Grange 3510m^3(25mdiax12mdeep); all shaft tanks are fabricated from segmental precast concrete blocks.

The shaft tanks are connected to the existing combined sewerage system through 1,050mm diameter inlet pipes. The twin pumped return system of each tank is activated by

telemetry from Yaddlethorpe STW, ensuring diluted storm sewage is returned, once permitted. Additionally, motor control centre kiosk, flushing system, vent stack, rising main, & sewers have been incorporated for each shaft tank.

The shaft tanks increase the capacity within the whole combined sewer network & reduce the number & volume of intermittent spills from their associated CSOs, thereby minimizing the potential human health & environmental flood impacts of the existing discharges whilst improving the BOD concentrations within Bottesford Beck for achieving the EAs 'Good' target.

Four above ground circular tanks constructed at Yaddlethorpe STW provide extra waste water storeage & reduce the inundation risk to Yaddlethorpe STW & discharge of diluted sewage overflow to Bottesford Beck: this eventuality is virtually eliminated by a pumping station at STW, discharging directly to the River Trent.

1. 8. To Flood or Not to Flood.

Bottesford Beck has generated minor localised flooding on occasion, but a significant flood is rare; July 2007 & August 2012 might be regarded as noteworthy recent over banking events.

With the latter event invoking, in particular between the A18 & A159, cess pit inundation, field & Golf Course water logging, partial flooding of the BBLP, & peripheral flooding of a few private rear gardens; the East Wetland had filled & water flowed onto the adjacent Paddock with over-spill into Ashby Ville Lake.

The EA cordoned the narrow section of the Bridleway at Winchester Drive due to the raging Beck flow!

NLC convened meetings of stakeholders: the EA advised that no channel maintenance work was planned for the Beck. The direct outcome of the meetings was to add Bottesford Beck to a list of eight other watercourses within England as River Maintenance Pilots.

Concurrent with these meetings & instigated by NLC, a detailed survey of bank & channel bed levels was ongoing & the EA sponsored a sediment survey to assess conditions for permitting channel upkeep tasks.

Taken during March 2013, sediment samples from the Emanuel Road Bridge to the Twigmoor Drain, besides other pollutants, contained concentrations of polycyclic aromatic hydrocarbons that, applying Canadian criteria of the time, exceeded thresholds of probable environmental effect if disturbed: these occur when crude oil products (petrol & diesel) & coal (iron & coke making) are burnt. Binding onto sediment particles, polycyclic aromatic hydrocarbons have low solubility in water. Also, concentrations of hydrocarbons exceeded waste acceptance criteria for inert waste together with clusters of lead & arsenic above sediment quality guidelines. These results had validated the classification of this section of the Beck watercourse as a European Union Water Framework Directive Sensitive Area.

Sponsored by a farmers association, a sediment survey of this section some years later was assessed by the EA who deemed that the sediment was re-moveable provided the spoils were stored on the local rural bank margins.

Flood mitigation measures along Bottesford Beck include attenuation (Burdock Road estate precipitation storage & Cafe Natura hydraulic brake), retention (basin of defunct Ashby (Concrete) Pond), & detention (Lakeside Parkway overspill/holding pond).

Two of the ponds behind Baldwin Avenue accept diverted spring waters which had previously drained directly to the Beck: in many circumstances this can reduce the pond free volumes & increase ground saturation.

Flood containment measures along Bottesford Beck include the Wetlands, the levee length of Lakeside Parkway, the Dutch wall bordering the Redwist Community Wood, & the nook wetland of Butterwick Hale.

1. 9. Investment.

Since 2010, total project funding for the Beck alone has exceeded £2million. Schemes have included information boards, channel de-silting, channel de-vegetation, & bank renovation.

As an example of funding, arising from a pollution incident during 2015 & under the terms of an EA Enforcement Undertaking, Tata Steel UK Ltd paid a donation of £73K during 2017 to the Humber Nature Partnership for improving Bottesford Beck. Two projects completed are forming a spur from the Ashby Ville LNR circular track along Emanuel Strip to the A18, noting that tree removal was completed two years earlier under other funding. With the possibility of damage to property, the other project involved the felling of wind vulnerable trees bordering the rear of Hazel Grove & Acorn Way, both to the south of Baldwin Avenue. As at March2020, approximately half of the donation required apportionment.

1. 10. <u>Management.</u>

Bottesford Beck is designated as a main river from downstream of the Emanuel Road Bridge.

As flooding has had the least impact to the fewest people, since the millennium, the EA has normally curtailed any maintenance of the Beck channel to tree debris removal & routine inspections of the watercourse assets.

Thus channel maintenance had been relying upon the interest, with action(s), of the riparian owners: the dominants are NLC & various farmers.

Stake holder involvement had been within the Bottesford Beck Improvement Group, now defunct. The Trent Rivers Trust, a charity, hosts the Lower Trent & Erewash Catchment Partnership, with Bottesford Beck & the River Eau one of four hubs of interest. The Bottesford Beck Management Board has the prime objective of developing & monitoring a plan for the watercourse, applying flexing as necessary. Acting as a pressure group & work team, Friends of Bottesford Beck (FoBB) is a volunteer organisation, initially convened to access grants which were not readily available to town & county councils. Severn Trent Water has the input for wastewater drainage & NLC, together with Severn Trent Water, for road drainage. Within its own boundary, the Steel Works has riparian ownership. The Scunthorpe & Gainsborough Internal Drainage Board (IDB) has responsibilities, mainly directed to the Trent Flats.

Amongst risk management authorities for Bottesford Beck are NLC & Humber Emergency Planning.

Although laissez-aller has been applied to some stretches of Bottesford Beck, asset protection had been the primary appeal of maintenance via conveyance tasks (de-vegetation, de-silting, debris removal, bank renovating): this concerns the condition of bed & banks as influences on the delivery of the water resource, reducing the distribution & frequency of the channel related processes (predominately erosion & deposition, impacted by discharge, silt load, & water level), & the achievement of the Beck conservation objectives. Thus stretches of the Beck have been maintained for the aims of managing flood risk, with consideration for the needs of nature & wildlife.

With regard to flood risk, the recent EA involvement in Beck maintenance management is seeking a balance between accepting lower flow velocities from excess channel vegetation, which in turn reduces bank erosion, & accepting higher flow velocities from channel conveyance tasking, which in turn increases bank erosion & the potential for encouraging the drawbacks of long term meandering, detrimental to access, road, bridge, & land security.

Not the end, management plans are the start of a process of strategic Bottesford Beck maintenance for the incorporation of future predicted parameters, bearing in mind Mark Twain's quip: 'Prediction is difficult - particularly when it involves the future.'

1. 11. <u>Maintenance Tasking.</u>

1. 11. 1. <u>Overview</u>.

For improving the flood resilience of properties & land near Bottesford Beck, conveyance works are the channel maintenance tasks for ensuring adequate water flows, albeit, with some stretches of the Beck channel having had nil or minimal tasking for reducing flow resistance.

With the inclusion of the Beck as a River Pilot & NLC as a dominant riparian owner, a push towards machinery for some channel conveyance works was incentivised: with a desire of

not to damage the BBLP Bridleway path via a 360 machine & negate the need to remove trees for operation, an amphibious machine was selected.

A Swedish Truxor amphibious base machine was contracted by NLC having weed cutters, the accessory of a silt pump, & relying on remote net barriers to capture cut aquatic vegetation; the rate of silt removal for this machine was viewed as inadequate & remote netting of aquatic vegetation cuttings had failures.

With this experience, Bottesford Beck as a major application but with others, NLC purchased a similar Truxor base machine but with the accessories of a front activated de-silting bucket, including machine outrigger stabilisers, & a cuttings collection basket (emptying basket cuttings onto the bank top allows little critters to re-enter the water).

The recent non-use of the NLC Truxor for Beck channel maintenance has been reflected in the dense & expanding growth of emergent aquatic vegetation within favoured sections & rising water levels on outfall aprons.

Of late, since mid October2024, the EA has committed resources to BBLP maintenance with manicuring Bridleway vegetation, de-cluttering aquatic vegetation, & controlling bank-side vegetation.

1. 11. 2. <u>Vegetation.</u>

If aquatic vegetation is left to grow unchecked, it can restrict the watercourse channel & cause increased siltation, reducing the channel capacity & impeding flow.

During 2000, the EA sponsored de-vegetation of the channel by applying a 360 wheeled ditching machine equipped with a de-weeding bucket.

During Nov2014 & via the contracted amphibious machine, &, during Dec2016, the new similar NLC amphibious base machine, partial de-vegetation by cutting a mid tranche of the channel had controlled levels within a band, noting the effectiveness of this process is frequency biased. The 2014 effort included much of the stretch between the A159 crossing & the Richmarsh Bend whilst the latter was foreshortened to Mulberry Gardens: noticeable Beck level drops allowed channel conveyance to improve in the short term by this trimming of the then dominant submerged vegetation, with regeneration to original weed length taking at least two seasons.

The NLC amphibious machine was applied during August2020 to trim minor amounts of central biased vegetation from the A159 to the submerged oil pipeline.

During September2020, this machine accessed the channel via a new cut bank-side opening adjacent to the Lakeside Parkway overspill/holding pond outfall. A channel central cut towards the Richmarsh Bend trimmed much submerged weed which resulted in a visual drop of the local Beck base level.

Accessed during September2021, aquatic vegetation was trimmed between the Boyd's Court outfall & the Ashby (Concrete) Pond area. The main cut was mid channel, although side cuts to the urban bank were created to access banking for off loading the collected trimmings: the lower localised level revealed much putrid sediment.

During the 2023/24 channel work period, a late August2023 start was incorporated with the NLC machine occupation restricted within a time window, but with ambition to reach at least Mulberry Gardens. In the event, channel vegetation upstream from the Cafe Natura to a position midway between the Baldwin Avenue entrance to the BBLP & the St Peter's footbridge was trimmed: clusters of emergent vegetation were bypassed to reduce bank erosion & increase habitat opportunity but, in any case, some varieties induced cutter jamming which reduced the rate of de-vegetation.

During mid November2024, following Bridleway & bank-side preparation for access, the EA selectively de-cluttered channel vegetation from Vale Wood car park to west of the golf course using a 360 tracked excavator equipped with a weed puller/gathering attachment. The base level for this stretch was noticeably reduced; most exposed putrid sediment was flushed during post precipitation events.

During early February2025, where practical, the EA accessed the Beck & near banking from west of the golf course to Emanuel Bridge & coppiced some trees, trimmed others of

channel overhanging branches, & treated undesirable stumps; the waste wood was chipped & blown to suitable ground.

The BBLP manicuring & channel vegetation de-cluttering exercise of 2024 was further progressed from the Vale Wood car park to the Cafe Natura by the EA during November2025, with NLC inputting a contribution of Bridleway tree lopping; the channel de-cluttering requirement was seen as minimal for balancing flood risk against meander potential, so a 360machine was not applied to the channel vegetation.

During summer2026, the BBLP Bridleway path edges were trimmed of vegetation, followed, in particular from west of Vale Wood to the A159, trimming Bridleway verge vegetation for reinstigating Bridleway status & locating & defining the Beck bank edge. This procedure was repeated upstream but with only selected lengths of the Bridleway reinstated & bank edge defining.

1. 11. 3. <u>Silt.</u>

Within the A18 to A159 stretch & since 2000, over 4,500tonnes of bank material has been eroded: greater channel efficiency & conveyance than that achieved with de-vegetation has been sought with de-silting. When de-silting (unclogging), by default, it involves removal of any aquatic vegetation cover, sediment, metallic scrap, & plastic rubbish. Some lengths of the Beck channel generate vegetation recovery post de-silt within one season, with the rapid re-colonisation of emergent vegetation sometimes overwhelming submerged vegetation.

In any case, de-silting within the Bottesford Beck channel should increase the number of available habitats for pioneer species of insects & bugs.

Under the Beck Pilot & during the 2014winter, NLC sponsored the contracted amphibious machine to remove ‘unhealthy’ silt from a channel section along the Trent Flats & down-stream of the Yaddlethorpe STW final effluent discharge outfall to the Beck; inefficient tidal boards at East Butterwick meant a proportion of the silt was of Trent origin!

Via a 360 tracked ditching machine, partial de-silting of the channel during Feb 2017 from the west of the golf course to 60m above the Boyd’s Court outfall reduced base level to a more historic norm. This followed a downstream survey local to Ashby South Grange CSO outfall which had indicated excessive silt deposition. Via its back activator bucket, a JCB had been initially tried but struggled & the NLC amphibious machine with the de-silt bucket attachment was applied but floundered, so NLC sponsored the ditching machine. The de-silt was limited within the boom reach of the only readily available machine & approximately a third of the channel width was de-silted, with the machine based on the rural bank: approximately 360tonnes were removed & levelled on the bank-top field margins. Unfortunately biased towards the rural bank, this de-silting has aggravated rural bank erosion & encouraged emergent vegetation growth on the now shallower urban side of the channel.

During 2018, the NLC amphibious machine struggled to deal with visible silt deposits on the inner of some bends towards the A159: inflexibility of close movement when using the outriggers & limited boom reach when unloading on bank tops were the shortcomings.

Supported independently by stake holders during Feb 2019 & via a 360 tracked ditching machine, full de-silting of the channel from just upstream of the Richmarsh Bend to the west of the golf course returned base level to a historic low; works were concentrated from the rural bank & in excess of 1,800tonnes were excavated to the bank top field margins & levelled. Over 6million litres of impeded channel & drainage ditch waters were released, partly flushing the whole Beck of black putrid sediment. Bed cutback had created a central upstream channel towards the Emanuel Bridge & the flow along Emanuel Strip changed from canal-like to river mode, but eventually reverted via back water from rapid downstream regeneration of aquatic vegetation.

The lower Beck level of this upper channel revealed field drainage pipes to Bottesford Beck of 1970’s vintage & also allowed effective cleaning of the rural side field drainage ditches.

Following a Jan2020 bed level survey, a 360 medium tracked excavator machine was applied during Feb/Mar2020 &, excepting the stretch from just above the St Peter’s

Footbridge to just downstream of the submerged oil pipeline crossing, channel de-silting was completed between the Holme Lane crossing & the A159, with the machine working from the urban bank; the intension was to remove a nominal silt depth of 300mm & in excess of 100tonnes were extracted to the sides of the Bridleway path & levelled. The silt was preferentially excavated from the centre of the water course for safeguarding the bordering nature. Trees & bushes removed for machine boom access were deposited within the adjacent undergrowth.

The back water level to the Winchester Drive outfall was lowered by this de-silt, exposing silt bars whilst increasing channel conveyance capacity.

1. 11. 4. <u>Debris.</u>

Much debris has been removed from downstream of the A18 crossing. In particular, the urban side of the Emanuel Strip stretch was cleared of debris & vegetation intrusion during 2013 by NLC & FoBB.

During 2014 & 2016 much tree debris was removed from the Yaddlethorpe stretch of channel by, again, NLC & FoBB.

Since 2014, at least four initial visits by FoBB have been made to clear the troublesome rural side banking just upstream of Redwood Court of distressed trees. A fallen tree from autumn 2023 was removed from this area in Jan2024. In the meantime, two further trees had collapsed & they were removed from the Beck channel during Nov2025.

Trash, including shopping trolleys, asbestos sheets, & stripped cable sheaving has been removed from the Beck by various groups & organisations, including the general public & farmers.

Detritus debris is highlighted after heavy rainfall events via loosened vegetation & algae entrapped around channel plants.

