Trent have been identified as Artifical waterbodies as a result of land drainage and navigation. For these watercourse, both the morphology and water quality issues will need to be addressed for GEP to be achieved.Table 7-3 presents the water quality assessment under the WFD for the impacted watercourses in Bassetlaw. Under the WFD, water quality should not deteriorate from the current status and where currently assessed as achieving less than GES or GEP, the aim is to improve the water quality to this status by 2015 (or 2027 where it is recognised that GES cannot be achieved by 2015). Where the waterbody is assessed as currently achieving 'high ecological status' or 'potential', future water quality should not deteriorate from this status. In terms of the impact of this on future effluent discharges in Bassetlaw as a result of the proposed development within the area, it means that water quality consents from these works, are likely to be more stringent under future consented conditions. Section 6 provides an assessment of the likely consent requirements for WwTW in 2026 under the WFD.

None of the watercourses within or bordering Bassetlaw (where assessed) are currently achieving good ecological status or potential. The elements most commonly preventing good status in all waterbodies by 2015 are phosphorus and invertebrates. It is expected that by 2015 this will still be the case with most waterbodies aiming to achieve 'good ecological status' or 'potential' by 2027. Ammonia and dissolved oxygen are generally classed as achieving 'high ecological status'.

Table 7-3: WFD Water Quality (based on information provided in the Humber River Basin Management Plan[15])

WwTW	Water Body ID (& Catchment)	Water Body Name	Designation	Current Ecological Status	Current Chemical Status	Biological	Ammonia	Dissolved Oxygen	Phosphorus
East Markham	GB104028058320 (Lower Trent & Erewash)	Tuxford Beck from Source to North Beck	×	Moderate	N/A	Moderate	Not stated	Not stated	Not stated
Elkesley	GB104028058140 (Idle & Torne)	River Poulter from Millwood Brook to River Maun	×	Moderate	N/A	Moderate	High	High	Moderate
Gamston & Retford	GB104028058091 (Idle & Torne)	River Idle from Maun/Poulter Conf to Tiln	HMWB (*Flood Protection)*	Poor	N/A	Poor	High	High	Poor
Gringley-on-the-Hill*	GB70410527 (N/A)	Chesterfield Canal, lower section	Artificial (*Navigation*)	Moderate	N/A	N/A	High	Not Stated	Poor
Harworth*	GB104028058370 (Idle & Torne)	R Torne from Source to Ruddle (Paper Mill Dyke)	HMWB (*Urbanisation*)	Moderate	N/A	Moderate	Good	High	Good
Hodsock	GB104028058190 (Idle & Torne)	Hodsoc Brook from Source to Owlands Wood Dyke	×	Moderate	N/A	Not stated	Good	High	Poor
Lound & Mattersey Thorpe	GB104028058092 (Idle & Torne)	River Idle from Tiln to River Ryton	×	Poor	N/A	Poor	High	High	Poor
Misson	GB104028058110 (Idle and Torne)	River Idle from River Ryton to River Trent	Artificial (*Land Drainage)*	Poor	Fail	Poor	High	High	Poor
Nether Langwith & Norton	GB104028058130 (Idle & Torne)	River Poulter from Source to Millwood Brook	×	Moderate	N/A	Moderate	High	High	Good
North Wheatley	GB104028058360 (Lower Trent and Erewash)	Wheatley Beck Catchment (trib of Trent)	×	Poor	N/A	Poor	High	High	Poor
Rampton	GB104028058340 (Lower Trent and Erewash)	Seymour Drain Catchment (trib of River Trent)	×	Poor	N/A	Poor	High	Moderate	Poor
Ranskill	GB104028058220 (Idle & Torne)	Ranskill Brook Catchment (trib of the River Idle)	HMWB (*Flood Protection, Urbanisation)*	Moderate	N/A	Moderate	High	Good	Good
Walkeringham & West Burton	GB104028058480 (Lower Trent and Erewash)	R Trent from Carlton-on-Trent to Laughton Drain	Artificial (*Land Drainage, Navigation*)	Poor	Good	Poor	High	High	Poor
Worksop-Manton	GB104028058101 (Idle & Torne)	River Ryton from Aniston Brook to Gibbet Hill	×	Moderate	Good	Good	Good	High	Poor

[15] Humber River Bain District River Basin Management Plan – Annex B: Objectives for Waters in the Humber River Basin District, 2009, Environment Agency. (http://wfdconsultation.environment-agency.gov.uk/wfdcms/Libraries/Humber_Consult/B%20-%20Objectives%20for%20waters.sflb?download=true)

Note: Individual physico-chemical elements are reported using environmental classes on a high, good, moderate, poor and bad scale but when used derive the overall ecological status only the three classes of high, good and moderate are used. In effect the environmental classes of poor and bad are incorporated into moderate status for this assessment.
* Not assessed but downstream watercourse assessment shown

WFD Classification Status					
High Status	Good Status	Moderate Status	Poor Status	Bad Status	N/A – Does not require assessment

7.4.1 WFD and Water Company Planning

An important consideration in the WFD planning process is the timing with respect to the statutory water company planning and funding process. At present, there is a discrepancy between the two planning timelines. The RBMPs are not due to be finalised until December 2009 and therefore the Programme of Measures which sets out what changes will need to be implemented in order to achieve 'good' status in all waterbodies, will not be known until this point. Whilst it is not just water companies which will be affected by the programme of measures, it is considered that water companies such as ST will have a key role to play in implementing the measures and helping to achieve 'good' status in time for the 2015 deadline as required by the WFD, or by 2027 as identified by the RBMP.

However, the current PR09 and AMP5 timelines are such that the water companies have already submitted their business plans, which set out the investment requirements for AMP5 (2010-2015), before the RBMPs plans are finalised. It is therefore uncertain how much of the investment required to meet with Programme of Measures can be planned for and funded in the next AMP period and that much of the investment required to meet good status will not be forthcoming until AMP6 (2015-2020).

Despite this, studies such as the WCS have a role to play in identifying likely impacts of the WFD and where future investment is most likely to be required in order to move key water bodies towards good status based on the interim risk characterisations. Use of the draft standards and draft RBMP is essential such that early decisions can be taken on where investment is most likely to be required in order to meet with the future programme of measures and attainment of 'good' status.

The RBMP and EA NEP has identified the measures provided in Table 7-4 to address current water quality related issues in the Bassetlaw Catchment.

Table 7-4: Water Industry Specific Measures to Address Water Quality Impacts from Point Sources up to 2015 (as identified in the RBMP)

Pressure	Description of the Action		
	What Will Happen?	When?	Where?
Ammonia, BOD, Phosphate	Schemes to ensure no deterioration in the current river classification as a result of discharge volumes. New consents of: • DWF – $425m^3d^{-1}$ • BOD – $10mgl^{-1}$ • Ammonia – 3 mgl^{-1} • Suspended Solids – $40mgl^{-1}$	2014	Rampton WwTW

7.5 Water Quality Summary

- Water quality within Bassetlaw has been assessed downstream of eighteen of the twenty-four WwTWs, as these are most likely to be impacted by proposed growth within the study area. The water quality has been assessed against current (historical) water quality objectives and future WFD targets,

- In general, water quality within Bassetlaw is of good quality and has complied with current water objectives over the latest EA reporting periods. However, Phosphorus levels in the majority of watercourses are often high or very high and as such are assessed as poor under the WFD meaning that improvements are required within these watercourses to reach WFD objectives of 'good ecological status' or 'potential',
- Six of the fourteen watercourses are Heavily Modified Water bodies or Artificial and are therefore required to reached 'good ecological potential' by 2015 or 2027,
- None of the watercourses are currently achieving 'good ecological status' or 'good ecological potential' under the WFD, with phosphorus and invertebrates frequently being assessed as poor. However, ammonia and dissolved oxygen are classed as 'high' in the majority of watercourses and as such, under the WFD should not deteriorate from this status under future conditions,
- A detailed water quality assessment will need to be undertaken as part of the Detailed WCS in conjunction with the wastewater treatment assessment to assess the impacts of proposed growth on downstream water quality, once the housing and employment levels and locations have been confirmed.

8 Ecology and Biodiversity

8.1 Introduction

The major issues that could have an adverse effect on the water environment that could arise due to new development are:

- Potential reductions in watercourse flow rates and levels, to such a degree that damage is caused to downstream designated sites,
- Potential downstream increase in watercourse flow rate and level, which would be most notable at low flows as a result of the potential additional wastewater volumes entering the river,
- Potential increases in nutrient load (and potentially concentration) at downstream sites, coupled with an increase in total oxidised nitrogen, potential lowering of dissolved oxygen and an increase in biological oxygen demand.

In addition to compliance with general environment legislation such as the WFD, a WCS should be compliant with the requirements of the Conservation (Natural Habitats & c) Regulations 1994 (as amended), which interprets the EU Habitats Directive into English Law.

The regulations require land use plans to take steps through a process called a Habitat Regulations Assessment (HRA) to ensure that a policy framework exists to enable their implementation without adverse effects (either alone or in combination with other plans and projects) on internationally designated wildlife sites, specifically Special Protection Areas (SPA), Special Areas of Conservation (SAC) and as a matter of United Kingdom Government Policy, sites designated under the Convention on Wetlands of International Importance 1979 (RAMSAR sites).

Since WCSs inform Core Strategies and other DPDs it is essential that the WCS takes account of the thresholds above or below which damage to international wildlife sites will occur when devising abstraction or effluent discharge solutions.