1. 11. 5. <u>Other Tasks.</u>

Bank protection has been via stone boulders, gabions, & concrete sacks, with an area of propriety tiered membranes along Emanuel Strip & a netted steep bank near Redwood Court. Concrete lego blocks have been used at & near the Richmarsh Bend. Willow kids & geo-textiles (Nicospan) have been applied to other bank renovations. Some of these works are in need of a revisit, including two manmade aquatic machine ramp accesses, both suffering end erosion from loss of protection.

FoBB have been instrumental in the trimming of consolidation willows on the rural bank adjacent to St Peter's Footbridge.

The protection configuration at the inlet to the Winchester Drive oxbow bend has failed, generating a decrease in the length of the oxbow neck, although the protection at the outlet bend is still functioning, but not ideally positioned: hazelnut faggots had been installed as an approach to preventing erosion of the inlet to the oxbow, with an immersed woven barrier at the outlet. A berm had been suggested as a longer term solution to reduce land loss; the berm was never constructed, noting, in any case, that the oxbow central banking was re-graded for aquatic machine access to the Beck. To date, longitudinal silt bars are forming at the oxbow inlet & outlet areas, inducing erosion & mass failure of the opposite banks, thus threatening the Bridleway bank-side verge.

Much Beck banking still requires renovation, in particular, a previous minor repaired area just 100metres upstream of Redwood Court is now threatening the Bridleway path.

The urban bank top level variations formed by processes such as bridleway path works & deposition of silt tailings has induced the formation of extra rills (non vegetated bank-side gullies) or, at least, changed the positioning of some: the rills have the potential to accelerate local path to bank edge degradation, with a few now threatening the BBLP Bridleway.

During April2021, two short areas of the BBLP path towards the A159 had some verge to Beck ground loss re-established with earth infill supported by timbered shuttering.

2. <u>Within & Bordering the Bottesford Beck Catchment.</u> (Map P28)

2. 1. <u>Peripherals.</u>

The catchment of Bottesford Beck contains an area of 70.2km^2 & supports a population in excess of 85,000.

The villages of South Conesby, Ravensthorpe, Sawcliffe, & others have become deserted or depopulated: perhaps, manorial gain, the early days of the enclosure of common lands, &/or the Black Death had been contributors to some settlements decaying whilst more favoured neighbours survived.

Specifically, badly affected by the Black Death, Sawcliffe was granted over 50% relief from taxation during 1354. By the 17thC, Sawcliffe had been reduced to a single farm but the remains of the original village are designated, with Ravensthorpe, as Scheduled Monuments. Sawcliffe includes a rectangular island, surrounded by a seasonally filled moat.

A Cistercian priory was located at Gokewell. By 1440, the priory housed eight nuns & never much more; the existence was harsh with ponds used as a fish food source still viewable. In 1536, Gokewell Priory was permanently closed as part of the dissolution of monasteries.

Of the various landed families within the local area were the Winns. The estate & manor of Thornton Curtis & the manor of Appleby had been acquired by the Winns before the purchase of land & buildings in 1694 belonging to the disused Nostell Priory of St Oswald near Crofton, close to Wakefield; by this time, sections of the priory had been converted & the estate would become the principal home of the Winn family, with Appleby Hall as secondary.

A comfortable house, Appleby Hall had been built during 1770-75. It was initially enlarged to a hunting lodge & then to a substantial mansion. Impropriator Charles Winn served the office of High Sheriff of Lincolnshire in 1828. He was awarded, purchased, & exchanged common lands around Appleby at the enclosures during 1832.

Appleby parish school was built by Charles Winn in 1850.

The eldest son of Charles, Rowland Winn used Appleby Hall as an occasional residence until his death in 1893. He had been Member of Parliament for the North Lincolnshire division between 1868 & 1885. In 1885, Rowland was enabled as 1st Baron St Oswald of Nostell, West Riding of Yorkshire, partly, in recognition for his work as a Conservative Whip.

Appleby Hall stood empty for some years before the main part of the house was destroyed by fire in 1933: the remains were demolished by the Home Guard practising during the 2nd World War!

Near Ravensthorpe, the Andersons bought Manby Hall during the 17thC. It was remodelled in brick between 1770 & 1773. Charles Anderson became Charles Anderson Pelham by marriage into the Pelham family. Charles Pelham eventually had succession to the Brocklesby Estate & Manby Hall became a secondary home. Even after major modifications, the heirs of the Brocklesby Estate rarely used Manby Hall & by 1872 the house was occupied by estate farmers. The Hall was in poor condition by 1900. During the next twenty years, the roof collapsed & the structure was fire damaged. By the mid 20thC, the house & out buildings were unrecognisable & in ruins. Snaking through Manby Wood, the carriage drive to Manby Hall had its entrance at Briggate Lodge, super-ceded by Forest Pines, & now Hilton Double Tree.

Sweeting Thorns is edged by the A18, Holme Lane, & solar farming. This functioning plantation & wild life refuge is noted for its fir tree crop used as trench supports during the 1st World War.

Twigmoor Wood is owned by the Scawby Estate; NLC have an agreement with the Estate to jointly manage a defined area of the wood for public access. This is an area of native woodland with introduced shrubs, conifers, & ornamental species: during May & early June, the wood is thick with rhododendrons in bloom. This has created a rich & varied habitat for wildlife, particularly birds such as woodpecker, tree creeper, & common warbler. There are two substantial lakes, previously known as Black Head Ponds, now named Gull Ponds after the once breeding populations of black headed gulls. The lakes overflow into the Twigmoor Drain as a feed to Bottesford Beck.

Grade 2 listed, Twigmoor Hall was late 18th/early 19thC, but with earlier origins. During the late 16th/early 17thC, Twigmoor Hall was known as a Catholic refuge. This house was the

home of John Wright before he was executed for his part in the Gunpowder Plot of 1605. The authorities described Twigmoor Hall as ". . . one of the worst in her Majesty's dominions & is used like a Popish college for traitors in the northern parts".

Grade 2 listed, Holme Hall was late 17th/early 18thC, but with later additions. Holme Hall was the home of the Morleys, a prominent Catholic family. It is now at the heart of the Pink Pig Adventure & Facility Farm, a working farm but a local attraction & now a Jackson family home. Recent conservation initiatives include the naturalisation of some field margins & introduction of dual habitat ponds for homing great crested newts. Extensive field fencing has been installed which will control the interface between urban casuals & the farm functions.

2. 2. <u>Bottesford Town.</u>

Within the corridor of the BBLP, the North Lincolnshire Sites & Monuments Record lists a number of sites, find-spots, & crop-mark complexes where prehistoric flints, stone axes, & Romano-British pottery have been discovered.

The Roman evidence supports Bottesford as a small Romano-British hamlet, connecting, via Bottesford Beck, Ermine Street (a major Roman road that ran from London to Lincoln to York) with the Isle of Axholme & Doncaster; translated, Bottesford means 'ford by the house or building', a ford being a tract of shallow water.

Bottesford is mentioned in the Domesday survey of 1085-86: the Domesday Book recorded the presence of a wooden Saxon church &, within the area, a water mill. Near to the Beck & assumed stored as scrap material for later retrieval, the remains of three large Saxon lead vessels were found.

Bottesford land was gifted to the Knights Templar.

Due to the might & assets amassed, the order was duly dissolved within England by 1312.

The Bottesford lands were passed to the Knights Hospitaller.

During the Reformation, almost all of the Knights Hospitaller property was confiscated & Bottesford lands were taken during 1540: a recreated order formed the St John's Ambulance Brigade, with a facility in nearby Ashby.

A spring, later invented as Templar's Bath but no longer active, together with the Well of St John, served as the dual supplies of water for the populace; the Well level never falls, even during dry periods, & its overflow may still be viewed at the side of an existing road (the actual Well is in the garden of the House of St John).

St Peter's Church is built on the site of the wooden Saxon church. Early 13thC, built with local limestone, & listed as Grade 1, the present Anglican building is dedicated to St Peter Ad Vincula (St Peter in Chains) which commemorates the imprisonment & deliverance of the Apostle of St Peter.

In 1795, Bottesford lands were allocated through Parliament via an Enclosure Act (these acts nominated commissioners to investigate, reallocate lands, & decide the financial liabilities); the Peacock & Morley families received the greater acreages.

After the enclosure of Bottesford field strips, the claim of Thomas Peacock to be Lord of the Manor was accepted & his descendants were treated accordingly.

Residence of the Peacock family, Bottesford Manor was substantially altered during the 1870's & given a romantic skyline with an array of Tudor chimneystacks. Edward Peacock (1831-1915), a noted antiquary & historian, built the Tower & Coach House, now named Tower House & Manor Cottage; the elaborate baronial style turret had housed a library.

2. 3. <u>Scunthorpe Town.</u>

Frodingham Church dates from the 12thC & building lasted two hundred years after which the original dedication to St Mary was changed to St Lawrence.

The iron industry of Scunthorpe was becoming established during the 1860's. The early exploitation was beset with difficulties because of a lack of knowledge for the chemistry of the local ore. Sometimes with explosions, failures were the result until a siliceous ore was found to mix with the local ironstone. Northamptonshire ore from Wellingborough was an

initial siliceous ore source: Northamptonshire ore is found in Lincolnshire, Rutland, & Northamptonshire.

Not until steelmaking was adopted in 1890 did Scunthorpe become any more than a producer of pig iron.

The labouring manpower supporting the ferrous industries came from the local agricultural areas; only skilled workers came from other industrial regions. The basic work was hard manual labour, with few concessions to safety, & there had been a long hard struggle for union recognition against the better organised Lincolnshire Ironmasters Association.

Destined 1st Baron St Oswald, Rowland Winn had recognised the industrial expansion around Scunthorpe by building 193 houses in New Frodingham & enlarging the local school. He financed the provision of the Scunthorpe Church of England School & donated the town church of St John. This church was completed in 1890 & consecrated on 15April, 1891; supported by Government funding, the building fabric has now been safeguarded for future applications.

Scunthorpe's population grew from 1,245 people in 1859 to over 4,000 in 1875 & 60,000 by 1954; marriage registers reflected the changing occupations from agricultural labourers to industrial workers.

After the 2nd World War & all within the Scunthorpe borough, foundries & three integrated steel works had existed. Beside 28,000 employees, a 12% share of Britain's pig-iron output, & a 10% share of steel ingots & casting production, the infrastructure of Scunthorpe had become deficient in civil & public buildings, shops, & housing stock (Scunthorpe house building was second to none, rate of population rise was exceptional).

In particular, the National Playing Fields Association considered that 6acres of open available space for every 1000 of population was desirable or at any rate the minimum: Scunthorpe had 0.65 of an acre compared with Birmingham at 3.8, Doncaster at 6.2, & Derby at 10.2. There was an argument that Scunthorpe should be treated as a new town so that more Government funding would be available. Nevertheless, some money was granted during 1955 to support the development of the Ashby Ville Recreation Grounds. Bog land was drained & pitches were created (rugby & soccer pitches with one dual marked, one American football, & a cricket field), all serviced by a superior changing room complex; unfortunately, the lower level pitches were always susceptible to water logging.

Between 1979 & 1985, the Grounds also supported Scunthorpe Speedway, but the arena had shortcomings (spectator banking design & construction). In any case, match results were disastrous.

With the foreseen urban sprawl, notably housing, it became prudent to replace the existing STW adjacent to Brat Hill.

The Yaddlethorpe STW on the Trent flat lands was operational by 1976 with sewage gas collected from 2007. Started during the early 2020s, a programme of upgrades will ensure the site can accommodate the needs of a growing population & the challenges of climate change. This facility has a road tanker service for collection providers to dispose of domestic, commercial, & trade liquid wastes.

Essentially running parallel to the Beck, a trunk sewer connection to the Yaddlethorpe STW, also completed in 1976, allowed the Brat Hill facility to be abandoned during the late 1970s. The reclaimed land became a public area &, within a basin, at the former settling ponds, the Ashby (Concrete) Pond was created. The pond had a continuous piped ground water supply, a concrete apron (not a concrete base) to assist model boat & canoe club launches, & an overflow to Bottesford Beck. Weed generation defeated both leisure camps, but, in any case, the pond was too shallow for some canoe manoeuvres. The pond became popular with wildfowl, fishermen (unregulated), & walkers but began self draining in 2011 when the ground water feed pipe (continuous flow) was excavated within an adjacent housing development. In excess of 3,000 fish were saved by an electro fishing team assisted by local anglers & stocked elsewhere, while eventually, Friends of Ashby Pond transferred hundreds of maturing frogs to a secluded Ashby Ville Lake bank area.

High levels of Escherichia coli (E coli) bacteria were measured within the thick layer of sediment exposed after the pond water loss: E coli had been promoted by the waste from

the wild fowl population. The health risks were mitigated by temporary fencing erected to prevent the access of both humans & animals whilst the sediment dried & natural processes dealt with the pathogens.

A small test pond was excavated within the Ashby Ville LNR middle wetland as preparation for two ponds, one destined for the west wetland & the other for the middle wetland, assured by NLC as replacements for the now defunct Ashby (Concrete) Pond.

Against the desire for a 39 dwelling private development, a village green application to protect the 2.5acre Ashby (Concrete) Pond plot for all was submitted by Friends of Ashby Pond during 2013. With a near 10year inoperative period, the site was formally designated as a village green during 2022 & allocated as a LNR for ensuring site care, protection, & enhancing its natural features (Adding the adjacent Redwist Community Wood could prove worthwhile to what might be named the South Grange LNR).

3. Provincial Heritage Chain.

3. 1. Linkages.

Existing in the region, particularly within the vicinity of Scunthorpe, the coversands are post-glacial wind-blown sands which have given rise to mosaics of heathland & support rare plant & animal communities. Sand was banked against raised lands with overblow to flatter terrain: Risby Warren has a distinctive formation of inland dunes.

Heathland is characterised by dense mats of moss with lichens & a sparse covering of acid loving herbs & grasses; areas of woodland can be monopolised by shrubbery. Heathlands are somewhat infertile & threatened by urban expansion, forestry, agriculture, & quarrying: with Scotton Common a protected area. What remains is now largely fragmented, with small remnant patches exhibiting, among others, harebells, common centaury, green woodpeckers, & small heath butterfly.

Any heathland was sparsely populated yet admirable breeding grounds or warrens for silver grey & black rabbits (Warrens surrounding Scunthorpe include Atkinson's, Risby, & Manton): breeding colonies were used for meat but by the 18thC, the skins of rabbits were sold at Brigg fur market. Large quantities of dressed furs were shipped to London & Manchester to trim clothing & hats or exported from Hull, especially to Russia. The skin trade declined during the early 19thC but rabbit wool was still being shipped from Brigg during the 1860's.

Enclosed strip farming still exists within the Isle of Axholme & Isle fenland had harboured the tail end of the hunter gatherers (the summer grazing of rich common pasture with dairy cattle, horses, & geese, but when large tracts of the commons were inundated in winter, fishing & fowling became an important source of sustenance).

Turbary is the ancient right to cut peat for fuel on a particular area of bog. It is associated with commonage or rights over another person's land. The turbaries of the Isle of Axholme include Epworth, Stockholes, & Haxey.

Sometimes called open pit mining, the method of open cast mining is generally preferred to underground mining when the resource is at or near the surface & with acceptable over burden removal. Where pits have enlarged to quarries, the local preference is often to retain the title of 'Pit'. Materials mined locally include sand, gravel, & limestone, but ironstone ore mining has generated by far the larger quarries with massive tonnages extracted.

Where open cast mining has been abandoned within & around the Scunthorpe area, the altered land topography has been utilised not only for the benefit of the community, but sometimes applied to national service by accepting contaminated earth from Barton, spoil from London Cross Rail, & household rubbish from Manchester. Besides landfill, noting that gas is collected from the Roxby site, other applications include LNRs, industrial development (even steel works extensions), & housing expansion, whilst other sites have seen land returned to agriculture.

With some abandoned surface workings flooded, fishing venues & water sports facilities exist.

Many sites have incorporated walking trails & nature refuges. Clapgate Pit near Broughton was worked to provide lime for agricultural land & exhibits rich & varied limestone flora whilst

a flooded pit near Messingham, 'The Messingham Sand Quarry Nature Reserve' has been developed & achieved the status of Site of Special Scientific Interest. Silica Pond LNR is a result of sand extraction.

The unpaved mining tracks to the north of Dawes Lane were used as stages during the 1989, 1990, & 1993 RAC Car Rallies.

Sand is still being extracted from a pit near Messingham, with some of the material used as quality feedstock in the manufacture of green & brown bottles.

With a NLC target of 2hectares of LNR for every 1,000 of the populace, proposals adopted in 2012 by NLC equated to a figure of 1.73: the national target is 1hectare for every 1,000 people.

Due to the loss of important habitat lands around Scunthorpe, nature, including plants, insects, reptiles, amphibians, mammals, & birds have taken refuge on brownfield sites such as the obsolete extraction pits, former landfill sites, & even active industrial sites such as the Steel Works. These brownfield sites are all convenient to Scunthorpe! Fortunately, a proportion of these have been protected by NLC as LNRs.

A 2011 to 2013 project, Scunthorpe Stepping Stones, for restoring/enhancing brownfield open mosaic habitats was managed by a nature conservation charity using NLC staff & many volunteers; this was landscape scale for local brownfield conservation & aided species movement (hence Stepping Stones). The habitat management techniques included thinning of woodland, scrub removal, creation of scrapes & bare ground, bracken control, bee banks, wildflower meadow creation, & re-facing sandy cliffs, all applied, where appropriate, to Sawcliffe LNR, Ashby Ville LNR, Conesby Quarry & Blue Lagoon, Messingham Sand Quarry, & the Steel Works.

To encourage bio diversity, cropping of undesirable undergrowth & dominant vegetation is ongoing via NLC within LNRs, with initiatives at Silica Pond, Ashby Ville, Atkinson's Warren, & others.

3. 2. <u>Ironstone Extraction.</u>

The discovery or the rediscovery of the Romano-British workings of the Frodingham ironstone ore field occurred during 1859. The outcrop ore bed is c11.5km in length extending south from Coleby & c3.5km in width from west to east. The greatest thickness is near Santon at 10m with thinning to 4m just north of West Halton: there are vast reserves of ore further east, but at depth!

Rowland Winn was most active in exploiting the area ore resource. In particular, following analysis to prove the quality & quantity of the ore, Rowland Winn sought & succeeded in finding processors for this iron ore: he marketed it to iron-makers, leased land for mining, mined his own ore, & built & encouraged the establishment of iron works.

To transport the ore & to bring the coal necessary for smelting, Rowland Winn had been key promoter & campaigned for the Trent, Ancholme, & Grimsby Railway, opened in 1866. Before this railway, transporting ironstone out of the area was a slow, precarious business: transport of ore to the Trent & onwards by barge to ironworks at Elsecar & Milton was via horse power, with carts on bridle tracks & wagons on rails &, a late enhancement, a self acting gin for controlling descending full wagons whilst raising empty wagons on Brumby Hill.

The Trent, Ancholme, & Grimsby Railway linked the South Yorkshire Railway at Keadby with the Manchester, Sheffield, & Lincolnshire Railway at Barnetby. This network enabled transport of materials in & out of an expanding industrial area.

Open cast mining of iron ore progressed from dangerous manual working to extraction by machinery.

In 1938, with opencast deposits declining & the ratio of overburden to ore increasing, underground mining was instigated but extraction was delayed by World War II. With adits at Santon & Dragonby, these entrances were eventually connected below surface. The method of mining was via pillar & stall, with pillars strategically left under buildings & farm yards! When underground workings were abandoned during 1969, the tunnels were eventually left to flood. The water softened the roof strata leading to collapse & surface subsidence. Large dangerous areas of Risby Warren were fenced & drainage to Bottesford Beck of the

underground workings was reintroduced. Although ownership of Scunthorpe Steel Works has changed, Tata still retains the responsibilities for the underground mines!

A monster roaming the ironstone outcrop was a Rapier W1800 walking dragline, ideal for shifting overburden & loosened ironstone. The 1800 nomenclature is the approximate weight in tons of the machine without its bucket. The world's largest dragline of its day, build quantity was four; the Scunthorpe machine commenced operations at Roxby Pit during 1962. The machine was retired in Crosby Quarry, &, after the machine canopy had supported bird roosting for many years, the monster died, together with two bucket loaders, as scrap feed stock for steelmaking convertors; these machines had been powered by electricity via trailing cables.

Open cast iron ore mining around Scunthorpe contracted & finally ceased during the 1980s.

3. 3. Crosby Warren Headway.

Perhaps destiny, Crosby Warren & open cast iron ore land between the Appleby-Frodingham (A-F) & Normanby Park (NP) Steel Works was utilised for an ore transfer cable conveyor, with rail wagons from Immingham unloading at the Foreign Ore Tippler, just south of Santon, & onwards to the A-F stockyards for blending. The conveyor transferred this material from these stockyards to the NP Steel Works & remnants, mainly concrete trestles, cable, & belting are still viewable.

In 1987, an oil well was sunk within Crosby Warren with a beam pump (nodding donkey) used for extraction. The flare stack is installed horizontally with the flame embanked so as not to be an attraction for Scunthorpe! The oil is transferred to a Humber Bank refinery by road tanker. A further area well head was developed in 2007.

Within Crosby Warren, with a Crosby quarry perimeter location & a prominent area of the Sawcliffe Hill LNR, the Millennium Community Wood is developing on reclaimed slurry land adjacent to the A1077, but access is challenging.

Since the millennium, much effort has been absorbed in resettling great crested newts to wetlands/ponds adjacent to the Millennium Community Wood for enabling extension of Steel Works' waste beds within Crosby Warren.

Commercial landfill at Crosby Warren & its quarry is still large scale.

3. 4. Succession of Ashby Ville Pit.

The Ashby Ville Pit is a remnant of iron ore extractions at the southern end of the outcrop. With this pit having a reputation as being wet & requiring extensive pumping to Bottesford Beck, it was eventually abandoned due to inferior quality of the ore: explorations confirmed that the ironstone outcrop bed in profitable & workable quality did not extend southwards beyond Ashby & the A18.

For a period, water had been pumped to the Steel Works for the process & removed sand was applied to blast furnace runners; the railway tunnel under the A18 & adjacent to the Ashby Lodge Pub used for transporting the ironstone & sand still exists, but somewhat flooded!

The Pit pumped drainage system became obsolete & the Ashby Ville Lake developed with flooded ironstone gullets & sand lagoons in evidence.

During the late 1960s, the Anchor Village was located adjacent to the lake. The complex accommodated construction workers for the Steel Works consolidation & modernisation. The legacy of asbestos left amongst the foundations of the demolished/relocated buildings was professionally removed prior to the establishment of a LNR.

A drain between the Lake & Bottesford Beck was installed prior to the Morrison's supermarket build as an expedient for flood mitigation: a penstock (shutoff) valve at the Lake outlet, an interconnecting pipe, & a clack (non return) valve at the discharge end to prevent any back flow from the Beck.

With the penstock open & inoperable & the clack open & seized, the Lake level began slowly rising in sympathy with a rising Bottesford Beck base level. By 2010, the Lake level rise was accelerating via submerged aquatic vegetation proliferation & silting within the

Beck. Various actions were instigated to overcome the Lake rising level; some fishing peg platforms were raised, building rubble was used as infill to a flooded section of the Lake circular track, a strong chemical was applied to dense aquatic emergent vegetation near the Mullberry Gardens outfall to the Beck, & when this action failed, the channel was entered & many reed stalks were cut. During 2015, the penstock was renewed & left closed to compensate for the permanently open clack (Still seized open to this day).

The following few years were somewhat dry. Although the Beck was capable of back filling the Lake, aquatic weed trimming within the Beck, ground absorption, Lake surface evaporation, & tree transpiration allowed the penstock to be left closed; the Lake level became high but stable.

Via the lower level induced by the 2019 full de-silt of the adjacent Bottesford Beck channel, the Lake was returned to a more historical low level by opening the penstock & releasing over 4.5 million gallons; the penstock was left open.

During the autumn of 2024, the penstock was again closed to prevent back filling from a rising Beck via excessive aquatic vegetation regeneration. The Lake water was again in an undesirable mode of being land locked, although the dry spring & summer of 2025 had controlled the level: the Lake was at a level allowing enough free volume to combat the next extended high rainfall period. Alas, this comfort volume was absorbed by the rainfall of winter2025: the penstock is now open & closed as the Lake level dictates & the Beck level allows.

With surrounding land accommodating a retail park & housing estate, the LNR had been declared during the summer2012 & incorporates the Lake, a Community Orchard (Formed within a Paddock during 2025, noting that at creation, the Paddock was completely covered by tree planting until the saplings were vandalized, then the plot was fenced & gated with the ambition of guesting the ex-NLC Hebridean sheep.), & three Wetlands: the Wetlands were created to take-in Bottesford Beck overspill as flood prevention for the Lakeside housing.

Included in the BBLP Bridleway project was an overwater walkway for bypassing Morrison's Supermarket & resurfacing Lake tracking; a bridge for crossing the Beck at Emanuel Strip is awaiting installation.

Adjacent to the roundabout at the A18/Steel Works entrance, a viewable SUDS with overflow to Ashby Ville Lake exists for dealing with drainage & pollutants from the adjacent road enhancement.

The opencast legacy has left a landscape with mounds, hollows, & disturbed soils which have developed into a dynamic mosaic of bare sandy areas, grasslands, scrub, & woodland. The low nutrient & free draining soils are perfect for pollen & nectar rich plants such as viper's bugloss, bird's foot trefoil, & smooth cat's ear. Among the wildflowers are toadflax, yarrow, & self-heal. There are two small copses with hawthorn, elm, English oak, & elder. This environment supports threatened bugs & rare invertebrates, the latter with complex life cycles requiring habitats close together such as bare ground for nest burrows & wild flowers for feeding. The site is a valuable residence for visiting & breeding birds, including little grebe, coot, swan, reed warbler, goose, & cormorant; attracting many twitchers, an unusual visitor during 2013/14 was a great northern diver. Mammals include common shrew, rabbits, & bat species. Butterflies include peacock, small heath, & ringlet. Fish include pike, bream, & carp.

The Community Orchard introduced within the Paddock contains a stone in memory of the Lake drowning of a teenager.

To reduce the risk to life by preventing easy public access to the Lake water, landscape barriers of fencing, vegetation, & stone (limestone) have been applied to exposed sand banking & dunes edging the Lake, with successes at deterring human occupancy & open water entry. Furthermore, NLC have instigated a Public Space Protection Order for an outright ban on swimming in the lake.

With earthworks for the Lakeside development envisaged to disturb a large population of voles, ditches surrounding each of the three wetlands were dug with ends connected to Bottesford Beck. These vole habitat ditches were susceptible to silting & not appreciated by

the voles due to ever increasing shading from adjacent self set tree & vegetation growth. The vole habitat ditches have become obscured & are sometimes dry, in sympathy with the lower Beck levels arising from local Beck channel conveyance tasking.

With fishing regulated & water skiing administered & policed by a club, the Ashby Ville LNR seems safeguarded for its existing users, noting that the traditional lakeside Boxing Day motor cycle trial has been relocated elsewhere since 2017.

During 2023, the main car park at Whimbrel Chase was resurfaced with tarmac & the layout has been highlighted with white lining: craters have been eliminated with vehicle access to the Lake defined, in particular, assisting the access of emergency responders.

3. 5. Conesby Quarry Hiccups.

The Conesby LNR is divided by Normanby Road, with the Blue Lagoon (a holding pond for receiving local surface water with overflow to the Winterton Beck catchment) on one side becoming established for public access & Conesby Quarry on the opposite side, but without public access & available for purchase/to let since 2019.

The Quarry void at the Normanby Road end had been progressively land filled with industrial slag, sludge, & flue dust &, together with Atkinson's Warren, became part of the protection & restoration work under the Coversand Heath Project which ran from 2003 to 2009. The restored land of the Quarry & paddocks overlooking Atkinson's Warren were grazed by the ex-NLC Hebridean sheep to suppress invading rank weeds (bracken & ragwort) which can dominate & reduce the area of acid grassland.

With its own access off Normanby Road, a transit traveller's site was constructed as a modern facility with privacy fencing, hard standing, reception, amenity block, & pitch services: the site fell into disrepair due to a lack of occupancy. After superficial repairs, the site was nominated as residential, but attracted too few tenants. The site became a ruin. During 2008/9, it was proposed to re-establish a traveller's residential facility; the adjacent Eddie Wright Raceway was opposed but, in any case, travellers themselves rejected the industrial terrain around the location!

The easterly face end void of the Quarry was used for toxic material landfill. The base material of the Blue Lagoon (hazardous steel works waste) was transferred across Normanby Road to cells formed with Conesby Quarry mined mudstone; this local material was also transferred to the Blue Lagoon as a lining before refill (thus the loss of the blue pollution tint). The east end Quarry void now consists of cells with some capacity for toxic materials together with inert landfill capacity, noting that mining potential still exists for mudstone, limestone, & ironstone.

During more recent times, the south quarry rim track is used as access from Normanby Road to the Dragonby rail assembly factory.

The Conesby Quarry area has leachate control facilities, with monitoring by regularised patrols.

A haven for butterflies, acid loving flowers & plants, & amphibians, the Blue Lagoon is circumvented by a path with the east tarmac through leg forming a short length of the National Cycle Network Route 169: a regional route only, isolated from the rest of the National Cycle Network, with trail head at Normanby Hall Country Park &, via the Pheonix LNR, Trent Valley Way & then Ridgeway, to the Green Acre Park trail head.

3. 6. The Slag Legacy.

3. 6. 1. Fertiliser Production.

A by-product of the steel industry, basic slag has been applied as a phosphate fertiliser & it is known for the ability to improve soil health & crop yields. Most British iron ores have a high phosphorous content & converting the liquid iron into liquid steel formed a phosphorous rich slag with a liming effect. Basic slag is produced during the steelmaking process when impurities from iron ore are oxidised & combined with lime. This results in a product rich in calcium silicate & phosphates. In Scunthorpe, production of basic slag expanded with the development of the integrated iron & steel making works (NP, Redbourn, & A-F). The basic slag was ground into a fine powder & bagged. The last basic slag processing facility at

Scunthorpe was redundant due to changes in the steel production associated with the Anchor Project & the basic slag plant spares were dispatched to a similar processing facility located within the Midlands during 1974. In any case, water soluble phosphate fertilisers had become available. However, basic slag remains of historical interest & it is still used in certain organic & sustainable farming practices.

As distinct from a phosphorous fertiliser was the production of a nitrogenous fertiliser within the Scunthorpe steel industry, although not associated with slag. A source of nitrogen fertiliser is sulphate of ammonia: ammonia is a compound of nitrogen & hydrogen. Sulphate of ammonia was produced at Scunthorpe by the distillation of the liquor produced as a by-product from coke making. In the early 1920's, the coke oven by-product plants of both NP & Rebourn were producing sulphate of ammonia, noting that production of this fertiliser was increased via Appleby Coke Ovens after the first world war &, much later in 1979, the Dawes Lane Coke Ovens. By 2023, coke making within the Scunthorpe Steel Works had ceased with the outcome that all associated by-product processing facilities were no longer required.