In addition to internationally designated sites, it is also important that adverse effects on nationally (SSSI) and locally (Local Nature Reserve or County Wildlife Site) designated sites and local Biodiversity Action Plan (BAP) habitats are avoided and that beneficial effects sought wherever possible.

8.2 Baseline Information

8.2.1 Internationally Designated Wildlife Sites

There are no internationally designated wildlife sites (SACs, SPAs or RAMSAR sites) within Bassetlaw. There are three such sites, Birklands and Bilhaugh SAC, Hatfield Moor SAC and Torne and Hatfield Moor SPA within 10 km of the district boundary. However, these are not hydrologically connected to any features within the district that are likely to be used for Public Water Supply to new housing, such that it can be scoped out of consideration in the WCS.

The Humber Estuary SAC, SPA and RAMSAR site lies approximately 12 km to the north of Bassetlaw. There is a clear connection between this site and development within the district since the principal receiving watercourses for treated wastewater in the district are all tributaries of the River Trent, which itself drains to the Humber Estuary. As such, impacts on this site are considered within this Section.

The Humber is the second-largest coastal plain estuary in the United Kingdom, and the largest coastal plain estuary on the east coast. It is a muddy, macro-tidal estuary, fed by the River Ouse, River Trent, River Hull, River Ancholme and River Graveney. Suspended sediment concentrations in the estuary are high and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness Coast. This is the northern most of the East Coast estuaries whose structure and function are intimately linked with soft eroding shorelines. Upstream from the Humber Bridge, the navigation channel undergoes major shifts from north to south banks, for reasons that have yet to be fully explained. This section of the estuary is also noteworthy for extensive mud and sand bars, which in places form semi-permanent islands.

The site is designated as an SAC for:

- Estuaries,
- Mudflats and sandflats not covered by seawater at low tide,
- Sandbanks which are slightly covered by sea water all the time,
- Coastal lagoons,
- *Salicornia* and other annuals colonising mud and sand,
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*),
- Embryonic shifting dunes,
- Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`),
- Fixed dunes with herbaceous vegetation (`grey dunes`),
- Dunes with *Hippophae rhamnoides*,
- Sea lamprey,
- River lamprey,
- Grey seal.

The site is also designated as an SPA for its populations of breeding hen harrier, bittern, little tern and avocet and its wintering and passage waterfowl, particularly dunlin, knot, redshank, golden plover, bar-tailed godwit, shelduck, black-tailed godwit and ruff. In addition to its habitats and birds, the Humber Estuary is also designated as a RAMSAR site for its population of natterjack toad.

8.2.2 Sites of Special Scientific Interest

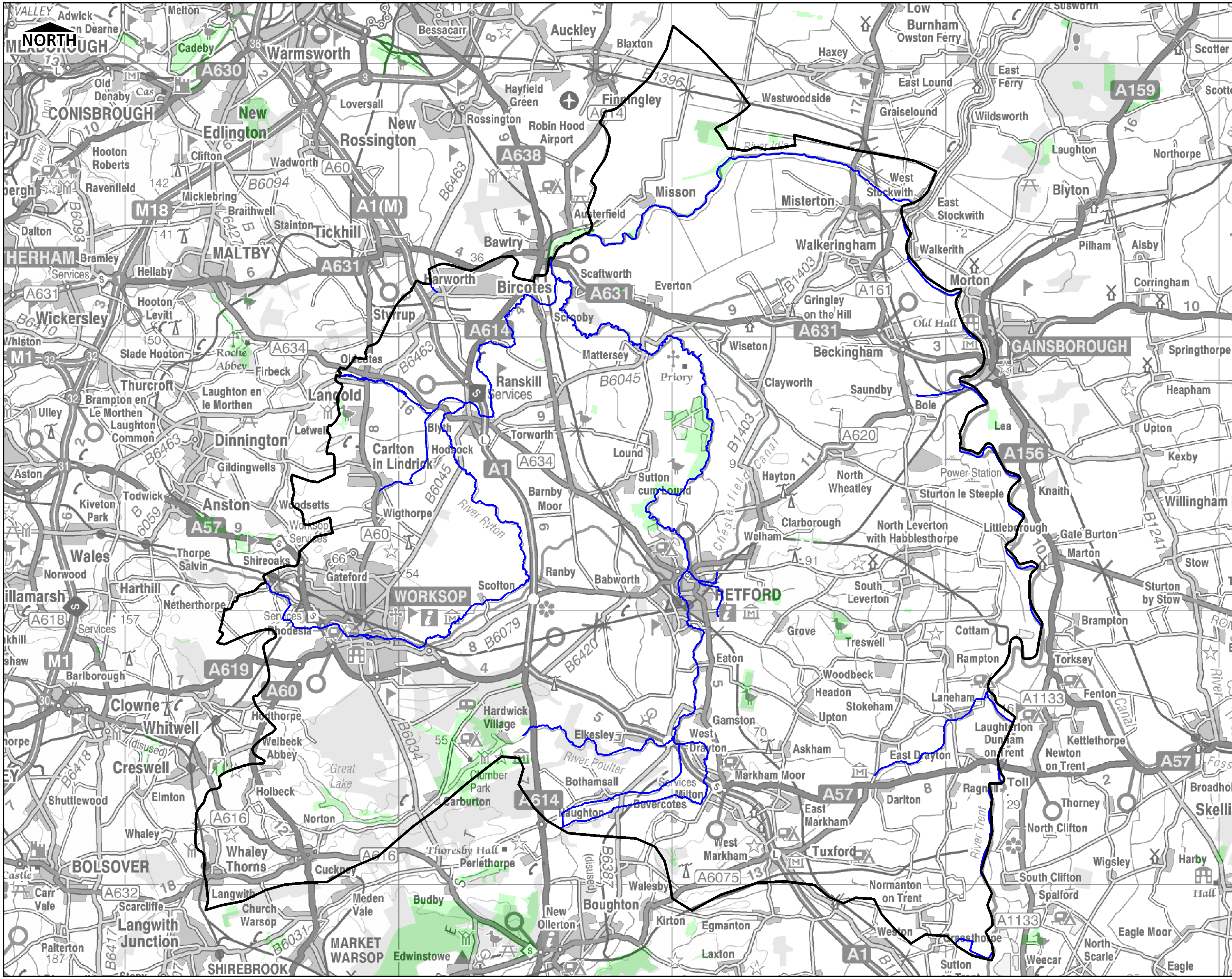
Bassetlaw contains around twenty SSSIs, including the River Idle Washlands SSSI, Clumber Park SSSI and Misson Training Area SSSI. It is important that any future development does not impact designated sites and again, this should be considered for hydrologically linked sites throughout the WCS.

The SSSIs that are potentially at risk from development and therefore require more detailed consideration in the WCS are those that are downstream of the likely development areas (primarily Worksop, Retford and Harworth / Bircotes). These were identified during the Scoping stage of this WCS as being the River Idle Washlands, Misson Line Bank and Misson Training Area SSSIs and the Sutton and Lound Gravel Pits.

Table 8-1 contains descriptions of the SSSIs noted above. Figure 8-1 shows the locations of SSSIs in Bassetlaw and its immediate environs.

Table 8-1: Water Dependent Conservation Sites in Bassetlaw

Site	Description
Misson Line Bank SSSI	Misson Line Bank contains fine examples of wetland plant communities of unusual diversity and species richness developed in association with a series of old borrow pits. In the centre of the site occur a series of water-filled borrow pits excavated from Keuper Marl. Areas of marsh at the water's edge are characterised by common spike rush *Eleocharis palustris*, grey club rush *Scirpus tabernaemontani* and soft rush *effusus* and contain such plants as tufted forget-me-not *Myosotis caespitosa*. In deeper water the marsh is replaced, locally, by reedswamp dominated by common reed *Phragmites australis*, lesser bulrush *Typha angustifolia* or bulrush T. *latifolia*. The aquatic community of larger pools contain abundant broad-leaved pondweed *Potamogeton natans*, fennel pondweed P. *pectinatus*, Canadian water weed *Elodea canadensis*, alternate water milfoil *Myriophyllum alterniflorum*, lesser marshwort *Apium inundatum*, and the liverwort.
Sutton and Lound Gravel Pits	Sutton and Lound Gravel Pits contains extensive areas of open water and margins which support an exceptionally rich assemblage of breeding wetland birds and a nationally important population of wintering gadwall. The site supports an exceptional diversity of breeding, wintering and passage birds. A series of flooded lagoons occur in association with a wide range of associated naturally-colonising habitat which includes sparsely - vegetated gravel islands and shorelines and a diverse suite of marginal vegetation communities dominated by species such as reedmace *Typha latifolia* and rushes *Juncus spp*. In places common reed *Phragmites communis* forms substantial strands. A variety of aquatic plants of interest occur within the lagoons including broad-leaved pondweed *Potamogeton natans*, fennel pondweed P. *pectinatus* and lesser bearded stonewort *Chara curta*, a charophyte with a restricted distribution across England. Around the margins of the lagoons are areas of dry open grassland, acidic scrub and wet willow-dominated woodland which add to the diversity of habitat present.



Legend

Bassetlaw Boundary

Main River

Site of Special Scientific Interest

Revision Details	By / Check	Date	Suffix

Drawing Status
FINAL

Job Title
BASSETLAW OUTLINE WATER CYCLE STUDY

Drawing Title
WATER ENVIRONMENT

Scale at A3: NOT TO SCALE

Drawn		Approved	
GC		AW	
Stage 1 Check	Stage 2 Check	Orginated	Date NOV 2010

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Drawing Number
FIGURE 8-1

8.2.3 Biodiversity Action Plan Habitats in Bassetlaw

As defined during the Scoping stage, BDC are a signatory to the Nottinghamshire BAP, which contains action plans for a range of habitats and species that require conservation action.

Bassetlaw contains a number of the priority habitats identified in the Nottinghamshire BAP. It is important that any future development does not impact priority habitats and again, this should be considered throughout the WCS. The BAP habitats located within Bassetlaw, which may be affected are:

- Lowland Heath,
- Coastal Floodplain Grazing Marsh,
- Lowland Mixed Deciduous Woodland,
- Lowland Dry Acidic Grassland,
- Wet Woodland.

8.3 Impact Screening Appraisal

8.3.1 Water Resources

As noted in Section 4 (Water Resources and Water Supply), ST and AWS have spare groundwater licence capacity available to meet the increased demands arising from the planned volume of new development within Bassetlaw. The use of spare capacity within existing licences should not raise any environmental issues requiring consideration in a Detailed WCS since the EA always assess fully licensed volumes in their Review of Consents process, irrespective of whether the current actual volume of abstraction is less than the licenced volume. As such the environmental constraints on the licenced capacity (and any need to reduce the licenced capacity) will have already been considered in the Review of Consents process and do not need to be reconsidered as part of the WCS.

8.3.2 Water Quality

Internationally Designated Sites

It is clear from Section 6 (Wastewater Treatment and Collection) and Section 7 (Water Quality) that water quality issues remain to be addressed and that either new wastewater treatment infrastructure or new / increased discharge consents are required. Increased phosphorus in the freshwater aquatic environment can result in severe eutrophication effects which in turn will allow the more sensitive and ecologically valuable species and habitats to be excluded. Excess nitrogen in the marine and estuarine environment can also lead to significant eutrophication problems.

All developments within Bassetlaw will be served by WwTW that discharge to watercourses that ultimately drain to the River Trent, which in turn drains to the Humber Estuary SAC, SPA and RAMSAR site.

Natural England's 'Regulation 33' report for the Humber Estuary notes that the Humber Estuary is hyper-nutrified with the highest levels of nitrates found in the tidal rivers and the concentrations reducing towards the mouth of the estuary as a result of dilution with seawater. It also notes that the Humber was originally designated under the UWwTD as a water body for which nutrient removal is not required as the adverse effects of nutrient enrichment were not found. The high turbidity of the estuary greatly reduces light penetration through the water column and limits the photosynthesis of algae[16].

However, much of the River Humber catchment area became a Nitrate Vulnerable Zone under the Nitrates Directive which implies that the habitats of the estuary are nutrient sensitive.

In addition, the Appropriate Assessment (AA) of the East Midlands RSS[17] states that:

> *"The majority of water quality problems on the Humber Estuary system come from industrial wastewater from the developments on the north bank of the river. Many of the contributory rivers in the Yorkshire and Humberside Region are also classed as having poor biological quality or worse (EA river water quality information) and whilst much of the Trent corridor is chemically good quality, biological quality is over much of the corridor is only 'fairly good' or worse (EA river water quality information)".*

Given this it cannot be said at this stage that significant adverse effects on the Humber Estuary SAC, SPA and RAMSAR site are unlikely when the development to be delivered at Bassetlaw is considered 'in combination' with that to be delivered in other districts whose treated effluent ultimately drains to the Humber Estuary. The cumulative increase in phosphate loading that may result from increased development in these districts renders it necessary to consider this issue further as part of the Detailed WCS.

Sites of Special Scientific Interest

Retford WwTW is one of the five works identified as potentially requiring tightening of its phosphorus consents in the context of increased housing delivery in Bassetlaw. This WwTW discharges to the River Idle and as such the potential for adverse water quality effects on the River Idle Washlands SSSI and Misson Line Banks SSSI, which lie downstream. There may also be potential for impacts on the Misson Training Area SSSI, although it may be possible to establish during the Detailed WCS that this site is not hydrologically connected to the River Idle. It is possible to screen out adverse effects on the Sutton and Lound Gravel Pits SSSI.

Biodiversity Action Plan Habitats

In addition, it will be important to ensure that any new wastewater treatment infrastructure to be delivered at Bassetlaw avoids losses to the following Nottinghamshire BAP habitats (and where possible enhances them):

- Lowland Heath,
- Coastal Floodplain Grazing Marsh,

[16] English Natures advice for the Humber Estuary European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (Interim Advice issued April 2003)
[17] Venn, O, Treweek J. 2009. Appropriate Assessment of the East Midlands Regional Plan (RSS). Report prepared for Government Office for the East Midlands by Treweek Environmental Consultants and Environ.

- Lowland Mixed Deciduous Woodland,
- Lowland Dry Acidic Grassland,
- Wet Woodland.

8.4 Conclusions

- There are no internationally designated sites in Bassetlaw,
- Water resources issues do not require further investigation since no new water resources need to be developed, or existing abstraction licensed volumes increased to provide development in Bassetlaw with potable water,
- Uncertainty remains over whether new wastewater treatment infrastructure or consented discharge volumes will need to be increased to service Bassetlaw and as such there remains some potential for adverse water quality effects on the Humber Estuary SAC, SPA and RAMSAR,
- There is also potential for adverse water quality effects on the River Idle Washlands SSSI, Misson Line Banks SSSI and possibly the Misson Training Area SSSI as a result of treated effluent discharge from Retford WwTW,
- These issues therefore require further investigation in the Detailed WCS.

9 Summary and Recommendations

9.1 Overview

The Outline WCS has identified the existing capacity of the current water environment and water cycle infrastructure and has used this assessment to determine where additional investment is required to supply new infrastructure or protect the water environment. The conclusions of each assessment are presented in Table 9-1 to give a visual assessment of issues pertaining to each development area in Bassetlaw. In addition, a summary of main constraints and issues that need to be addressed are discussed.

Table 9-1: Water Cycle Development Issue Summary

Potential Growth Area	Dwellings (and employment land)	Wastewater		Water Resource	Water Quality and Environment
		WwTW Volumetric & Process Capacity	Network Capacity		
Beckingham	60	G	O	G	G
Blyth	60	O	G	G	G
Carlton-in-Lindrick	300	O	O	G	O
Clarborough Hayton	60	G	O	G	G
Cuckney	60	O	G	G	G
Dunham	60	O	G	G	G
East Markham	60	G	G	G	G
Elkesley	60	G	G	G	G
Everton	60	G	G	G	G
Gamston	60	O	G	G	G
Gringley-on-the-Hill	60	G	G	G	G
Harworth/Bircotes	1,750 (28 Ha)	O	O	G	G
Langold	60	O	G	G	G
Lound	60	O	O	G	G
Mattersey	60	G	G	G	G
Misson	60	G	G	G	G
Misterton	250	G	O	G	G
Nether Langwith	60	G	G	G	G
North Leverton	60	G	G	G	G
North/South Wheatley	60	O	O	G	G
Rampton	60	O	O	G	G
Ranskill	60	G	G	G	G
Retford	1,500 (16 Ha)	O	O	G	O
Sutton (Cum Lound)	60	O	O	G	G
Sturton-le-Steeple	60	G	G	G	G
Tuxford	250	G	G	G	G
Walkeringham	60	G	G	G	G
Worksop	2,000 (36 Ha)	O	G	G	O

Key

G	Spare capacity, minimum investment required, minimal issues.
O	Strategic scale mitigation or water cycle infrastructure will be required.
R	Major investment required / major limitation.

9.1.1 Water Resources and Supply

- Virtually all the water supplies for Bassetlaw come from groundwater sources,
- In general, the CAMS document for the area shows a mixed picture, the River Idle is classified as being 'Over-abstracted', whilst the River Poulter has 'No Water Available',
- The EA have assessed Bassetlaw as lying partly within an area of serious water stress (in the east of the district) and an area of moderate water stress (in the west of the district),
- Bassetlaw is served by two water companies, ST and AWS. According Statement of Response published in March 2009, both companies are in surplus i.e. resources exceed demands. In the case of ST, this is position through to the end of planning period in 2035. In the case of AWS, the EA has reported that the supply zones within Bassetlaw are not forecast to have any supply/demand deficits throughout the planning period up to 2035,
- ST and AWS have both assumed the growth contained within the East Midlands RSS and East of England RSS respectively. The latest growth figures provided by BDC for new homes are slightly above those contained within these two RSSs,
- Under the latest growth figures for Bassetlaw and based on Water Company consumption figures (Scenario 1), the total residential water demand for Bassetlaw up to 2026 would be 1.41 Mld^{-1}. Broken down into the main development areas, then the demands are highest in Worksop (0.62 Mld^{-1}), followed by Harworth / Bircotes (0.48 Mld^{-1}) and Retford (0.33 Mld^{-1}),
- Using the Code for Sustainable Homes estimates of water consumption, the total residential water demands would vary from 1.04 Mld^{-1} (Scenario 4 – CSH Level 5/6, 80 $lh^{-1}d^{-1}$) to 1.56 Mld^{-1} (Scenario 2 – CSH Level 1/2, 120 $lh^{-1}d^{-1}$) by 2026,
- Both ST and AWS recognise the importance of water efficiency in managing the future growth in demand within Bassetlaw. Leakage control will continue to play an important part, although it has to be recognised that maintaining leakage at existing levels with an increasing network will require a significant commitment from both water companies,
- Both ST and AWS currently hold a large number of groundwater licences locally and it is likely that there will be sufficient spare licence capacity available on these licences in order to meet these extra demands required up to 2026 within Bassetlaw. An initial assessment of where the main development may obtain their extra water has been made as part of this Outline WCS. Further work will be required at the detailed stage of this WCS to fully asses the constraints within the mains water supply network and at the water treatment works,

- Other potential risks to water supplies within Bassetlaw include; deteriorating groundwater quality within aquifers, the effects of climate change on both water resources and demands, water supply resilience issues and the EAs Review of Consent process which may reduce licensed abstractions,

- Once both ST and AWS have published their final WRMPs, the details contained within these plans should be incorporated into the Detailed WCS for Bassetlaw.