The application of these steelworks' fertilisers had, at least, a captive localised market in as much as Lincolnshire is essentially an agricultural county with a diversity of soil types, including clays, sands, shallow limestone, peat, & silt, which in turn supports a varied farming scene: as the county that feeds the country, Lincolnshire is renowned for its cereals, fruit & vegetable production, livestock, & horticulture.

Scunthorpe basic slag was most effective in light, sandy, & peaty soils. It was slow release, neutralised acidity due to liming, & supplied phosphorous for plant growth, particularly to grasslands, pastures, & arable crops. It promoted root, flower, seed, & fruit development.

Scunthorpe sulphate of ammonia worked well in alkaline soils. It was high in nitrogen, not prone to rapid nitrogen loss, & it was suitable for grassland & cereals. In particular, leafy root crop production was supported by the promotion of vigorous leaf & stem growth.

The Steel Works once hosted a flourishing gardening club.

With recognition as the garden town of the north, it was no secret that the fertilisers of the Scunthorpe steel works had historically benefitted the allotments, gardens, lawns, & parks of the town, accepting that the use of slag from Scunthorpe has transposed to boost the production of traditional construction & other applications.

3. 6. 2. <u>Glass & Construction.</u> (Map P29)

Although iron & steel production at the Scunthorpe Steel Works has reduced, the processing of slag is still buoyant under 2 blast furnace operation: the site facilities include ground granulated blast furnace slag (GGBFS) processing for glass & cement enhancement, ashphalt manufacture, & ballast screening.

The Scunthorpe GGBFS is produced by rapidly cooling molten iron slag using water. This transforms the slag into a glassy, granular material.

The GGBFS is dried, crushed, & screened to form 'calumite slag', size consistent with other glass making raw materials: 'calumite slag' is an alumina source used in soda-lime-silica products from float glass to fibre glass, including container glass. Its melting & refining properties enable glass producers to reduce energy consumption & limit carbon dioxide & nitrogen oxides emissions, whilst improving product quality.

For cement enhancement, GGBFS is dried & finely ground into a powder & normally used in combination with Portland cement to create 'slag cement': this product can effectively reduce energy consumption, carbon dioxide emissions, & building material cost when compared with pure cement manufacture. When used in a concrete mix, the 'slag cement' improves resistance to chemical attack, reduces heat of hydration, & generates a longer lifespan; this high performance concrete is used in the construction of bridges & coastal features for reducing corrosive actions & deterioration of the structures.

The GGBFS processing sites are within/near the iron-making area of Scunthorpe Steel Works.

The Yarborough site receives steel slag. It undergoes crushing & screening to a size of 20mm or less & left to weather in windrows for at least 6months for reducing concentrations of calcium oxide: it is dispatched for use as ballast, in particular for roads.

The Santon complex comprises a road-stone coating/ashphalt plant which mixes blast furnace & BOS slag as an aggregate with bitumen & other additives to create road surfaces. The site also produces aggregates used in the wider construction industry.

The Intermediate site receives air cooled blast furnace slag for crushing, screening, & stockpiling; this site also stocks water cooled GGBFS, noting that this material has been imported when Scunthorpe blast furnace output has become insufficient.

Although Scunthorpe Steel Works was owned by the Chinese, now nationalized, the downstream plant assets producing saleable slag products are controlled within Europe: 'calumite slag'-German-HeidelbergCement, 'slag cement'-Swedish-LKAB, & Santon, Yarborough, Intermerdiate sites-Irish-CRH.

Within the Scunthorpe area, slag aggregate & dust are used for path & track construction & slag dust is a popular substitute for grit sand in the laying of block paving/slabs as it is less prone to movement & water dissipation: the Bridleway path of BBLP is a local application of these materials.

3. 6. 3. Reclamation of a Slag Bank.

The NP Steel Works slag bank had been used since 1912 for the tipping of slag, flue dusts, rubble, scrap refractory, & other bulky wastes.

Large amounts of slag were processed directly & sold as aggregates, fertiliser, or bulk-fill. During low demand or generation of a sub-grade product, slag was stockpiled on the slag banks site. Following the NP Steel Works closure during the early 1980s, a large proportion of slag bank materials, in particular, blast furnace slag, were recovered.

The materials of the slag banks were not particularly heavily contaminated but contained variable amounts of volumetrically unstable steel slag (prone to expansion, resulting in ground heave) randomly distributed throughout: all unwanted materials were removed to Conesby Quarry as landfill.

The whole reclaimed site was to become the Pheonix LNR, but with great crested newts re-homed, land drainage incorporated, & service road constructed, the reclaimed NP Steel Works slag bank now consists of a commercial area edged by a divided Pheonix LNR & the Pheonix Parkway LNR; the Trent Valley Way defines the westerly border of these connected public assets.

Although the reclamation area has rapidly been returning to nature, a concrete batch factory & latterly a flat pack kitchen manufacturer were named to occupy some of the commercial land. The particular plot is presently for sale & overlooked by a bund of reworked sub soils.

Over-viewing a reclaimed moat site (associated with the medieval village of Little Conesby), access causeway, four ponds, an assortment of ladle skulls, a disused railway freight line from Dragonby to Flixborough Stather (This branch line had rails & ancillaries removed during 2024), the remains of an Anglo-Saxon ecclesiastical site, & a ruined medieval church with its attached graveyard, the Pheonix LNR has the bund as a part border.

A narrow strip of a divided Pheonix LNR contains a tarmac section of cycling Route 169 bordered by an unstable waste tip. This tarmac Route is blocked by tip slippage & encroachment; fortunately, a detour gritted pathway complete with bridge has been installed.

The waste tip ignited on Xmas day2021, with emergency responders attending the firing & fuming towards the end of January 2022. This was repeated during mid August 2022, but, this time, the emergency responders were promptly summoned. By mid September 2022, the tip had been rehashed with tonnage over the Route 169 tarmac length greatly increased & the tip material repose angle again exceeded: further tip encroachment onto the LNR is visible & will increase via slump & further slippage (Before rehash, terracing had followed previous slippages threatening Route 169 & the LNR).

Of late, much more waste had been processed & stocked on site. Nevertheless, the waste facility operating company was voluntarily wound up during February2023. By early April 2023, the liquidators had disclaimed the operating company's interest in all site waste including the combustible waste pile, glass waste, & spill over waste onto the Pheonix LNR. By mid August2023, the liquidators had disclaimed the operating company's interest in its permit to operate a regulated facility & its process permit for incineration; the dissolution date of the operating company was 18July2024.

The ineffective portable fencing around tip spill over onto Pheonix LNR was replaced with propriety fencing during Jan2024 to deter human & animal access.

Emergency responders have been involved with the tip via ongoing regular inspections, remote atmospheric monitoring, & drenching eruptions.

During 2025, more rehashing has increased the tip height risking further slippage towards the Pheonix LNR & eruptions next to a tip access gate on Route 169 are still fuming on a regular basis.

A realistic cost estimate for dealing with this tip in a proper manner is £4 million!

4. Homelands of Bottesford Beck.

4. 1. Distinctive Districts of the Beck Homelands. (Map P30)

The backbone of the Bottesford Beck homelands is the Lincolnshire Edge, a major limestone escarpment, comprising a ridge which runs for 50miles from the Leicestershire border near Grantham to the Humber. The western side has panoramic views & overlooks the River Trent flat lands. The prominent landscape feature never rises more than 60m above sea level within a generally 'flat' county. The Edge is locally known as The Lincoln Cliff in the south of the county, but cliff is applied at Helmswell & at the narrow flood plain of the lower River Trent east bank, a minor area of the Trent flat lands. At its northern boundary, the limestone drops below the Humber estuary.

The Beck homelands have areas of distinctive districts.

To the east of the Edge, the land is akin to a plateau, but overall accommodates a gentle Dip Slope to the Central Lincolnshire Vale. Besides northern areas of coversand heath & historically desolate land, the actual soils of the limestone Dip Slope are generally of good agricultural quality & support the cultivation of cereals, oilseeds, root crops, & potatoes, along with pig & poultry rearing. Farmsteads of large buildings & sheltering copses are dispersed within the Dip Slope, where there is a sense of openness with large fields & tightly clipped hedges. There are woodlands in the area & on the scarp slopes in the west. World War airfields are a feature within the Dip Slope: facilities are now generally used for agriculture, industry, retail, &, specifically, light aircraft (Sturgate), motor sport (Blyton), antiques centre & industrial estate (Hemswell), sky diving & heritage centre (Hibaldstow), with Scampton in adaption.

At its east, the Dip Slope blends into the tranquil, rural, & sparsely settled landscape of the Central Lincolnshire Vale, largely used for agricultural production, mainly for the growing of arable crops, principally cereals. This is in spite of historically challenging soils & conditions. The dominant 'boulder clay' derived soils, underlain by mudstone bedrock, led to seasonably waterlogged conditions which, under natural unmodified conditions, support wet grasslands & woodlands. However, a history of agricultural improvement, incorporating drainage serviced by the River Ancholme in the north & the River Witham towards the south, modern machinery, & agrochemicals has transformed this land & increased its productivity.

To the west of the Edge exists the Humberhead Levels, divided by the River Trent with a much lesser acreage on the Trent flat lands of the east bank & incorporating the Isle of Axholme & surrounding lands on the west bank. With areas of low uplift, there are remnants of this vast complex of moor, bog, woodland, cover sand, & fen that once encapsulated this water logged land, historically enriched by flooding of the River Trent & River Ouse, combined with the peaty soil; petrified wood known as log oaks can still be found beneath some surfaces. The large scale agricultural landscape contains big geometric fields, generally bounded by ditches & the highly productive land can be aided by pumping to keep

the water table down. Areas reveal field & drainage patterns linked to past uses & historical drainage initiatives which instigated riots & local wars, some albeit minor.

Along the upper Humber South Bank, industry has declined (cement production, tile manufacture, rope making), but most assets have been transformed for the benefit of bio diversity & the community (clay pits to ponds, the Ropery, the Water's Edge Country Park).

The homelands have retained characteristic land place names. The form of vegetation is what differentiates marshes from other types of wetland such as moor; moors are lowland wetlands within the homelands that have accumulated a degree of peat. Associated with marshes & water meadows are ings, & if woody plants are present, generally, in the form of low growing shrubs, carr has sometimes been designated.

4. 2. A Glimpse of the Past.

Chains of ancient settlements were a characteristic of the region. By the end of the 11thC, the landscape was studded with small villages, many in easy reach of a navigable river by tracks & causeways to the stathers or landing places such as on the Trent-side at Burton, Flixborough, Keadby, & Amcotts.

Influential on transition of the homelands has been land ownership, enclosure, & more, specifically, drainage.

4. 3. Land Drainage. (Map P31)

4. 3. 1. Edge & Dip Slope.

The Edge forms a watershed between the major catchments of the Trent & Ancholme, both of which flow into the Humber, & the Witham which flows into The Wash. The northern scarp lands are drained by a combination of Winterton Beck & Bottesford Beck; their watersheds direct the former to the Humber & the latter to the River Trent. Lands of the Dip Slope have been drained & they are now productive farmlands surrounded by ditches & hedges.

4. 3. 2. Central Lincolnshire Vale.

Major change to the Ancholme occurred during the 17thC when a new straight channel was constructed from Bishopbridge to South Ferriby. The 'New River Ancholme' conveys most water, whereas the 'Old River Ancholme' still meanders: the latter is mostly reduced to a ditch, save around Brigg's central 'Island Carr'. The Ancholme not only receives the drainage from a network of twelve pumping stations but supplies water to industry, mainly in the lower Humber Bank area. All commercial carrying on the Ancholme had ceased by the 1980s. Some bridges are private rights of way & many are listed (statutorily protected for architectural merit &/or age). Similarly, South Ferriby Lock is a scheduled ancient monument.

In the south, the River Witham facilitates drainage.

4. 3. 3. Humberhead Levels.

Land drainage projects have transformed the Humberhead Levels into fertile lands creating areas of greater suitability for agriculture & settlement. Specifically, before drainage efforts, the Isle of Axholme was surrounded by water, including free meandering rivers with changeable channels. In winter, much land was flooded; each settlement was built on areas of dry raised ground & boats could sail between Wroot, Haxey Carr, & the River Trent.

The current state of drainage to the Humberhead Levels involves a combination of historical infrastructure & modern management: the area relies heavily upon artificial drainage & pumping for managing water levels, especially since some ground is below sea level.

The River Eau is notable for draining the Humberhead Levels from the eastern River Trent bank-side to the River Witham catchment. The River Eau is 24km long with the source near Harpswell at the foot of the Edge. It flows through Scotter which has a history of river flooding. The Eau joins the Trent at Susworth & drains via gravity & a tidal gate during

periods of Trent low water. The Eau tributaries are Northorpe Beck, Manton Sewer, & Dar Beck.

The early timeline for Humberhead Levels drainage projects of the western River Trent bank-side lands originate with Roman, continue through Medieval, & climax, perhaps, via project management & labour supply with the Dutch during the 17thC: enclosure, warping, collection, movement, & disposal of water have been some of the considerations for drainage projects for the Humberhead Levels.

Drainage efforts have included relieving the River Idle by digging Bykersdyke from the Idle to West Stockwith, cutting Mere Dyke & constructing a controlling sluice at Luddington for the River Don (the River Don originally discharged to the River Trent), attempting drainage with Snow Sewer & Hekdyke, stopping the River Idle at Idle Stop & directing all Idle flow to West Stockwith, cutting the River Don at Snaith & creating the Dutch River to Goole, & restricting the River Torne into a new engineered channel.

The drainage outlet into the River Trent at Keadby was by gravity until a pumping station of 1940s vintage was built to assist when water levels in the Trent were too high for gravity discharge.

Before joining the River Trent, the Hatfield Drain, River Torne, & South Drain, collectively known as the Three Rivers, flow into a lagoon at Keadby Pumping Station. The large pumping station serves to drain excess water into the Trent, whilst keeping enough water in the Three Rivers to serve the 37,000hectares of upstream farmland. It also prevents water from flowing back from the Trent into the lagoon during high tides or flood waters.

Extensive improvements to Southfield pumping station at West Butterwick were completed in 1999: further modernisation is under consideration.

A major upgrade of Keadby Pumping Station was completed during 2023. Whilst maintaining operations, the three year project has seen installations within the structure of the original station. The site had an exemption to the Eel Regulations, 2009, & the updating is now fully compliant via eel (& fish) friendly Dutch pumps. The electric rather than the original diesel pump sets will contribute towards the EA's carbon reduction & net zero targets.

4. 4. A North Sea Welcome!

Surplus waters from a large area of mid/northern England are conveyed by the Rivers Trent & Ouse. Their confluence at Trent Falls originates the Humber Estuary: the water drained from one fifth of England's total area flows through the Humber & thence to the North Sea.

The River Trent is third in the list of longest rivers in the United Kingdom. Its source is in the Staffordshire moorlands & it drains most of the North Midlands. The river is known for dramatic flooding after storms & spring snowmelt. Becoming tidal at Cromwell Weir, it passes Gainsborough where the river frontage is lined with warehouses once used when the town was an inland port; many have been renovated for modern usage. Down-river of Gainsborough, extensive raised banking exists. Down-river of Keadby Bridge, coastal/sea vessels still deliver cargoes to the wharves of Grove Port, Neap House, Keadby, Gunness, & Flixborough.