9.1.2 Flood Risk and Drainage

- Surface Water Management is a key consideration when assessing development within large areas. PPS25 requires that new development does not increase the risk of flooding elsewhere by managing surface water runoff generated as a result developing land. Altering large areas of land by urbanising it fundamentally alters the way in which rainfall drains to watercourses and has the potential to increase the rate and amount of water that enters watercourses causing an increase in flood risk. In many cases, the management of surface water is achieved via a requirement to restrict runoff from developed sites to that which occurs from the pre-development site usage and this is achieved by incorporating a range of SUDS which aim to maximise the amount of rainwater which is returned to the ground (infiltration) and then to hold back (attenuate) excess surface water. Incorporating SUDS often requires a large amount of space and for large developments often requires the consideration of large scale strategic features such as balancing ponds which can attenuate and store large volumes of water generated during very heavy rainstorms to prevent flood risk downstream,

- The management of surface water has the potential to act as a constraint to development within Bassetlaw, not just because of space requirements, but because the reduction in runoff rates and volumes is likely to be onerous, linked with permeability and groundwater related issues. Additionally, several of the smaller watercourses, ditches and drains in Bassetlaw are identified as low-flow channels with no additional capacity to accept surface water runoff and will require attenuation of surface water generated by new development,

- These issues will require further consideration once site masterplans become available and should potentially be considered in the development of DPDs, AAPs or as part of site specific FRAs.

9.1.3 Wastewater Treatment and Collection

- There are twenty-four WwTWs located within the study area. Eighteen of these works have been identified as potentially being impacted by proposed development within the study area and have therefore been assessed as part of the Outline WCS,

- The wastewater network assessment showed that there is a good coverage of existing sewers across towns and villages identified for growth up to 2026 and that this should facilitate new connections to the existing network. However, detailed modelling will need to be undertaken to assess the capacity in the network especially for Harworth/Bircotes, Retford and Worksop where substantial housing growth is planned and for growth areas located upstream of small networks i.e. in some of the smaller villages; for small development sites it is recommended that this is undertaken through a pre-development enquiry by the developer,

- Where possible, it is recommended that housing and employment growth should be located at the downstream end of the wastewater network serving the town or village, thereby minimising the need to upgrade the existing network upstream and allowing connections to the larger pipes discharging to the WwTW,

- The existing sewer network has been used to identify the volume of proposed development that is likely to be served by each of the WwTWs and this has been used to calculate the future wastewater flows to be treated at the works and therefore future capacity,

- Two of the assessed WwTWs (North Wheatley and Rampton) are already exceeding their volumetric consents and therefore have no capacity to treat further flows from new development in areas that are served by these works unless they apply for, and are granted an increase to their flow consent by the EA. Worksop-Manton is currently exceeding its volumetric consent but ST have indicated that it has capacity to accommodate an additional 570 dwellings, but with 2,000 dwellings (plus employment growth) planned for the area this capacity will be exceeded under future growth conditions. Subsequent upgrades to the three works may be required to treat the additional flow, but ST have confirmed that should additional capacity be required, they do not envisage any physical constraints that would prevent this capacity provision. The upgrades are likely to take 2-3 years to provide, and would only be initiated once planned development proposals have been provided by BDC,

- Under future growth conditions Gamston, Harworth and Norton WwTW are also likely to exceed their existing flow consents by 24%, 10% and 24% respectively as a result of proposed growth in Gamston, Harworth/Bircotes and Cuckney. Gamston has capacity to accommodate 20 of the proposed 60 dwellings, whilst Harworth has capacity to accommodate 620 of the proposed 1,750 dwellings (and 2,718 jobs),

- Though capacity calculations for Retford WwTW indicate that there is sufficient spare hydraulic capacity to accommodate the proposed growth there are concerns relating to the capacity of the Biological Filters. Further process analysis will be required to confirm actual capacity but should additional capacity be required ST do not envisage any physical constraints that would prevent additional capacity being provided,

- ST have indicated that there are marginal concerns over future quality performance at Harworth WwTW as a result of proposed growth, and additional treatment capacity is likely to be required at the works and as such, is likely to take 2-3 years to provide. However, this would only be initiated once planned development proposals have been provided by BDC. It should be noted however that ST do not envisage any issues with the provision of additional treatment capacity (subject to a revised discharge consent being agreed with the EA),

- ST have also indicated that there are marginal concerns over future quality performance at Hodsock WwTW as a result of proposed growth in Blyth, Carlton-in-Lindrick and Langold, with the current sizing of biological filters indicating that there could be stress from a load perspective. However, due to the relatively small volume of growth planned for this works, ST do not envisage any issues in dealing with future growth demand at Hodsock WwTW,

- ST have indicated that should additional treatment capacity be required for other smaller works in the catchment, they do not envisage any physical constraints that would prevent additional capacity being provided,
- WwTW quality consents are likely to require tightening under the WFD and as a result of the proposed growth within the area to comply with WFD standards. Under the WFD the majority of receiving watercourses are already achieving 'high ecological status' or 'potential' for Ammonia and BOD, and as such, future discharges will need to ensure there is no deterioration from this status,
- The five largest works of Harworth, Hodsock, Langwith, Retford and Worksop already have phosphorus consents of $2mgl^{-1}$ in place under the UWwTD, but due to the current 'poor' status of phosphorus levels in the receiving watercourses, it is likely that these will require further tightening under future conditions (irrespective of growth) to comply with WFD standards,
- In terms of addressing growth specifically, Haworth WwTW will exceed its current flow consent as a result of growth and will require tightening of the quality consents in order to comply with WFD standards; however the consents required are within BAT and hence theoretically achievable,
- Three other works, namely North Wheatley, Rampton and Worksop will also exceed their flow consent with growth; however this is already the case with current population wastewater flows. Tightening is likely to be required to address the current flow and future flow capacity issues, but modelling has shown the consents required are within BAT and hence theoretically achievable,
- Worksop WwTW, which treats the largest volume of effluent in Bassetlaw and will receive the largest increase in wastewater as a result of growth in the study area, is likely to be the most constrained in terms of treating wastewater from future growth. It is already exceeding its flow consent and discharges to a smaller watercourse than the other larger works in the area. As such there is less dilution available for the effluent discharge in the receiving watercourse,
- Further modelling of the required future water consents may be required as part of the Detailed WCS, in conjunction with the EA and ST, to ensure that future discharges, particularly from the three largest works of Harworth, Retford and Worksop, are compliant with downstream WFD standards.

9.1.4 Water Quality

- Water quality within Bassetlaw has been assessed downstream of eighteen of the twenty-four WwTWs, as these are most likely to be impacted by proposed growth within the study area. The water quality has been assessed against current (historical) water quality objectives and future WFD targets,

- In general, water quality within Bassetlaw is of good quality and has complied with current water objectives over the latest EA reporting periods. However, Phosphorus levels in the majority of watercourses are often high or very high and as such are assessed as poor under the WFD meaning that improvements are required within these watercourses to reach WFD objectives of 'good ecological status' or 'potential',

- Six of the fourteen watercourses are Heavily Modified Water bodies or Artificial and are therefore required to reached 'good ecological potential' by 2015 or 2027,

- None of the watercourses are currently achieving 'good ecological status' or 'good ecological potential' under the WFD, with phosphorus and invertebrates frequently being assessed as poor. However, ammonia and dissolved oxygen are classed as 'high' in the majority of watercourses and as such, under the WFD should not deteriorate from this status under future conditions,

- A detailed water quality assessment will need to be undertaken as part of the Detailed WCS in conjunction with the wastewater treatment assessment to assess the impacts of proposed growth on downstream water quality, once the housing and employment levels and locations have been confirmed.

9.1.5 Ecology and Biodiversity

- Water resource issues relating to ecology and biodiversity do not require further investigation as no new water resources need to be developed,

- Uncertainty remains over whether new wastewater treatment infrastructure or consented discharge volumes will need to be increased to service Bassetlaw and as such there remains some potential for adverse water quality effects on the Humber Estuary SAC, SPA and RAMSAR,

- There is also potential for adverse water quality effects on the River Idle Washlands SSSI, Misson Line Banks SSSI and possibly the Misson Training Area SSSI as a result of treated effluent discharge from Retford WwTW,

- These issues therefore require further investigation in the Detailed WCS.

10 Policy, Developer Guidance and Funding

10.1 Introduction

It is intended that the completed Bassetlaw WCS will produce an overall strategy that each of the key stakeholders can sign up to. This will aid in the process of delivering development in the Bassetlaw and local environs by helping to ensure that objections to proposed development on the grounds of water issues such as flood risk and abstraction are minimised. A completed WCS that is agreed by BDC, ST, AWS, NE and the EA will aid developers in understanding the requirements they need to meet in order to comply with the WCS recommendations. It will also set the framework for funding water infrastructure requirements in the future.

In order to achieve this, the Bassetlaw WCS should aim to produce the following:

- Guidance on planning policy with respect to development and the water cycle that the council can use to input into the LDF, and guidance on incorporating the WCS findings into the Development and Flood Risk SPD,
- Guidance for developers in terms of actions to achieve compliance with the overall WCS. This will be in the form of a Developer Checklist and it is envisaged that this will eventually be a document, which if its criterion are all met for a proposed development, will help to ensure no objection from the EA or LPA on the grounds of water cycle issues. This type of checklist document has been successfully developed for other WCS such as the inaugural WCS completed for Corby. Consideration should also be given to the checklist drawn up in the SFRA,
- Agreement on funding mechanisms, particularly for strategic, development wide infrastructure required i.e. strategic scale and integrated surface water attenuation schemes, maintenance and responsibility,
- Planning timelines for provision of water infrastructure against growth to aid both ST and AWS in planning for future water and wastewater infrastructure,
- To provide justification for ST and AWS in seeking funding through the AMP process for the required infrastructure,
- Highlight the need for a strategic approach to surface water management e.g. continued development of SWMPs across whole areas rather than from individual developments.

10.2 Developer Checklist

The overall intention is that all developers would be asked to use the Water Cycle Developer Checklist as part of the planning application process and to submit a completed version with their planning applications. The EA is a statutory consultee with regards to flood risk and the water environment and as such, will need to sign up to the Checklist as will BDC. The checklist provided in this Outline WCS (Appendix H – Developer Checklist) has been developed from examples used in previous WCS as well as the EAs national standard checklist available on their website.

10.3 Funding and Cost Apportionment Mechanisms

In terms of the overall funding mechanism, it is important to consider that the Government has laid down strict rules on how water companies are funded, especially with regard to domestic development, and the industry's economic regulator (OFWAT), regulates this process. Water Companies have the responsibility for providing wastewater treatment and water supply costs to OFWAT (both of these costs in the case of ST and water only costs in the case of AWS) and they are funded through charges to customers within respective operating areas through the Periodic Review process and AMP process. In general, WCS have not considered the apportionment of developer contributions towards strategic water supply and wastewater facilities.

Therefore, developer contributions may relate to strategic scale flood management infrastructure (including surface water attenuation).

This Outline WCS report introduces the various policy, funding and developer requirement elements to the Bassetlaw WCS, but it is envisaged that these will be developed further in any Detailed WCS, should such a study be necessary.

The Outline WCS has highlighted that there is a need for expenditure on new infrastructure in the following areas:

- Wastewater treatment and sewerage,
- Large scale surface water management schemes,
- Smaller, site specific surface water management.

Although the options for providing the additional infrastructure will be developed further in any future Detailed Study, it is important to consider funding at a strategic level now to inform the development of the Detailed WCS.

10.3.1 Stakeholder Participation

Sometimes other WCSs have invited property developers to the stakeholder group to provide an input into the direction of the study. It is important to ensure that all developers involved are represented so as to avoid giving any unfair advantage to any one group of developers. In so doing, the developers who are involved would be best placed to undertake the recommendations from the WCS and ensure that these are incorporated into the design of the developments.

10.3.2 Infrastructure Funding

Developers may also contribute to the capital works of infrastructure required within the WCS, although in general this would not apply to wastewater or water supply infrastructure as this is regulated by the Water

Companies through OFWAT. It would, however, include contributions for funding large scale flood risk mitigation measures, with particular emphasis on large scale surface water attenuation storage scheme for development in and around Bassetlaw.

10.3.3 Minimisation of Cost

Despite this, developers can at least contribute to minimising the capital cost of water infrastructure. It can be seen from the assessment of future demands (see Table 4.3 in section 4.5.2.1) existing infrastructure that a key variable is water consumption per capita. To a large extent developers are being encouraged to do this through initiatives such as the Code for Sustainable Homes and the amendments to the Building Regulations. Both of these now strongly promote technologies such as grey water recycling, designing developments with less impermeable surfaces, specifying higher quality materials for pipework etc.

Other examples include:

- If the percentage return to sewer can be reduced from 90% to 75%, the number of additional properties that can be accommodated per 1 $m3d^{-1}$ headroom at an existing WwTW is 0.8,
- Higher quality pipes could reduce the infiltration of groundwater into drains thereby increasing the number of houses that could potentially be served by a given WwTW.

10.3.4 Water Resource Provision – Manufacturing Sector

From December 2005, non-household customers who are likely to be supplied with at least 50 million litres of water per year at their premises are now able to benefit from a new Water Supply Licensing mechanism. If eligible, they may be able to choose their water supplier from a range of new companies entering the market. The Water Supply Licensing mechanism enables new companies to supply water, once OFWAT has granted them a licence. These companies can compete in two ways:

- By developing their own water source and using the supply networks of appointed water companies (such as ST and AWS) to supply water to customers' premises. This would be carried out under the combined water supply licence,
- By buying water 'wholesale' from appointed water companies (such as ST and AWS) and selling it on to customers. This is done under a retail water supply licence.

These are potential options for the manufacturing sector to be provided with these services in Bassetlaw.

10.3.5 Cost Apportionment Mechanism

The Outline WCS has considered that surface water attenuation will be required in order for new development to comply with PPS25. Developers could contribute towards the cost for provision of this on a strategic level. In addition, there are potential options for developer contribution towards strategic sewerage infrastructure provision. Dependent on the options taken forward in the detailed study, a potential charge could be made to developers through the Section 106 mechanism with BDC setting up a fund to receive Developers' contributions and to use them to fund works.

Research for the Corby WCS has identified that there is a legal requirement for such contributions to be made on the basis of commensurate impact of each development, for instance according to its location in the catchment. This mechanism has already been applied successfully in Corby, whereby contributions have been agreed via Section 106 agreements for two key developments; this is an important precedent.

11 Progression of Water Cycle Study

11.1 Introduction

Through completing this Outline WCS, the following issues have been determined which consider further detailed consideration. The Outline WCS forms part of the infrastructure work undertaken to help inform the production of the Core Strategy.

11.1.1 Water Resources

- Review of ST and AWS final Water Resources Management Plans,
- Detailed assessment of constraints to development within the water supply network,
- Detailed review of WTW Capacities.

11.1.2 Flood Risk and Drainage

- Determination of pre-development surface water runoff,
- Determination of requirements for surface water management,
- Detailed assessment of suitable SUDS techniques (on an area by area basis).

11.1.3 Wastewater

- Wastewater network modelling for Harworth-Bircotes, Retford and Worksop (and potentially some smaller settlements),
- Review of wastewater capacity calculations,
- Detailed discussions with the EA, ST and AWS to determine the likelihood of DWF consents being extended,
- Detailed discussions with ST and AWS to determine the likelihood and feasibility of WwTW extensions.

11.1.4 Water Quality

- Detailed water quality assessment to fully assess impacts of growth.

11.1.5 Ecology and Biodiversity

- Detailed consideration of impacts of growth on water quality and wastewater volumes in relation to SSSIs and Humber Estuary SAC, SPA and RAMSAR.

References

- Water Cycle Study Guidance, Environment Agency (2009)
- East Midlands Regional Plan, Communities and Local Government (2009)
- Statement of Response to Draft Water Resources Management Plan, Severn Trent Water (2009)
- Statement of Response to Draft Water Resources Management Plan, Anglian Water Services (2009)
- Draft Employment Land Capacity Study, Nathaniel Lichfield and Partners (2009)
- Draft Strategic Housing Land Availability Assessment, Bassetlaw District Council (2009)
- Core Strategy Issues and Options Consultation Document, Bassetlaw District Council (2009)
- Strategic Flood Risk Assessment, JBA Consulting (2009)
- Future Development Scoping Study for Harworth Bircotes, Nathaniel Lichfield and Partners (2009)
- Idle and Torne Catchment Abstraction Management Strategy, Environment Agency (2009)
- Draft Humber River Basin Management Plan, Environment Agency (2009)
- Draft Water Resources Management Plan, Severn Trent Water (2008)
- Draft Water Resources Management Plan, Anglian Water Services (2008)
- Representation on Severn Trent Water Draft Water Resources Management Plan, Environment Agency (2008)
- Representation on Anglian Water Services Draft Water Resources Management Plan, Environment Agency (2008)
- Annual Monitoring Report, Bassetlaw District Council (2009)
- Planning Policy Statement 25 ‘Development and Flood Risk’, Communities and Local Government (2006)
- The SUDS Manual, CIRIA (2007)
- FD2320 – Flood Risk Assessment Guidance for New Development, Environment Agency/DEFRA (2006)

Appendix A – Bassetlaw Employment Growth Calculations

Employment Growth

No. New Dwellings	6,042
Occupancy Rate (OR)	2.1
Estimated New Population (New Dwellings x OR)	12,688
Current Working population (% aged between 18 and 65)	61.2%
Estimated New 'Working' Population	7,765
Jobs per hectare ratio (New working pop x total emp area)	97
Commercial Job Consumption (l/h/d)	0.028

Age Structure	Bassetlaw (AMR, 2009)
Under 16	19.9%
16-17	2.6%
18-24	6.8%
25-44	28.3%
45-64	26.1%
65+	16.2%

Employment Land Distribution

Total Employment Development (ha) 80

Area	%	Total (ha)	No. Jobs	Wastewater (l/d)	WwTW
Worksop	45%	36.0	3,494	98	Worksop
Harworth	35%	28.0	2,718	76	Harworth
Retford	20%	16.0	1,553	43	Retford
	100%	**80.0**	**7,765**	**217**	

Appendix C – Severn Trent Wastewater Treatment Assessment

Bassetlaw DC Outline Water Cycle Study (Revised Growth Projections)

Potential impact of proposed developments on sewage treatment works
Original assessment made 29 January 2010. Revised 14 September 2010 following revised growth projections.