The River Ouse is tidal as far inland as Naburn. The Ouse's system of tributaries drains a large part of the Pennines & much of the Yorkshire Dales & North York Moors. The Ouse valley is a wide, flat plain; heavy rainfall higher in the river's drainage basin can bring severe flooding to York & Selby & neighbouring riverside villages. Just upstream of its Trent confluence & opposite Blacktoft is a wetland reserve, noted for its birdlife. The water is slightly saline & the reserve's tidal reed bed is the largest within England. It is managed using a mixture of konik horses, reed cutting, & excavation of pools within the reed bed.

Due to the Humber Estuary being tidal, the impact of storm surges & exceptional high tides can lead to flooding well away from the coast as additional water is pushed into the estuary. The risk of flooding due to tidal influences extends far inland along the Humber tributaries (A large inland port allowing access to seagoing vessels, Goole is vulnerable to tidal surge along the Ouse). As the excess water tries to flow back to the sea, large areas of low lying

land are at risk: managed realignment & some recent projects along the upper Humber have increased the capacity of the estuary to hold flood & surge waters.

Many fish live in the Humber & also use the estuary as a migration route: the Atlantic salmon & the critically endangered European eel are examples, with the former coming to spawn, while the latter use it for growth. In 2019, the river oyster was reintroduced into the Humber after a sixty year absence. The estuary is a refuge for breeding & over-wintering waders & wildfowl & a passage onwards: it forms part of the Severn-Trent flyway, a route used by migratory birds to cross Britain.

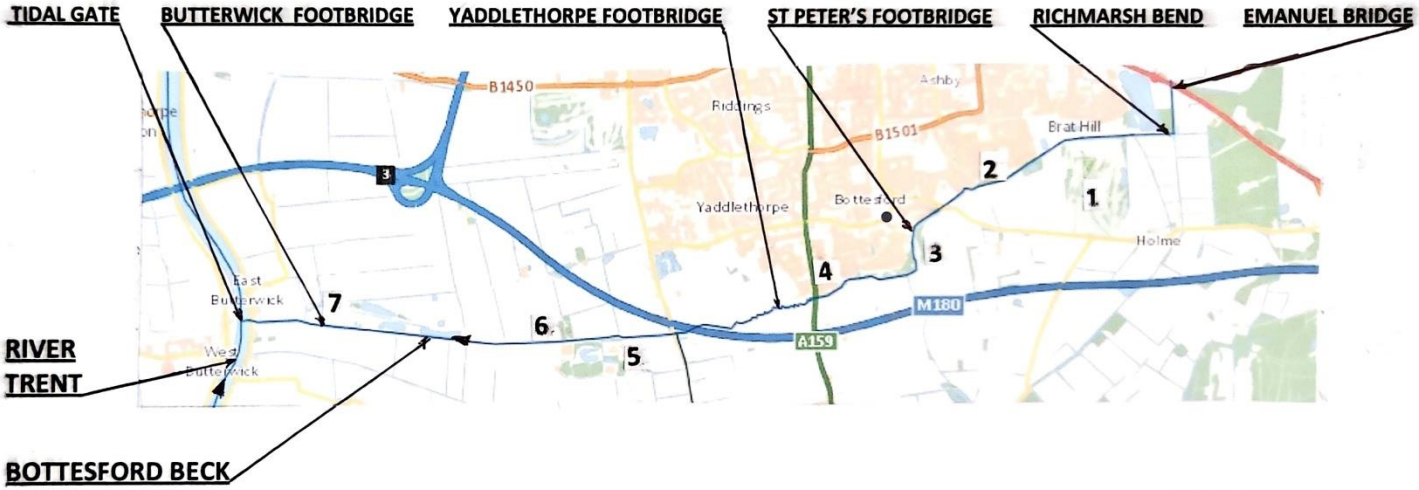
4. 5. <u>Connections.</u>

Convenient routes to the homelands on both sides of the lower River Trent are via bridleways, public paths, & trails such as the Open Cast Way, Ridgeway, the Isle Greenway, the Peat Land Way, the Ironstone Walk, Route 169, & the Ancholme Valley Way: some have connectivity to the Trent Valley Way, running from the source of the River Trent at Biddulph Moor, near Stoke, to Alkborough.

The Viking Way, a long distance trail of 237km to Oakham, Rutland, commences east of South Ferriby, follows the Humber shore, & travels under the Humber Bridge & through Barton, before climbing to The Wold & onwards.

Regional waterways exist for pleasure navigation & the rivers include the Idle & New Ancholme, together with the Chesterfield Canal & the Stainforth & Keadby Canal.

BOTTESFORD BECK ROUTE (Main River)



1 Holme Hall Golf Course

2 Redwist Community Wood

3 Holme (Bluebell) Wood

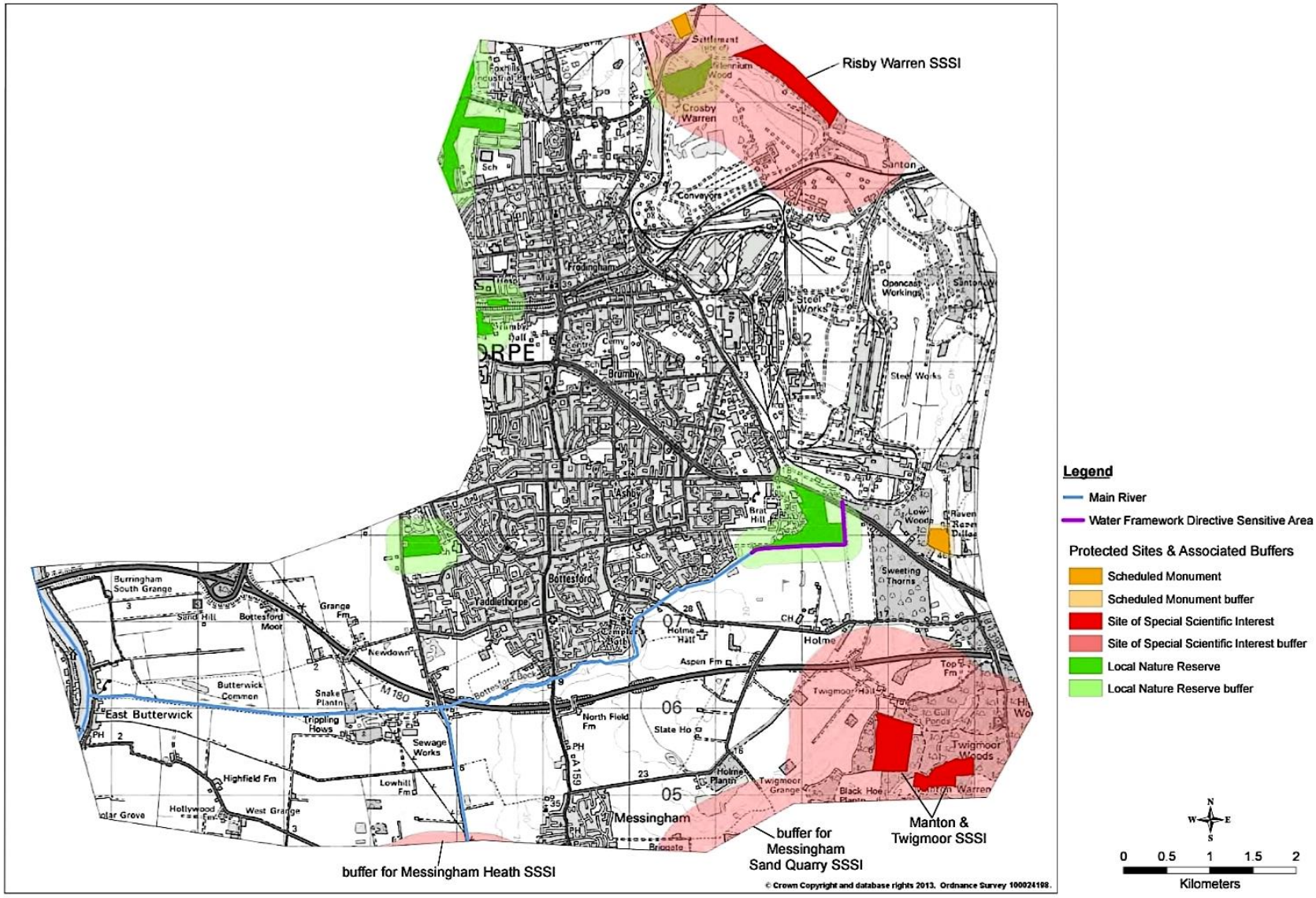
4 Cafe Natura

5 Yaddlethorpe STW

6 Snake Plantation

7 Butterwick Hale

Bottesford Beck Catchment



Legend

- Main River
- Water Framework Directive Sensitive Area

Protected Sites & Associated Buffers

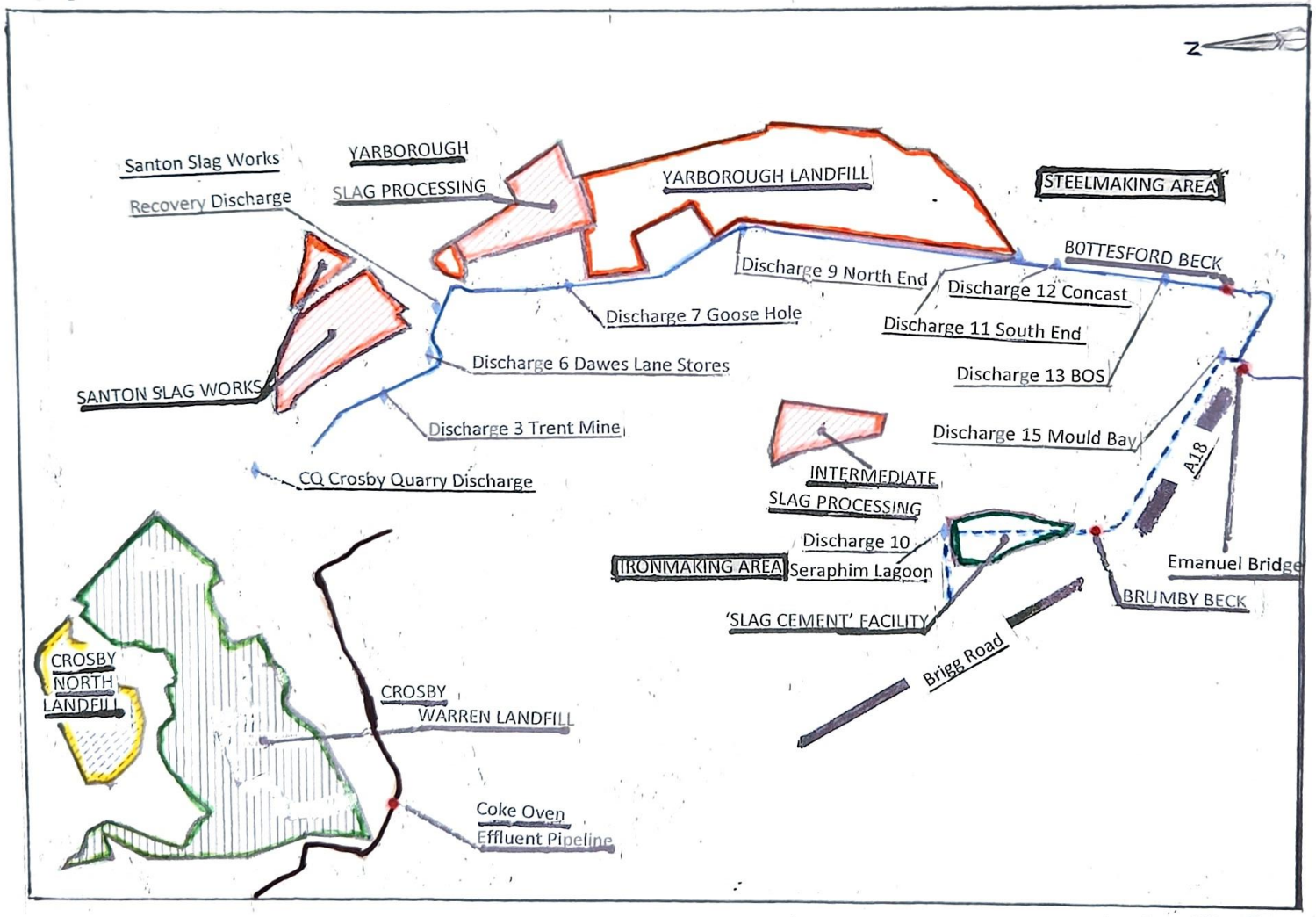
- Scheduled Monument
- Scheduled Monument buffer
- Site of Special Scientific Interest
- Site of Special Scientific Interest buffer
- Local Nature Reserve
- Local Nature Reserve buffer

N W E S

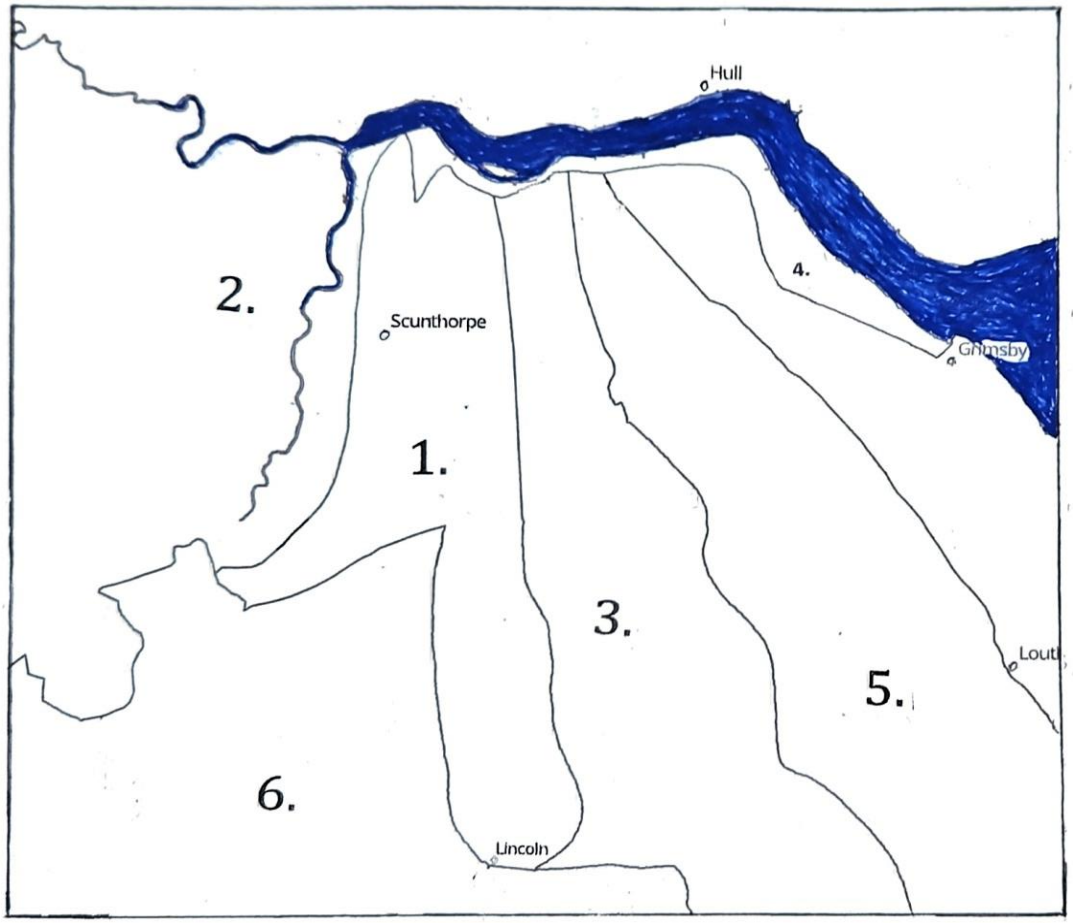
0 0.5 1 1.5 2

Kilometers

STEEL WORKS – Site Drainage, Landfill, & Slag Handling.