General comment regarding treatment capacity:
Whilst sewage treatment works may not have sufficient spare capacity to accept the levels of development being proposed in its catchment area this does not necessarily mean that development cannot take place. Under Section 94 of the Water Industry Act 1991 sewerage undertakers have an obligation to provide additional treatment capacity as and when required. Where necessary we will discuss any discharge consent implications with the Environment Agency. If there are specific issues which may prevent or delay the provision on additional capacity these have been highlighted below.

Sewage Treatment Works Name	OS Grid Ref		Current PE	Current / observed dry weather flow (m3/d)	Estimated spare hydraulic capacity		Current treatment process	Current quality performance (RAG)	Future quality issues (RAG)	Physical constraints regarding provision of additional treatment capacity (RAG)	Potential Revised Growth Projections
	Eastings	Northings			PE	Dwellings (@ 2.4hd/dwelling)					
East Markham	475300	372500	3683	961	1244	520	Re-Circulating Filtration	Marginal	None expected to be an issue	No land or other constraints preventing expansion	310 dwellings
Elkesley	468172	375068	914	126	775	320	RBC Treatment (Integral)	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings
Harworth	461100	392100	8468	1517	1480	620	Re-Circulating Filtration	Marginal	Marginal concern	No land or other constraints preventing expansion	1750 dwellings & 28Ha employment
Hodstock	459600	386200	8887	1991	1044	440	Re-Circulating Filtration	Marginal	Marginal concern	No land or other constraints preventing expansion	420 dwellings
Misson	469404	395250	590	95	413	170	Act Sludge - Mechanical	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings
Nether Langwith	454500	370200	2930	623	2356	980	Re-Circulating Filtration	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings
North Wheatley	476843	385843	530	124	See comments	See comments	Single Filtration	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings
Rampton	480200	377800	1906	388	See comments	See comments	Oxidation Ditch Treatment	Good	None expected to be an issue	No land or other constraints preventing expansion	120 dwellings
Retford	469700	382800	25618	4945	See comments	See comments	Re-Circulating Filtration	Good	None expected to be an issue	No land or other constraints preventing expansion	1560 dwellings & 16Ha employment

Sewage Treatment Works Name	Any other comments	Receiving Watercourse	River Catchment	Current Consent Information							
				Consent Reference	FFT	DWF (m3/d)	Amm (Summer)	Amm (Winter)	BOD (mg/l)	SS (mg/l)	P
East Markham	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is likely to be sufficient hydraulic capacity to accommodate 310 dwellings in the catchment. Should additional treatment capacity be required we do not envisage any issues in dealing with future growth demand.	Tuxford Beck	Lower Trent & Erewash	T/69/45785/R	2,782	1160	10		20	30	
Elkesley	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is likely to be sufficient hydraulic capacity to accommodate an additional 60 dwellings in the catchment. Should additional treatment capacity be required we do not envisage any issues in dealing with future growth demand.	River Poulter	Idle & Torne	T/73/45969/R	1,080	250	15		25	45	
Harworth	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is limited hydraulic capacity and additional treatment capacity will be required to accommodate the levels of development being proposed in Harworth. Provision of additional capacity is likely to take 2-3 years to provide but this would only be initiated once planned development proposals have been confirmed by Bassetlaw DC. Notwithstanding this we do not envisage any issues with the provision of additional treatment capacity (subject to a revised discharge consent being agreed with the Environment Agency).	Trib River Torne	Idle & Torne	T/83/45790/R	4,778	2050	10		25	45	
Hodstock	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is some hydraulic capacity at this site, however the current sizing biological filters indicated there could be stress from a load perspective. Based on the revised growth projections for Carlton-in-Lindrick and Langold it is marginal whether there is sufficient spare headroom to accommodate an additional 420 dwellings without provision of additional treatment capacity. Should additional capacity be required we do not envisage any physical constraints that would prevent additional capacity being provided.	Langold Stream	Idle & Torne	T/76/45601/R	5,478	2158	5		15	40	2
Misson	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is hydraulic capacity at this site to accommodate an additional 60 dwellings.	River Idle	Idle & Torne	T/78/45502/R		161			25	45	
Nether Langwith	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is significant hydraulic capacity at this site. An additional 60 dwellings proposed in this catchment is not envisaged to be an issue	River Poulter	Idle & Torne	T/73/45847/R	2,203	1000	5	10	25	45	2
North Wheatley	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is no spare hydraulic capacity at this site. However asset sizing data indicates there is capacity within the secondary treatment process but capacity improvements may be required to other processes. Should additional capacity be required to accommodate an additional 60 dwellings we do not envisage any physical constraints that would prevent additional capacity being provided.	Wheatley Beck	Lower Trent & Erewash	T/69/45707/R		120	10		20	40	
Rampton	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is no spare hydraulic capacity at this site. To accommodate an additional flows from a further 120 dwellings a revised discharge consent will need to be obtained from the Environment Agency but should additional treatment capacity be required to meet tighter quality parameters it is not envisaged that there are any physical constraints that would prevent additional capacity being provided.	Seymour Drain	Lower Trent & Erewash	T/69/45500/R		345	10		25	40	
Retford	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is sufficient spare hydraulic capacity to accommodate the revised growth projections of 1560 dwellings and 16Ha of employment, however there are concerns relating to the capacity of the Biological Filters. Further process analysis will be required to confirm actual capacity but should additional capacity be required we do not envisage any physical constraints that would prevent additional capacity being provided.	River Idle	Idle & Torne	T/74/46203/R	15,898	6593	10	15	30	50	2

Sewage Treatment Works Name	OS Grid Ref		Current PE	Current / observed dry weather flow (m3/d)	Estimated spare hydraulic capacity		Current treatment process	Current quality performance (RAG)	Future quality issues (RAG)	Physical constraints regarding provision of additional treatment capacity (RAG)	Potential Revised Growth Projections	Any other comments	Receiving Watercourse	River Catchment	Current Consent Information							
	Eastings	Northings			PE	Dwellings (@ 2.4hd/dwelling)									Consent Reference	FFT	DWF (m3/d)	Amm (Summer)	Amm (Winter)	BOD (mg/l)	SS (mg/l)	P
Walkeringham	477700	393000	4464	1503	2727	1140	Single Filtration	Marginal	None expected to be an issue	No land or other constraints preventing expansion	370 dwellings	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is significant hydraulic capacity at this site to accommodate the revised growth projections of 370 dwellings. Further process analysis will be required to confirm actual capacity but should additional capacity be required we do not envisage any physical constraints that would prevent additional capacity being provided.	River Trent	Lower Trent & Erewash	T/69/45814/R	5,270	2090	15		25	45	
West Burton	480443	386423	2006	375	1294	540	Single Filtration	Marginal	None expected to be an issue	No land or other constraints preventing expansion	120 dwellings	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is significant hydraulic capacity at this site to accommodate the revised growth projections of 120 dwellings. Further process analysis will be required to confirm actual capacity but should additional capacity be required we do not envisage any physical constraints that would prevent additional capacity being provided.	River Trent	Lower Trent & Erewash	T/69/45540/R		582			25	45	
Worksop-Manton	461200	379200	57794	11783	1356	570	Single Filtration	Marginal	None expected to be an issue	No land or other constraints preventing expansion	2000 dwellings & 36Ha employment	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is limited spare hydraulic capacity at this site. Notwithstanding this we do not envisage any physical constraints that would prevent additional capacity being provided to meet future development being proposed in Worksop. Provision of additional capacity is likely to take 2-3 years to provide but this would only be initiated once planned development proposals have been confirmed by Bassetlaw DC.	River Ryton	Idle & Torne	T/75/45222/R	32,227	10227	3		15	30	2
Gamston	470900	376400	229	52	50	20	RBC Treatment (Integral)	Marginal	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings	This is a small rural sewage treatment works where the provision of an additional 60 dwellings (equivilant to around 144PE based on 2.4 people per dwelling) would represent a significant increase in current flows. Consequently the works is likely to required complete replacement although at present we do not envisage any physical constraints that would prevent additional capacity being provided	River Idle by pass stream		T/74/45570/R		60			25	45	
Gringley-on-the-Hill	473400	391600	1007	181	281	120	RBC Treatment (Integral)	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings	This is a small rural sewage treatment works buy comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is hydraulic capacity at this site to accommodate an additional 60 dwellings.	Trib Of Chestfld.canal		T/78/45644/R		226	10		20	40	
Lound	469400	386700	1328	206	74	30	Single Filtration	Good	None expected to be an issue	No land or other constraints preventing expansion	120 dwellings	This is a small rural sewage treatment works where the provision of an additional 120 dwellings (equivilant to around 288PE based on 2.4 people per dwelling) would represent a large increase in current flows. Consequently the works is likely to required upsizing/replacement in order to accommdate the additional flows although at present we do not envisage any physical constraints that would prevent additional capacity being provided	Unnamed Trib Of River Idle		T/74/45708/R		325			60	70	
Mattersey Thorpe	467500	390200	6183	1114	3231	1350	Re-Circulating Filtration	Marginal	None expected to be an issue	No land or other constraints preventing expansion	120 dwellings	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is significant hydraulic capacity at this site. An additional 120 dwellings proposed in this catchment is not envisaged to be an issue	River Idle		T/74/45568/R	4,597	1631			25	45	
Norton	457370	371663	304	92	0	0	RBC Treatment (Integral)	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings	This is a small rural sewage treatment works where the provision of an additional 60 dwellings (equivilant to around 144PE based on 2.4 people per dwelling) would represent a significant increase in current flows. Consequently the works is likely to required complete replacement although at present we do not envisage any physical constraints that would prevent additional capacity being provided	River Poulter		T/73/45542/R	447	92	15		25	45	
Ranskill	466800	387900	1469	187	1069	450	RBC Treatment (Integral)	Good	None expected to be an issue	No land or other constraints preventing expansion	60 dwellings	Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is significant hydraulic capacity at this site. An additional 60 dwellings proposed in this catchment is not envisaged to be an issue	Trib Ranskill Brook		T/77/45889/R	1,011	358	10		30	50	

Appendix D – Wastewater Volumetric Consent Assessment

Calculations

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	WWTW Volumetric Capacity Assessment	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Purpose of Calculation
To undertake an assessment of the volumetric capacity of wastewater treatment works (WwTW) in the Bassetlaw WCS Study Area and calculate available headroom.

Method of Calculation
Spreadsheet

Source/Reference Documents Used
ST WwTW Details (DWF for Bassetlaw.xls) provided 15-09-2010
OFWAT Security of Supply Rpt 2006-2007

Key Parameters Used
Dry Weather Flow (DWF)
Flow to Full Treatment (FtFT)
Measured Dry Weather Flow (mDWF) - used for Attleborough, Dereham and Watton in place of current Calculated DWF
Current Population Served by WWTW (P)
Current Trade Flow Treated at WWTW (E)
Per Capita Water Demand (G)
Infiltration (I)
Property Occupancy Ratio (OR)

Calculated DWF = PG+I+E
where: PG=Pd*Gd+Ph*Gh
I=25%PG
E=trade flows m3/d
where: Pd=domestic poluation
Ph=holiday poluation
Gd=domestic per capita consumption (144 l/h/d)
Gh=holiday per capita consumption (55 l/h/d)
Gc=commercial per capita consumption (28 l/h/d)

Calculated FtFT = 3PG+I+3E

The Occupancy Rate (OR) is 2.4
The commercial employment per capita consumption (Gc) is 28 l/h/d
The future domestic per capita consumption (Gf) is 137 l/h/d

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Calculations

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	East Markham WWTW Volumetric Capacity Assessment	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Site Name: East Markham
Receiving Watercourse: Tuxford Beck
Grid Reference: 475300,372500
Consent Reference: T/69/45785/R

Base Data - Provided by ST (October 2010)			
Total PE		3,683	PE
Domestic PE	Pd	3,683	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	1,160	m3/d
Flow to Full Treatment Consent	FtFT	2,782	m3/d
Measured Dry Weather Flow	mDWF	961	m3/d

Parameters			
Consumption			
Gd	Domestic	0.134	m3/d
Gh	Holiday	0.055	m3/d
Gc	Commercial	0.028	m3/d
Gi	Industry	0.028	m3/d
Gf	Future Domestic	0.125	m3/d
Dwelling Occupancy			
OR	Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	494	m3/d
Infitration	I = 0.25*PG	123	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	617	m3/d
Calculated FtFT	3PG*I*3E	1,604	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	199	m3/d
FtFT Capacity	FTFT - Calculated FtFT	1,178	m3/d
DWF Capacity	mDWF\DWF	17	%
Population Capacity		1,274	PE
Dwelling Capacity	Population Capacity/OR	531	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	310	dwellings
Additional Population	Phf = Hf*OR	744	PE
Additional Flow from Housing	PGhf = Phf*Gf	93	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	23	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	116	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	1,077	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	1,906	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	83	m3/d
FtFT Capacity	FTFT - fFTft	876	m3/d
DWF Capacity	mDWF\DWF	7	%
Population Capacity		531	PE
Dwelling Capacity	Population Capacity/OR	221	dwellings

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Element	**Elkesley WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Site Name: Elkesley
Receiving Watercourse: River Poulter
Grid Reference: 468172,375068
Consent Reference: T/73/45969/R

Base Data - Provided by ST (October 2010)			
Total PE		914	PE
Domestic PE	Pd	914	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	250	m3/d
Flow to Full Treatment Consent	FtFT	1,080	m3/d
Measured Dry Weather Flow	mDWF	126	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	122	m3/d
Infitration	I = 0.25*PG	31	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	153	m3/d
Calculated FtFT	3PG*I*3E	398	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	124	m3/d
FtFT Capacity	FTFT - Calculated FtFT	682	m3/d
DWF Capacity	mDWF\DWF	50	%
Population Capacity		794	PE
Dwelling Capacity	Population Capacity/OR	331	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	149	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	457	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	102	m3/d
FtFT Capacity	FTFT - fFTft	623	m3/d
DWF Capacity	mDWF\DWF	41	%
Population Capacity		653	PE
Dwelling Capacity	Population Capacity/OR	272	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Gamston WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Site Name: Gamston
Receiving Watercourse: River Idle by Pass Stream
Grid Reference: 470900,376400
Consent Reference: T/74/45570/R

Base Data - Provided by ST (October 2010)			
Total PE		229	PE
Domestic PE	Pd	229	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	60	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	52	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	31	m3/d
Infitration	I = 0.25*PG	8	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	38	m3/d
Calculated FtFT	3PG*I*3E	100	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	8	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	13	%
Population Capacity		51	PE
Dwelling Capacity	Population Capacity/OR	21	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	75	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	158	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-15	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	-24	%
Population Capacity		-96	PE
Dwelling Capacity	Population Capacity/OR	-40	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	Gringley-on-the-Hill WWTW Volumetric Capacity Assessment	22/09/2010	D124351
Originator	Checked / Revision / Suffix / Orig		
SK	Date / Check		

Site Name:	Gringley-on-the-Hill		
Receiving Watercourse:	Trib of Chestfld. Canal		
Grid Reference:	473400,391600		
Consent Reference:	T/78/45644/R		

Base Data - Provided by ST (October 2010)			
Total PE		1,007	PE
Domestic PE	Pd	1,007	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	226	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	181	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	135	m3/d
Infitration	I = 0.25*PG	34	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	169	m3/d
Calculated FtFT	3PG*I*3E	439	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	45	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	20	%
Population Capacity		288	PE
Dwelling Capacity	Population Capacity/OR	120	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	204	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	497	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	23	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	10	%
Population Capacity		147	PE
Dwelling Capacity	Population Capacity/OR	61	dwellings

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Element	Harworth WWTW Volumetric Capacity Assessment	22/09/2010	D124351
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Site Name:	Harworth		
Receiving Watercourse:	Trib River Torne		
Grid Reference:	461100,392100		
Consent Reference:	T/83/45790/R		

Base Data - Provided by ST (October 2010)			
Total PE		8,468	PE
Domestic PE	Pd	8,468	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	2,050	m3/d
Flow to Full Treatment Consent	FtFT	4,778	m3/d
Measured Dry Weather Flow	mDWF	1,517	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	1,135	m3/d
Infitration	I = 0.25*PG	284	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	1,418	m3/d
Calculated FtFT	3PG*I*3E	3,688	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	533	m3/d
FtFT Capacity	FTFT - Calculated FtFT	1,090	m3/d
DWF Capacity	mDWF\DWF	26	%
Population Capacity		3,411	PE
Dwelling Capacity	Population Capacity/OR	1,421	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	1,750	dwellings
Additional Population	Phf = Hf*OR	4,200	PE
Additional Flow from Housing	PGhf = Phf*Gf	525	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	131	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	2,718	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	76	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	732	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	2,249	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	5,622	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-199	m3/d
FtFT Capacity	FTFT - fFTft	-844	m3/d
DWF Capacity	mDWF\DWF	-10	%
Population Capacity		-1,274	PE
Dwelling Capacity	Population Capacity/OR	-531	dwellings

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Element	**Hodstock WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
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Site Name: Hodstock
Receiving Watercourse: Langold Stream
Grid Reference: 459600,386200
Consent Reference: T/76/45601/R

Base Data - Provided by ST (October 2010)			
Total PE		8,887	PE
Domestic PE	Pd	8,887	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	2,158	m3/d
Flow to Full Treatment Consent	FtFT	5,478	m3/d
Measured Dry Weather Flow	mDWF	1,991	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	1,191	m3/d
Infitration	I = 0.25*PG	298	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	1,489	m3/d
Calculated FtFT	3PG*I*3E	3,870	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	167	m3/d
FtFT Capacity	FTFT - Calculated FtFT	1,608	m3/d
DWF Capacity	mDWF\DWF	8	%
Population Capacity		1,069	PE
Dwelling Capacity	Population Capacity/OR	445	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	420	dwellings
Additional Population	Phf = Hf*OR	1,008	PE
Additional Flow from Housing	PGhf = Phf*Gf	126	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	32	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	158	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	2,149	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	4,280	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	10	m3/d
FtFT Capacity	FTFT - fFTft	1,198	m3/d
DWF Capacity	mDWF\DWF	0	%
Population Capacity		64	PE
Dwelling Capacity	Population Capacity/OR	27	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Lound WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Site Name: Lound
Receiving Watercourse: Unamed Trib of River Idle
Grid Reference: 469400,386700
Consent Reference: T/75/45708/R

Base Data - Provided by ST (October 2010)			
Total PE		1,328	PE
Domestic PE	Pd	1,328	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	325	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	206	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	178	m3/d
Infitration	I = 0.25*PG	44	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	222	m3/d
Calculated FtFT	3PG*I*3E	578	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	119	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	37	%
Population Capacity		762	PE
Dwelling Capacity	Population Capacity/OR	317	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	120	dwellings
Additional Population	Phf = Hf*OR	288	PE
Additional Flow from Housing	PGhf = Phf*Gf	36	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	9	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	45	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	251	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	695	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	74	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	23	%
Population Capacity		474	PE
Dwelling Capacity	Population Capacity/OR	197	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study				Date	Project Number
Element	**Mattersey Thorpe WWTW Volumetric Capacity Assessment**				22/09/2010	D124351
Originator	Checked	Revision	Suffix	Orig		
SK			Date	Check		