The Distinctive Districts of Bottesford Beck.



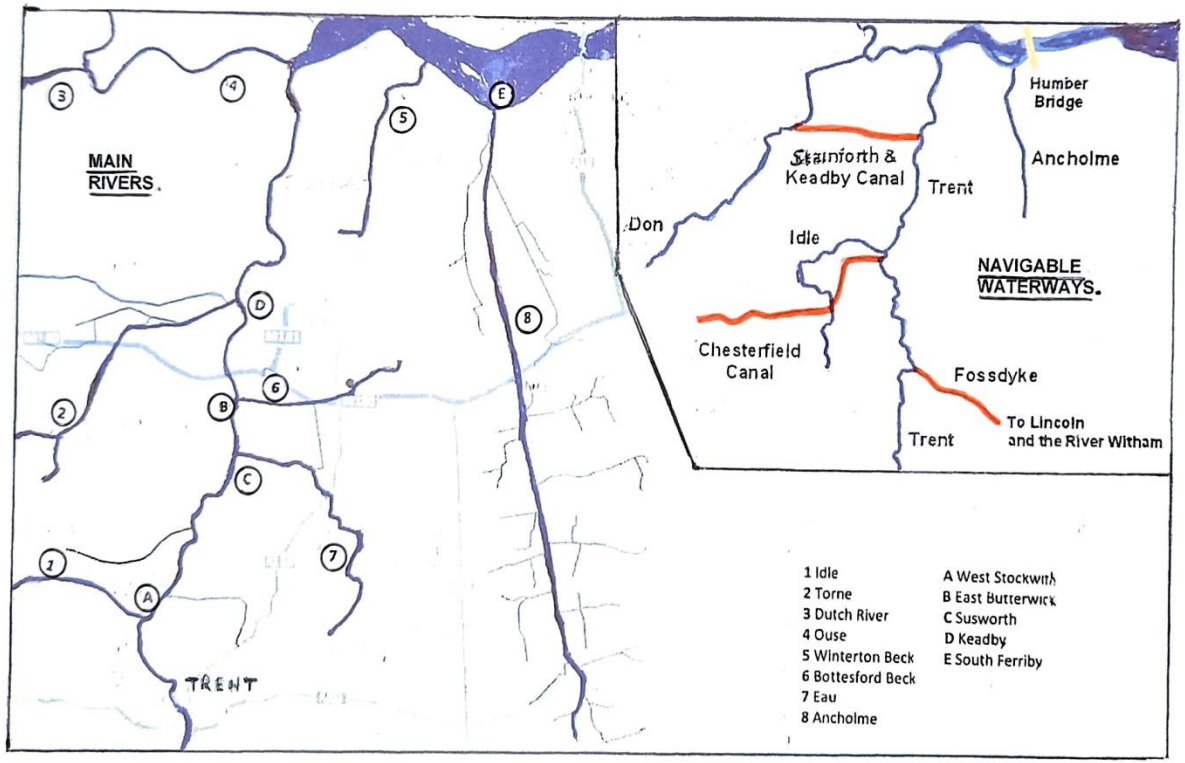
Near to Bottesford Beck.

1. North Lincolnshire Edge & Dip Slop
2. Humberhead Levels.
3. Central Lincolnshire Vale.
4. Humber Estuary South Bank.

Remote from Bottesford Beck.

5. Lincolnshire Wolds.
6. Trent & Belvoir Vales.

REGIONAL WATERCOURSES.



SUPPLEMENTS.

A. Hydro Oversight.

Abbreviations: RWAs - Regional Water Authorities
NRA - National River Authority
EA - Environment Agency
DEFRA - Department for Environment, Food, & Rural Affairs
Ofwat - Water Services Regulation Authority
OEP - Office of Environmental Protection
CSO - Combined Sewer Overflow
IDB - Internal Drainage Board

A. 1. Water Industry Management.

Towards the end of the 19thC, municipal pride was generated in the building of reservoirs to supply water to urban centres in England. At the same time many waste water treatment facilities were constructed. These were built & operated by local councils & replaced a previously haphazard system of private water supply & casual disposal of waste.

With water resource management residing firmly at local council level, the 1973 Water Act introduced RWAs for holistically managing water through administrative boundaries that were governed by watercourse catchments rather than by political districts.

Creating a conflict of interest within water management, the RWAs had been in charge of both waste disposal & pollution control but, in any case, throughout, the RWAs had been operating from a diminishing fund base which had led to a reducing investment in waste treatment facilities.

With the driver of upcoming European Community legislation, a huge investment would be required in waste treatment to conform to water quality standards. To this end, the private sector was selected as the preferred option to generate funding.

In 1989, a new Water Act was introduced to privatise the supply of drinking water & waste water treatment. This created a set of private water companies with geographic boundaries essentially the same as the RWAs. At the same time a new body, the NRA was set-up to act as a watchdog for water quality. The Water Industry Act 1991 replaced the 1989 Act & set out, in detail, the main powers & duties of the private companies.

This management structure is still in place, excepting that since 1996, the NRA has been subsumed within a larger body, the EA.

A. 2. Governance & Redress.

DEFRA is a ministerial department supported by 34 agencies & public bodies (quangos). Of interest & sponsored by DEFRA, Ofwat is a non-ministerial department & the water industry economic regulator. The EA & the OEP are executive non-departmental public bodies supported by DEFRA.

As distinct from ordinary watercourses, the EA has a role for main rivers, including permissive powers with policing. The EA, amongst other duties, monitors river quality, prosecutes polluters, & issues licenses for water abstraction & treated wastewater disposal.

The OEP is intended to replace the environmental protection functions of the European Union, but concerns have been raised about potential lack of powers, independence, funding, & about freedom of information.

DEFRA operates in England, Wales, & Northern Ireland & governs the English water industry. Initially, during the 1989 ownership change to private, there were 9 drinking & waste water companies (water service companies) & 29 drinking water-only companies (water supply companies). The government's English water industry golden company shares were allowed to lapse in 1995 & this propagated frequent changes to the ownership of the water companies. As of late, the 9 water service companies still exist, but only 3 have publicly quoted shares, whilst, following consolidation, the number of water supply companies has reduced to 5, noting that with a lack of government golden shares, the water supply companies had not been protected from takeover bids & had become private, with 4

of 5 of them de-listed: the English water industry is probably the only world water industry with no partial or full government ownership.

With the promise of sustained small public share holdings after the 1989 sell off, the private ownership models now vary from private equity funds, representing a broad range of investors, to direct ownership by institutional investors & international infrastructure companies, or some combination of these, whilst actual investors owning at least 80% of the water industry companies include the super-rich, banks, hedge funds, pension funds, foreign governments, & businesses lodged in tax havens. The private companies have, at 2023, combined debts of c£60billion & Ofwat admits that early 2000s intervention to prevent water companies from accumulating excessive debt was lacking.

In particular, after a period as a listed company, Thames Water was acquired by German utility RWE in 2001. Five years later, a group of investors led by Australia's Macquarie bought Thames Water for £8billion & loaded it with excessive debt. During the Macquarie ownership from 2006 to 2017, the debt pile tripled to almost £11billion. Presently owned by Kemble Water Holdings Ltd, Thames Water & Kemble Water had combined debts of £18billion in December 2023; the sole debt of Thames Water was reported as over £16billion during end of January 2025. During February 2025, the High Court signed-off a £3billion loan to keep Thames Water afloat. Ofwat has rejected a request by Thames Water to increase customer bills by 53% above inflation over five years, but will allow 35%; shareholders of Kemble Water Holdings Ltd include Ontario Municipal Employees Retirement System, Infinity Investment SA (a subsidiary of the Abu Dhabi Investment Authority), China Investment Corporation, & the Universities Superannuation Scheme.

As far back as 2009, the European Commission had been preparing to take the United Kingdom to the European Court of Justice by alleging that it was excessively discharging sewage into watercourses & seas via named storm overflows, thus breaking standards that the United Kingdom had agreed after the introduction of the Water Framework Directive in 2000. Ongoing during the 2011/20 decade, the EA increased pressure for event duration monitoring to provide the evidence for investment & regulation of storm overflows: as a result, all storm overflows in England are now monitored by the water service companies.

Arising from an EA requirement to improve the monitoring for managing flow-to-full treatment at waste water treatment works, water service companies revealed possible breaches within permit conditions (Flow-to-full treatment refers to the level of acceptance sewage a works must treat prior to discharge to settled storm tanks or as final effluent). Ongoing expansion of real-time surveillance monitoring of waste water treatment facility discharges had confirmed operational irregularities, induced by an element of self regulation delegated to the water service companies & reducing EA routine & arising pollution inspections.

Following the releases of the potentially unpermitted waste water discharges into watercourses, the EA & Ofwat announced in Nov2021 separate investigations into possible widespread non-compliance by water service companies at over 2,200 waste water treatment facilities.

The EA investigation is classed as criminal & as such must be conducted in accordance with criminal rules & procedures; the standard of proof in a criminal proceeding is much higher than with the regulatory investigation by Ofwat.

To Nov2023, the EA had identified 114 'indicator sites' to be representative of all the waste water treatment facilities where offending may have occurred: the EA has obtained evidence of working practices & data at each of the 114 sites for analysis. After Feb2025, the EA gathered statements for its investigation from external witnesses & looking to whistleblowers for providing information. During Jul2026, the EA announced its intention to criminally prosecute former water industry executives for conspiracy to defraud, with more cases to follow.

To date & instigated by the Ofwat investigation, all English water service companies are the subject of enforcement cases in relation to the operation of their wastewater businesses.

In a fresh twist to excessive sewage discharging, the OEP suspects that DEFRA, Ofwat, & the EA had misinterpreted environmental law & permitted firms to pollute watercourses by

exceeding network CSO design intent via regulatory oversight of untreated discharges; these authorities had two months to respond from 12/09/2023. By 16/12/2024, the OEP had concluded that there had been failures to comply with environmental law & had sent each of the public authorities a decision notice setting out the findings & the steps that might be taken to put matters right. The public authorities had two months to respond & confirm whether the steps will be followed: failure to do so could result in court action! This investigation by the OEP was instigated during mid 2022 & completed mid 2025, with final report December 2025: there will be no court appearances as many actions have now been taken, are being progressed, &/or commitments are in place, with the OEP assurance of monitoring the outstanding undertakings.

A. 3. <u>Flood Risk</u>.

Since the Flood & Water Management Act of 2010, the EA has responsibility for the overview of flooding, with the direct management of risk for main rivers & coastal, & lead local flood authorities (either unitary authorities or county councils) or IDBs have responsibility for managing flood risk from ordinary watercourses.

If a riparian land owner ('bank' owner) has a river or stream, usual ownership is the watercourse that is on or under the land. If a watercourse runs along the edge of the land, except for the water, riparian ownership is to an imaginary mid channel line! Riparian responsibilities include maintenance duties (watercourse banks & bed to be clear of obstructions to ensure water flows freely), erosion control (protect land from erosion & can include building structures like walls, subject to regulatory approval), & pollution control (avoiding pollution of a watercourse & manage waste & runoff to maintain water quality).

As distinct from ordinary watercourses, riparian owner maintenance on main rivers is divided into tasks with or without permission from the EA: the former includes removal of sediment from in-channel & re-profiling banks whilst the latter includes removal of channel debris & trimming bank-side vegetation.

Government policy & limited financial resources dictates a focus on value for money: the EA priority is to invest in activities such as maintenance, improvement, or construction works on main rivers that will contribute most to managing & reducing flood risk to people & properties rather than works that sustain land drainage & support agricultural production; in the past, rivers were dredged or de-silted or de-vegetated more often for this purpose.

Alongside the responsibilities of a riparian owner, the EA may still consider undertaking tasks on or near main rivers, reiterating, usually dependant on reducing flood risk to a population.

A. 4. <u>Low Land Drainage.</u>

IDBs are public bodies that manage water levels for low lying land: IDBs work to reduce flood risk to people & property & manage water levels for agricultural & environmental needs. The work of an IDB is closely linked with that of the EA. An IDB has a range of functions overseen by the EA, but an IDB is ultimately responsible to DEFRA. IDBs are concentrated within the Norfolk Broads, Fens in East Anglia, the Somerset Levels, Yorkshire, & Lincolnshire.

The area of an IDB is by catchment(s) within a region. Much IDB work involves the maintenance & operation of ordinary watercourses, pumping stations, & other critical infrastructure. Currently, there are 112 IDBs in England covering 9.7% of the landmass & these IDBs are responsible for over 500 pumping stations, 22,000km of watercourse, 175 automatic weed screen cleaners, & numerous sluices & weirs.

A. 5. <u>The Pilots.</u>

Nine watercourses in England were nominated as River Maintenance Pilots for trialling a new regulatory approach to make it easier for riparian owners to remove silt from a main river, if they chose to do so. The Pilots also aimed to make it easier for stake holders to find out about channel maintenance, if any, by the EA.

Running from Oct 2013 to Oct 2014, extended to Mar 2015 & perhaps to a legislation change, each Pilot involved a nominated manager from the EA. A Pilot was subject to a Regulatory Position Change. Under a Pilot, farmers & landowners at risk of flooding would be allowed to de-silt main rivers without needing to obtain an existing permit.

The Pilot scheme was closed on 5 Oct 2017, albeit, with no legislation change.

A. 6. Agricultural Operations.

The control of agricultural runoff & pollutants relies upon the land, soil, & animal management stewardship of farmers supported by advice, grants, & regulation, namely, The Reduction & Prevention of Agricultural Pollution, Regulations 2018 (also known as 'Farming Rules for Water') & policed via EA monitoring. Updated Statutory Guidance for application of the regulations was issued by DEFRA during 2022 & covers the EA policing approach together with the application of the rules for the use of fertiliser: the EA have made changes to its key enforcement policies which have brought it into compliance with the requirements for these regulations.

On 19November2024, the OEP launched an investigation into the government's Statutory Guidance on applying the Farming Rules for Water that may be unlawful as some of the wording is not consistent with the regulations themselves: this guidance is likely to be relied upon by farmers & may therefore lead to breaches of the regulations when applying manure or fertilizer to the land: after a rapid review, DEFRA published in June2025 revised 'Amended Statutory Guidance'.

A. 7. Into the Future?

On 23October2024 the government announced the creation of an independent Water Commission to carry out a systemic review & reform of the water industry: the commission's remit to strengthen regulation, boost investment, & inform further regulation should deliver a long-term strategic plan to protect & improve water quality, noting that the government had already discounted public sector purchase of water companies & their assets.

The report from the Water Commission was issued on 21July2025, adopted, & awaits completed actions from the government.

Government will not meet the ambition that most watercourses will be on the road to good condition or else already in that state by 2027, but the Commission might have delivered the shift mode that is needed for water bodies to thrive in the longer term.

B. Anyone's Watercourse!

Abbreviations:
SUDS - sustainable urban drainage system
PFAS - per & polyfluoroalkyl substance
STW - sewage treatment works
CSO - combined sewer overflow
SSO - settled storm tank overflow

B. 1. Catchment of a Watercourse.

The inclination to overview a watercourse as a definitive & static entity must evolve as the mastery of the dynamic components of a continuously changing channel set in a catchment context: even within somewhat undisturbed catchments, watercourses change through time, albeit, normally, over relatively long timescales.

The geographical location of a catchment determines its climate, geology, topography, soil cover, & land use. In turn, these characteristics determine the delivery of water with matter (runoff) to a watercourse.

A watercourse catchment mainly dictates the rate of channel level rise or fall via this runoff, a mechanism of precipitation: runoff can occur either on or below ground surfaces & at differing velocities.

During & immediately after precipitation events within its catchment, a watercourse channel experiences peak flows & between peaks, steady periods of base flows.

Flow peaks are influenced by precipitation properties within the catchment such as rainfall intensity & duration & catchment characteristics themselves, especially catchment size. Other catchment factors include slope angles, shape of catchment, soil types, vegetation types & coverage percentages, degree of urbanisation, & antecedent soil moistures.

Base flows are partially supported by the slow seepage of catchment groundwater into a channel; this seepage is not necessarily visible & occurs over lengths of bed & bank.

A flood is usually the inundation of water instigated by a period of excessive &/or prolonged rainfall/snowfall within the catchment, creating abnormally large land & watercourse conveyances: the amount of damage might be a flood highlight, whilst damage cost might be a flood rating.

Factors influencing catchment flood size can be local scale such as hill slopes, urbanisation, & flood plain configuration. Apart from the distribution, amount, & intensity of precipitation, a significant flood size factor is the degree of ground saturation, both rural & urban, immediately before the precipitation.

Where extensive urbanisation of the catchment occurs, flood frequency & magnitude can increase: an urban network of gutters & drains frequently leads directly to a drainage system, delivering flood water in a faster time. With more frequent & intense rainfall predicted, climate change will make flash flooding & overloading of drainage networks more likely.

The amount of free volume of a large pond/lake prior to inundation can be a localised flood size factor.

Urban drainage (low filtration) from a catchment can concentrate pollutants within the first flush of water, noting that drainage flow usually increases with the creep of impervious surfaces (block paving, concreting, slab laying, etc). Suspended solids within drainage will increase via poorly maintained construction sites & eroding ground.

Much agricultural runoff is delivered via open channel drainage ditches, noting that the spreading of intensive farming animal waste on near watercourse fields may generate an excess of nutrients within the runoff.

The addition of nutrients to a watercourse will lead to increases in net primary productivity as eutrophication, from the Greek meaning ‘well nourish’: the nutrient status of a watercourse is determined by its catchment supply &, in turn, influenced by the geology of that catchment. Some catchment waters are naturally eutropic, while others become concerning when human activities, such as sewage effluents & runoff from agricultural land, accelerate the enrichment process.

Whilst limiting pollution problems associated with drainage by allowing modification via biological action, SUDS are natural elements designed to reduce flood risk by limiting discharge rates whilst water is held for longer within runoff; SUDS include green roofs, rain gardens, swales, basins, ponds, & lakes.

Rain gardens are designed landscape sites that reduce pollutant load, flow rate, & total quantity of drainage. Rain gardens rely on plants & engineered ground medium to retain drainage & increase dwell time of infiltration whilst remediating & filtering drainage pollutants.

Basins & ponds are classed as detention or retention, where a detention basin has a pond with at least one ground water feed & overspill(s) to drainage whilst a retention basin has no connections, relies upon evaporation & ground absorption for removal of runoff, & may develop a transient pond.

B. 2. <u>Traits of a Watercourse.</u>

Although a watercourse is complex & dynamic, its channel is viewed as being in equilibrium with the water/matter flow rate: a channel adjusts its shape to this conveyance. Often, in an irregular & unsteady manner during high flow events, physical forces act upon the materials of a channel bed & banks (including vegetation) to sculpt the channel characteristics, including gradient or long-profile, cross-sectional shape, & plan form.

The factors dictating channel flow rate are the volume of water/matter present, the gradient of the channel, & the resistance to flow within the channel. The resistance to flow is governed by the state of the channel surfaces; amongst others, boulders, debris, & aquatic

vegetation create large amounts of friction, slowing water/matter as it flows within its channel.

For a given flow, due to the loss of velocity & cross sectional area, a channel level rises with increasing debris, aquatic vegetation, & sedimentation (Sediment is matter that settles to a channel bottom &, deposited as sediment, silt is fine sand & clay).

For an increasing flow supported by channel shape, the potential for silt movement is increased.

A rising water level combined with silt movement induces more likelihood of saturated ground due to the risk of banks being overtopped, increases the chance of bank failure via accelerated erosion, & engenders less effective drainage due to the inability of land to drain to the channel under gravity.

Bank erosion is a natural process, but failure is dependent on the location & the rate at which erosion is occurring: without erosion, watercourses would not meander & change course.

A watercourse copes with contaminants & human & other waste through degradation, dilution, & dispersion. The effectiveness of these processes is dependent upon the existing pollution load, temperature, acidity & alkalinity of the water, channel conveyance, & mixing potential, with influences of flow velocity & turbulence, & related to time of year, the vegetation cycle.

B. 3. <u>Aquatic Vegetation.</u>

In-channel vegetation reduces flow velocities by the presence of stems, leaves, & root, all of which aids the capture of pollutants, traps & settles silt, & impedes bank erosion by stabilising soil surfaces.

Classified as submerged, emergent, & floating, aquatic plants have adapted to live in a watercourse & reproduce by flowering & setting seeds, with much seed carried by wind, bird, or fish. Some of these plants have also evolved to have asexual reproduction by means of rhizones, turions, & fragments.

Aquatic vegetation largely determines the fertility of a watercourse. Habitat complexity provided by the plants tends to increase diversity & density of aquatic life: plants provide cover for fish, substrate for invertebrates, produce oxygen, & act as food for water fowl & some fish. Many of the smaller aquatic animals use the plants as a home or for protection from predators.

Higher (vascular) aquatic plants (pondweeds, duckweeds, sea-grasses, etc) typically use carbon dioxide & excrete oxygen during photosynthesis. These plants also respire &, particularly during darkness, excrete carbon dioxide & require oxygen to maintain normal functions: large fluctuations in the dissolved oxygen concentrations of channel water can occur between day & night.

The controlling factors for distribution, abundance, & growth of plants will vary according to light availability, temperature, channel depth, nutrient levels, inorganic carbon concentration, turbidity, zooplankton grazing, toxic substances, & flow regime.

Eutrophication ultimately detracts from biodiversity through the proliferation & dominance of nutrient tolerant plants & algae. These tend to displace more sensitive species of higher conservation value, changing the structures of ecological communities. Eutrophication can give rise to undesirable aesthetic impacts in the form of increased turbidity, discolouration, odours (unpleasant), slimes, & foam formation.

Eutrophication can lead to massive growth of algae & aquatic plants & lower the dissolved oxygen level; this may lead to the death of invertebrates & fish. In turn, pollution can affect channel water quality & the balance of organisms. When the growths die, bacterial action depletes oxygen availability for other water life.

Any rapid growth of aquatic vegetation might have blocked sunlight which again affects other water life.

B. 4. <u>Watercourse Bank Migration.</u>

B. 4. 1. <u>Bank Erosion & Failure.</u>

Bank erosion is the wearing away of the banks of a watercourse: distinguished from erosion of a watercourse bed, referred to as scour. Watercourse banks experience erosion & failure, with the primary processes of fluvial erosion & mass failure.

Fluvial erosion is the direct removal of soil particles by channel conveyance, with erosion rate determined both by the force of flowing water & the resistance of the bank material to erosion.

Mass failure occurs when the weight of a watercourse bank is greater than the strength of its soil, causing bank collapse; this process is dependent upon a number of factors including the internal strength of the soil, degree of layering, soil water content, & vegetation.

The erosion & failure processes are linked as fluvial erosion of the bottom of a bank, creating a steeper bank angle or overhanging soil blocks: these soil blocks are more unstable & likely to collapse as mass failure.

Other failure mechanisms include cycles of wetting & drying or freezing & thawing which weaken bank soil & make it more susceptible to erosion. Groundwater seepage can flow out of a watercourse bank with enough force to erode the bank material. If concentrated, seepage can form piping as a 'pipe' of soil is eroded.

Some common solutions of watercourse bank erosion & failure are retaining walls, sheet piling, sacks, blocks, gabions, mattresses, & maintaining deep vegetation.

B. 4. 2. <u>Bank Vegetation.</u>

Banks with vegetation erode more slowly than those without. Dense vegetation growing on a bank face can deflect flowing water & reduce fluvial erosion. Roots can increase the strength of bank material, making a bank less prone to mass failure.

While deep rooted vegetation can increase the strength of watercourse banks, replacement with grass & shallower rooted vegetation can weaken soil; concentrated runoff onto a bank causes further weakening. A common natural method of reducing instability & failure is the re-introduction of native plant species within the adjacent overbank areas. The extensive root system of these plants will provide support in the soil & reduce runoff erosion.

The roots of trees growing by a watercourse are undercut by bank erosion. As the roots bind the soil tightly, abutments are formed which jut out over the water, lessening the rate & progress of bank migration. However, trees can also add significant weight to the tops of watercourse banks & can induce a decrease in stability; coppicing suitable trees & shrubs will induce an increase in stability.

B. 5. <u>Storm Water & Overflows.</u>

Storm water schemes aim to reduce flooding or the harmful effects of flushing foul water or both.

Communities began to realize the benefit of separating storm water from sewage water & began to construct separate sewer & storm drainage lines. The primary benefit of waste stream separation is the degree of further processing: storm water requires less treatment than sewage before returned to the environment.

Called a combined sewer system, this older system carries foul water from homes & industry together with runoff (surface waters from roof gutters, patios, driveways, & some highways); these combined waters flow to a treatment facility within one conduit.

Constructed since the 1960's, a modern system has one conduit for foul water (from sinks, washing machines, toilets) & a separate sewer conduit for runoff; foul water flows to a treatment facility whilst runoff is normally discharged to a water body, or the sea, or permeable ground.

By design, the combined sewer systems were sized to carry all foul flows plus much wet weather flows but not necessarily flows during high precipitation periods: to prevent backup of the diluted sewage into homes & businesses & flooding of land, the relief mechanisms are CSOs to watercourses or lakes or seas.

To cover the high precipitation periods & prevent inundation of treatment facilities if plant throughput capability is exceeded, storage tanks within a facility are the integral backup. The

tanks have sufficient dwell time for settlement of solids prior to any settled storm tank overflows (SSOs) to a watercourse or lake or sea if storage capacity is exceeded.

Storm overflows include CSOs & SSOs: the overflows are sometimes screened but not treated & contain contaminants.

Storm overflows can sometimes have a relatively low environmental impact when compared to runoff & the continuous discharge of processed foul water (final effluent), ex-treatment facility; the public health impact of storm overflows is mostly unknown with inadequate data on water quality (measured by faecal bacteria) in existence.

Nevertheless, with the original design intent of many combined sewer networks becoming compromised due to the increase of conveyance demands within obsolete systems (A common fault of dated combined sewers are too small pipe diameters), the frequency & prolonged discharge times of some CSOs are becoming unacceptable &, sometimes, illegal, particularly during dryer weather periods. In fact, some CSOs had simply holes knocked into manhole walls to alleviate flooding, but a proportion of CSOs now include 6mm mesh screen to prevent discharge of solids & a screen rake to alleviate blocking, together with overflow event duration & rake failure monitoring.

Limiting discharge rates by water being held for longer within a drainage system (attenuation) is one approach for reducing or eliminating CSOs & SSOs, usually, by the inclusion of network storage via large deep tunnels or reservoirs or tanks or combinations of these elements; completed or ongoing big buck projects include the Underground Reservoir of Paris, the Thames Tideway of London, the General Drainage Plan of Lisbon, the Tunnel & Reservoir Plan of Chicago, & the Shaft Tanks of Scunthorpe.

The more ambitious projects will also collect urban & some rural runoff & drainage, especially from roads, presently discharged directly to watercourses, lakes, or seas, but diverted to the foul attenuated drainage system & onwards for treatment.

B. 6. <u>Pollution.</u>

Due to the impact of waste products generated by agriculture, industry, & urbanization, no natural watercourse exists within England. Many are polluted beyond legal limits. At 2024, only 14% of watercourses were in acceptable ecological condition, the criteria of health. Data from 3,553 stretches of watercourse failed to be rated as ‘good’ or ‘high condition’ overall, with 36% failing due to fertilizer or livestock pollution, 24% failing due to water industry activities, including waste water treatment discharges, & 11% failing due to urban & transport runoff pollutants such as brake lining dust & oil deposits.

Other sources of pollution include solutes, solvents, micro plastics, the PFAS group of chemicals (sometimes called ‘forever chemicals, with some carcinogenic), dioxins, & some dioxin-like compounds.

Landfill sites & their drainage liquids (leachate) can contain these substances & other hazardous & persistent pollutants: over 750,000tonnes of leachate is tankered annually to STWs & normally mixed with domestic sewage & liquid trade waste. The STWs produce treated final effluent, discharged into watercourses & seas, & solid sewage sludge (biosolids), with millions of tonnes produced annually & sold by the water service companies to farmers as fertilizer & spread on fields, but can contain micro plastics, heavy metals, or PFAS chemicals. In any case, a proportion of these sites are not capable of dealing with some of these toxic pollutants & many chemicals escape treatment, ending up in watercourses or accumulating on fields; this increases the contamination risks to water bodies & agriculture, with possible chronic human exposure via food & drink!

Expanding the relevance of PFAS chemicals, these are manmade inventions emanating from the 1940s, invisible, & virtually indestructible, with now over 16,000 options applied to make products resistant to grease, water, stain, & heat. These ‘forever chemicals’ are everywhere, from food packaging & furniture to outdoor gear, cosmetics & even dental floss. These chemicals are rarely labeled clearly, often hidden behind terms such as ‘non-stick’ (Teflon) or ‘waterproof’: avoidance is difficult since PFASs persist in food, soil, water, & air. Ingested or absorbed through the skin, prolonged exposure to PFASs has shown links with liver & testicular cancer, damage to the immune system, kidney disease, increased

cholesterol, hormonal imbalance, & pregnancy complications. Once inside a body, 'forever chemicals' do not break down & become difficult to dispel: during January2026, France banned this group of chemicals & in early February2026, the British government announced increased testing for PFASs as part of a plan to tackle these substances projected to updated toxic waste legislation in December2028!

Pollution from abandoned metal mines is a consequence of England's industrial heritage, noting that rectification projects are ongoing, but even now, still arising.

Positively, pollutants that kill wildlife & discharged by STWs as final effluent into watercourses & seas such as ammonia (can harm aquatic life), phosphorous (can deprive water of oxygen), & toxic metals (copper, lead, cadmium, & mercury) have been reduced, with 85% less ammonia discharged in 2025 compared with 1990.

Negatively, a proliferation of watercourse aquatic vegetation will reduce the self flushing during precipitation events & generate more residual pollution.

B. 7. <u>Impacts To & Within a Watercourse.</u>

The susceptibility of an undisturbed watercourse arises from storm events that act to send waves of aggressive water motion energy & the ability of a watercourse to resist this change.

Many activities such as flood defence schemes, fishing habitat modifications, near bank vegetation management, & bank protection works impact watercourses directly, whilst other activities, including land use change, stocking densities, & agricultural drainage schemes are ancillary via catchment input, mainly runoff.

With increasing human activity affecting all watercourses, the influences on channel form are susceptible to change. In some cases channels may be insensitive to changes, such as bedrock lined channels & pebble, rocks, or boulder lined beds (armor) with well vegetated cohesive banks. In other cases, watercourses may be prone to form changes: in uplands, many watercourses have become unstable over a long period as high grazing densities have changed catchment vegetation with consequential changes in watercourse width, depth, & plan form as a response to increased runoff followed by increased channel erosion rates.

Negative impacts might occur upstream or downstream of a tasked stretch (dredging, de-silting, de-vegetation, debris removal, bank renovating) if a watercourse is not considered within its catchment setting.

Watercourse tasking which accelerates channel flow can impact downstream overbanking & flooding.

Confined channel water (via engineered banking) which increases flow velocities & bed scour might increase downstream overbanking & flooding.

Aquatic vegetation growth, silt deposition, channel debris, & structures will reduce channel conveyance capacity & may result in deeper upstream water levels (back water).

Future climate change will lead to an increase in overbanking & flooding, particularly, whilst a watercourse adjusts to the differing flow regimes.

C. <u>Underpinning the Present.</u>

C. 1. <u>Rustic Progress?</u>

Enclosure is the subdivision & fencing of common land into individual plots which were claimed or allocated to those deemed to hold rights to the enclosed land: enclosure is a factor in the concentration of land ownership.

Those in favour of enclosure, including beneficiaries, insisted that it was necessary for economic development or improvement, whilst those against, including the dispossessed, claimed that it deprived the poor of their livelihoods & leads to rural depopulation.

Nevertheless, with the evolution of enclosure, the rural appearance of England was changing with new drain ways & roads. Farmers, cottagers, some tradesmen who were also farmers & their labourers had worked open field systems with strips of arable land & enjoyed the rights of common on open lands: by the 1830s, most down land farming within England was within fields enclosed between hedges & fences, without rights of common.

Over some hundreds of years, much land had been privatised by removal from collective ownership & management & handed to individuals: an 1872 commissioned land register for England published that 0.6% of the population owned 98.5% of agricultural land.

C. 2. Settlement Narratives.

Up to 3,000 English villages disappeared as a result of the Black Death, the bubonic plague pandemic that raged from 1346 to 1353. This does not mean all the inhabitants died: many of the villages ceased to exist after survivors moved away. For keeping livestock, a landowner might enclose deserted land & not permit the re-establishment of a village. If a village was to be reinstated, rebuild could be remote due to fears about infection: this explains why some churches are not at the heart of their communities. In any case, if a landowner & heirs died during the pandemic, the land would be sold off by the Crown to a new owner who probably would have no interest in re-establishing a village.

The most common type of building had a timber frame with walls made of wattle & daub: this was a lattice framework of willow or hazel (wattle), caked (daubed) in mud or clay to be waterproof. The roof would be thatch. Without any maintenance, this type of building collapsed & rotted away. The only trace of a village would be buildings of stone, usually the church, a manor house, or water mill.

Around 6,000 moat sites had existed in England, the majority serving prestigious aristocratic or seigniorial residences with the moat primarily a status symbol rather than a means of defence.

C. 3. Ye Knights of Olde.

Predating the Knights Templar, the Hospitaller ran hospitals on the pilgrim routes, with a facility in Jerusalem. In the year 1113, the Hospitaller achieved papal recognition as the Knights Hospitaller & rapidly militarised to taking up arms & fighting alongside the crusaders in the Holy Land. As knighthood & chivalry went out of military fashion, so the Knights Hospitaller order evolved into a charitable foundation. During the dissolution of the monasteries, almost all the Knights Hospitaller property was confiscated within England.

Though not formally suppressed, this effectively caused the activities of the English administrative division of the Knights Hospitaller to come to an end until a recreated order received a royal charter during 1888 & became largely separated from the Roman Catholic main stem.

The Knights Templar was a military order of French origin, ostensibly to protect pilgrims visiting Jerusalem after its capture from the Muslims in 1099. The Knights Templar established a headquarters in Jerusalem & in 1129 the order gained the endorsement of the Catholic Church. A Papal Bull was issued that granted the order special rights, including an exemption from taxation. The organisation had many non combative members who ran a large economic structure throughout Christendom with innovative financial techniques as a forerunner to the modern banking system: the Knights Templar established a banking network for pilgrims. After losing their stronghold in the Holy Land with the fall of Jerusalem, they withdrew to their bases, the principal one of which was Paris.

Due to the wealth & power amassed, the order was viewed as a threat & duly purged, suppressed, & disbanded & classed as a failed organisation; nevertheless, linkages supposedly traced to the Knights Templar not only include Roman Catholic groups, charitable bodies, & darker organisations, but also Freemasons (Professing to Trinitarian Christian faith, the ‘United Religious, Military & Masonic Orders of the Temple & of St John of Jerusalem, Palestine, Rhodes & Malta in England & Wales & Provinces Overseas’ utilise the history & practises of the medieval Knights Templar as a basis for ceremonies, although there is no direct link with ye knights of olde).

C.4. Latter Day Scunthorpe Steel Manufacture.

Abbreviations: A-F - Appleby-Frodingham
NP - Normamby Park

BSC - British BSC Steel Corporation
BOS - Basic Oxygen Steelmaking
BBM - Bloom & Billet Mill
MSM - Medium Section Mill

Just prior to the Anchor Project of the early 1970's, the steel works within Scunthorpe were A-F & Redbourn on a common site & NP on an independent site; all were under the banner of the BSC & each was classed as integrated & each produced VIRGINSTEEL (steel from blast furnace iron). Previous owners were United Steel Companies (A-F), Richard Thomas & Baldwins (Redbourn), & Guest, Keen, & Nettlefords (NP); heritage steel making of Scunthorpe included Siemens open hearth furnaces, Ajax furnaces, Oberhausen rotor convertor, & Linz-Donawitz convertors (full combustion), noting that a vertical slab casting machine had been added to Appleby melting shop. The blast furnace Queens (Anne, Bess, Victoria, Mary) of A-F were first established & expanded during the 1950s, with hearth diameter increases then, & at a later period.

The Anchor Project of the early 1970s was the catalyst for the modernisation & consolidation of steelmaking within Scunthorpe. This project was the largest investment to date by BSC & probably exceeded £400million with its acceleration fund: the Anchor Project was the largest single scheme with government support & sponsorship, overtaken by 'new Teesside', Concorde, & others.

The Anchor Project was concentrated within reclaimed iron ore workings on the south side of the A-F/Redbourn site; remote aspects of Anchor were import facilities for high grade iron ore at the Immingham Bulk Terminal, a conveyor for blended ore transfer from the Anchor site to NP, & the A-F Plate Mill heavy shear line. Constructed on the Anchor site was a foreign ore rail wagon Tippler, an Ore Blending Plant for blast furnace feed material, a Desulphurisation Plant for treating liquid iron within torpedo cars, a BOS Plant with 3off 300ton suppressed combustion steel convertors (nominal charge of 250tons of liquid iron with 50tons of coolant scrap), a mould preparation bay for the support of ingot teeming, a Continuous Casting Plant with a twin strand slab caster, a slab bay for dispatch preparation, a BBM, & a MSM.

Enhancements since Anchor include coal & oxygen injection to the Queen's blast furnaces, construction of the Dawes Lane Coke Ovens & the NP Formed Coke Plant (coke from low grade coal), BOS gas recovery, hot metal weighing, hot metal ladle desulphurisation, torpedo car lids (heat retention), secondary steelmaking (vacuum degassers, ladle arc furnace, ladle treatment & reheat), BOS sub lance (in- process temperature & sampling), steel ladle argon stirring, 100% continuous casting via billet & extra bloom machines, & MSM rail production with service facilities.

Taking the example of the BOS Plant, environmental initiatives have included replacing wet scrubber fume cleaning with more effective bag filters & electro-static precipitators; as an example, the intermittent rogue fume escape from the convertors was vented to atmosphere via the building open cowled roof until the roof was sealed, with upper building & convertor secondary fume extraction by a variable speed fan for peak extraction & fixed speed fans for continuous building ventilation with fume cleaning by a dry precipitator.

Closures since the Anchor Project include Redbourn Works, Formed Coke Plant (Government sponsored, closed after subsidy ceased, last shift record production), NP Works, Coke Oven Plants (Appleby & Dawes Lane), Plate Mill, Heavy Section Mill, BBM, & 2off Pit Arch Plants. Queen's blast furnaces have been reduced to 2off operational units. (Following Anchor commissioning, a 'new Teesside' was announced, outpacing Anchor with a £500million spend, of which £400million to Redcar ironmaking & £100million to the nearby Lackenby steelmaking complex. The Redcar spend was biased towards a 10,000tonnes a day blast furnace, one of the largest in Europe. Via procurement economies, an extra blast furnace was ordered & stored piecemeal on an open site at Lackenby until its build location was established. Scunthorpe had been considered for the build but, in any case, the extra furnace was scrapped before the closure of Teesside Steel Works in 2015).

Amongst examples of function demise on the A-F site, the once largest covered structural engineering facility in Europe has become dormant, having manufactured structures such as

bridges & oil drilling platform sea legs, & on the Anchor site, the central food preparation centre became defunct.

Past sales projects using Scunthorpe Steel Works resources have included land mine removal machine, bomb barriers, modular steel structure car parking, & diesel locomotive build.

Past external contracts applying Works' manpower have included mechanical plant maintenance & steel structural inspections.

Functions that have been contracted out include demineralised water plant operation, breathing apparatus training, & waste oxide briquette manufacture, all partly supported by some Steel Works assets &/or resources.

After Anchor, the ownership of the Scunthorpe Works had changed from British (BSC) to Anglo Dutch (Corus), to Indian (Tata), to British (Greybull, a family investment concern), to Chinese (Jingye): Jingye named its English assets as British Steel! Previously owned by Liberty Steel, the Scunthorpe Merchant Bar Mill is dormant following the covid epidemic & the collapse in 2021 of Liberty main lender Greensill Capital.

For consolidating plant performance & product quality, Jingye installed a new replacement billet caster & the Chinese have suggested plans for a clean, green, & sustainable business with a £1.25bn proposal for electric arc furnace (EAF) steelmaking using a feed stock of scrap, together with development of an industrial park on 300acres of existing & future waste land, co-supported by NLC.

In the meantime, possible closure of the operational Queen's blast furnaces & BOS Plant would be overcome by importing semi finished product as feed stock for sustaining production at the MSM &, maybe, the Rod Mill, until EAF steel became available; two lower output EAFs were being considered due to limitations within local electricity supply.

To cover the possible loss of works arising gas (blast furnace gas & BOS gas), a spur was routed from the grid during 2024 to boost existing supply of natural gas for reheating the proposed import of semi finished product for the mill(s).

To impose Government decision making, legislation to protect & manage the future of Scunthorpe Steel Works had become active but the Works remained under Chinese ownership: this ensured that the blast furnaces would not be prematurely closed. The Works still retains high technology capabilities for producing VIRGINSTEEL; historical site negatives include the reductions in output (BOS Plant record annual liquid steel stands at 4.6million tons, present output at half or less than this figure), employment (22,000 in 1970, 2,700 in 2024), & a variety of end products, noting that limestone & coolant scrap are the bulk native materials presently applied to steelmaking at Scunthorpe.

Ongoing investment considerations have included a direct reduction iron (DRI) facility & a plate mill.

DRI (sponge iron) might be considered if high grade coke was not available, but, in any case, sponge iron is importable, noting the lower carbon generation of DRI over blast furnace liquid iron: hydrogen would preferentially be applied as the reducing gas in a Scunthorpe plant, with local hydrogen infrastructure essential.

As a paradigm, two Midrex DRI plants, each with a capacity of 400,000tons per year of reduced iron were erected in 1980 by BSC on the Hunterston Peninsula, Ayrshire. A projected BSC annual increase of steel production to 28million tons per year was one reason that two plants were built, but the cost of North Sea gas as the reducing fuel for these facilities proved uneconomic. The plants were never used & dismantled & shipped to America in 1996; this process was repeated in 2005, with Saudi Arabia as the destination.

A plate mill would support the expansion of the defence industry (plate for the latest aircraft carriers was sourced from Scunthorpe) & a modern mill would have the capability, for instance, to roll wind turbine mast plate, presently, all imported. The surviving British heavy plate mill is Dalzell in Lanarkshire, owned by Liberty Steel & mothballed as per Scunthorpe Merchant Bar Mill: Dalzell was reported as rolling again during early 2026 to fulfill a Government order for a war ship build!

An operational suggestion to support Scunthorpe would be the use of the Speciality Steels UK (SSUK) EAF at Rotherham. SSUK was part of Liberty Steel, but it was put under

Government control during 2025 following the demise of Liberty Steel: the Government announced its intention to nationalize SSUK during September2026.

The concept of rail from EAF steel might be based on the Hayange model, an ex-steelmaking complex located in north east France: iron & steel making ceased during 1972. Travel along a public road through the site in 1995 revealed rusty blast furnaces on one side & an operational rail mill on the opposite side. In 1999, the Hayange rail mill was sold to BSC & it was closely associated with Scunthorpe Steel Works through not only ownership but as a recipient of billet feed stock from Scunthorpe. This relationship was terminated via Jingye ownership of Scunthorpe: a tribunal in Strasbourg rejected a bid by Jingye to buy the Hayange rail mill due to growing concerns about Chinese investments within Europe. The Hayange rail mill was acquired by Liberty France, part of the GFG Alliance consolidated Liberty Steel Group, & fed with blooms from Liberty Ascoval, an EAF plant in France using recycled steel, including recovered scrap rail. This created an integrated French rail business, with Ascoval, as distinct from VIRGINSTEEL, a foreseen GREENSTEEL hub. During 2021, Hayange & Ascoval were purchased by German steelmaker Stahl-Holding-Saar.

The challenges of the Scunthorpe Steel Works provides a magnifying lens to the importance of coupling sustainable & lower cost energy, stable & appropriate ownership, timely & strategic investment, & effective finished product import monitoring & control to what might be viewed as a diminishing critical national asset.

These bullet points are directly or indirectly covered within the March2026 Government Steel Strategic Plan which might be summarized as ‘Regeneration for a GREENSTEEL Industry’; included in the Plan are protectionist trade restrictions, modernization of scrap processing, relevant training regimes, appropriate region investment, refinement of energy costing, & government project preferential purchasing.

Regarding VIRGINSTEEL at Scunthorpe, cessation of site produced liquid iron by smelting ore is confirmed within the Plan as ‘end of life’ associated with the blast furnaces, with the criteria for ‘end of life’ not specified; of late, Queen Bess & Queen Anne production of liquid iron & slag had been inconsistent but now appears more settled: Queen Victoria is dormant & in need of a reline, whilst Queen Mary is defunct as elements used for spares.

The Steel Industry (Nationalisation) Act received Royal Assent during July2026 & means the country’s last two operational blast furnaces at Scunthorpe are formally under state ownership for the first time since 1988 (if warranted, Jingye will be financially compensated): the decisions on the specifics of the blast furnace futures are deferred, with ‘end of life’ criteria still to define. (The nationalisation decision was based upon the protection of thousands of jobs, supporting industry that relies on UK made steel, & helping to safeguard supply chains, major infrastructure projects, & national security. These aims are intended to be achieved by stabilizing the business & developing a commercially sustainable, low carbon future).

GREENSTEEL would be manufactured through processes designed to achieve near zero emissions via low carbon production: instead of using fossil fuel as both fuel & reducing agent, GREENSTEEL would normally be supported by hydrogen & renewable electricity infrastructures.

With ‘end of life’ promised for environmentally unfriendly blast furnaces, their replacement & infrastructure support for a technology to produce VIRGINSTEEL as GREENSTEEL at Scunthorpe is paramount: perhaps Anchor Project 2?

Alas, large European steelmakers such as AcelorMittal & Thyssenkrupp have postponed investments in low carbon projects due to economic uncertainty & reduced profit margins. Generally, European steelmakers are struggling with the high costs of transitioning to low carbon production whilst competing with heavily subsidized, carbon dioxide intensive imports, causing the British government to ponder the way forward!

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