Site Name: Mattersey Thorpe
Receiving Watercourse: River Idle
Grid Reference: 467500,390200
Consent Reference: T/74/45568/R

Base Data - Provided by ST (October 2010)			
Total PE		6,183	PE
Domestic PE	Pd	6,183	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	1,631	m3/d
Flow to Full Treatment Consent	FtFT	4,597	m3/d
Measured Dry Weather Flow	mDWF	1,114	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	829	m3/d
Infitration	I = 0.25*PG	207	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	1,036	m3/d
Calculated FtFT	3PG*I*3E	2,693	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	517	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	32	%
Population Capacity		3,309	PE
Dwelling Capacity	Population Capacity/OR	1,379	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	120	dwellings
Additional Population	Phf = Hf*OR	288	PE
Additional Flow from Housing	PGhf = Phf*Gf	36	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	9	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	45	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	1,159	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	2,810	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	472	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	29	%
Population Capacity		3,021	PE
Dwelling Capacity	Population Capacity/OR	1,259	dwellings

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Element	**Misson WWTW Volumetric Capacity Assessment**				22/09/2010	D124351
Originator	Checked	Revision	Suffix	Orig		
SK			Date	Check		

Site Name: Misson
Receiving Watercourse: River Idle
Grid Reference: 469404,395250
Consent Reference: T/78/45502/R

Base Data - Provided by ST (October 2010)			
Total PE		590	PE
Domestic PE	Pd	590	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	161	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	95	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	79	m3/d
Infitration	I = 0.25*PG	20	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	99	m3/d
Calculated FtFT	3PG*I*3E	257	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	66	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	41	%
Population Capacity		422	PE
Dwelling Capacity	Population Capacity/OR	176	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	118	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	315	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	44	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	27	%
Population Capacity		282	PE
Dwelling Capacity	Population Capacity/OR	117	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study					Date	Project Number
Element	**Nether Langwith WWTW Volumetric Capacity Assessment**					22/09/2010	D124351
Originator	Checked	Revision	Suffix	Orig			
SK			Date	Check			

Site Name: Nether Langwith
Receiving Watercourse: River Poulter
Grid Reference: 454500,370200
Consent Reference: T/73/45847/R

Base Data - Provided by ST (October 2010)			
Total PE		2,930	PE
Domestic PE	Pd	2,930	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	1,000	m3/d
Flow to Full Treatment Consent	FtFT	2,203	m3/d
Measured Dry Weather Flow	mDWF	623	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	393	m3/d
Infitration	I = 0.25*PG	98	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	491	m3/d
Calculated FtFT	3PG*I*3E	1,276	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	377	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	38	%
Population Capacity		2,413	PE
Dwelling Capacity	Population Capacity/OR	1,005	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	646	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	1,335	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	355	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	35	%
Population Capacity		2,272	PE
Dwelling Capacity	Population Capacity/OR	947	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study					Date	Project Number
Element	**North Wheatley WWTW Volumetric Capacity Assessment**					22/09/2010	D124351
Originator	Checked	Revision	Suffix	Orig			
SK			Date	Check			

Site Name: North Wheatley
Receiving Watercourse: Wheatley Beck
Grid Reference: 476843,385843
Consent Reference: T/69/45707/R

Base Data - Provided by ST (October 2010)			
Total PE		530	PE
Domestic PE	Pd	530	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	120	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	124	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	71	m3/d
Infitration	I = 0.25*PG	18	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	89	m3/d
Calculated FtFT	3PG*I*3E	231	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	-4	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	-3	%
Population Capacity		-26	PE
Dwelling Capacity	Population Capacity/OR	-11	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	147	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	289	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-27	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	-22	%
Population Capacity		-173	PE
Dwelling Capacity	Population Capacity/OR	-72	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Norton WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Orig	
SK		Date / Check	

Site Name: Norton
Receiving Watercourse: River Poulter
Grid Reference: 457370,371663
Consent Reference: T/73/45542/R

Base Data - Provided by ST (October 2010)			
Total PE		304	PE
Domestic PE	Pd	304	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	92	m3/d
Flow to Full Treatment Consent	FtFT	447	m3/d
Measured Dry Weather Flow	mDWF	92	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	41	m3/d
Infitration	I = 0.25*PG	10	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	51	m3/d
Calculated FtFT	3PG*I*3E	132	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	0	m3/d
FtFT Capacity	FTFT - Calculated FtFT	315	m3/d
DWF Capacity	mDWF\DWF	0	%
Population Capacity		0	PE
Dwelling Capacity	Population Capacity/OR	0	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	115	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	191	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-23	m3/d
FtFT Capacity	FTFT - fFTft	256	m3/d
DWF Capacity	mDWF\DWF	-24	%
Population Capacity		-147	PE
Dwelling Capacity	Population Capacity/OR	-61	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Rampton WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
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SK		Date / Check	

Site Name: Rampton
Receiving Watercourse: Seymour Drain
Grid Reference: 480200,377800
Consent Reference: T/69/45500/R

Base Data - Provided by ST (October 2010)			
Total PE		1,906	PE
Domestic PE	Pd	1,906	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	345	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	388	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	255	m3/d
Infitration	I = 0.25*PG	64	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	319	m3/d
Calculated FtFT	3PG*I*3E	830	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	-43	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	-12	%
Population Capacity		-275	PE
Dwelling Capacity	Population Capacity/OR	-115	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	120	dwellings
Additional Population	Phf = Hf*OR	288	PE
Additional Flow from Housing	PGhf = Phf*Gf	36	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	9	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	45	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	433	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	947	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-45	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	-26	%
Population Capacity		-288	PE
Dwelling Capacity	Population Capacity/OR	-120	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Ranskill WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
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SK			

Site Name: Ranskill
Receiving Watercourse: Trib Ranskill Brook
Grid Reference: 466800,387900
Consent Reference: T/77/45889/R

Base Data - Provided by ST (October 2010)			
Total PE		1,469	PE
Domestic PE	Pd	1,469	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	358	m3/d
Flow to Full Treatment Consent	FtFT	1,011	m3/d
Measured Dry Weather Flow	mDWF	187	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	197	m3/d
Infitration	I = 0.25*PG	49	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	246	m3/d
Calculated FtFT	3PG*I*3E	640	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	171	m3/d
FtFT Capacity	FTFT - Calculated FtFT	371	m3/d
DWF Capacity	mDWF\DWF	48	%
Population Capacity		1,094	PE
Dwelling Capacity	Population Capacity/OR	456	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	60	dwellings
Additional Population	Phf = Hf*OR	144	PE
Additional Flow from Housing	PGhf = Phf*Gf	18	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	5	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	23	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	210	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	698	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	149	m3/d
FtFT Capacity	FTFT - fFTft	313	m3/d
DWF Capacity	mDWF\DWF	41	%
Population Capacity		954	PE
Dwelling Capacity	Population Capacity/OR	397	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study	Date	Project Number
Element	**Retford WWTW Volumetric Capacity Assessment**	22/09/2010	D124351
Originator	Checked	Revision / Suffix / Date	Orig / Check
SK			

Site Name: Retford
Receiving Watercourse: River Idle
Grid Reference: 469700,382800
Consent Reference: T/74/46203/R

Base Data - Provided by ST (October 2010)			
Total PE		25,618	PE
Domestic PE	Pd	25,618	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	6,593	m3/d
Flow to Full Treatment Consent	FtFT	15,898	m3/d
Measured Dry Weather Flow	mDWF	4,945	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	3,433	m3/d
Infitration	I = 0.25*PG	858	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	4,291	m3/d
Calculated FtFT	3PG*I*3E	11,157	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	1,648	m3/d
FtFT Capacity	FTFT - Calculated FtFT	4,741	m3/d
DWF Capacity	mDWF\DWF	25	%
Population Capacity		10,547	PE
Dwelling Capacity	Population Capacity/OR	4,395	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	1,560	dwellings
Additional Population	Phf = Hf*OR	3,744	PE
Additional Flow from Housing	PGhf = Phf*Gf	468	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	117	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	1553	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	43	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	628	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	5,573	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	12,808	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	1,020	m3/d
FtFT Capacity	FTFT - fFTft	3,090	m3/d
DWF Capacity	mDWF\DWF	15	%
Population Capacity		6,528	PE
Dwelling Capacity	Population Capacity/OR	2,720	dwellings

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Element	Walkeringham WWTW Volumetric Capacity Assessment	22/09/2010	D124351
Originator	Checked	Revision Suffix / Date	Orig / Check
SK			

Site Name: Walkeringham
Receiving Watercourse: River Trent
Grid Reference: 477700,393000
Consent Reference: T/69/45814/R

Base Data - Provided by ST (October 2010)			
Total PE		4,464	PE
Domestic PE	Pd	4,464	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	2,090	m3/d
Flow to Full Treatment Consent	FtFT	5,270	m3/d
Measured Dry Weather Flow	mDWF	1,503	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	598	m3/d
Infitration	I = 0.25*PG	150	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	748	m3/d
Calculated FtFT	3PG*I*3E	1,944	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	587	m3/d
FtFT Capacity	FTFT - Calculated FtFT	3,326	m3/d
DWF Capacity	mDWF\DWF	28	%
Population Capacity		3,757	PE
Dwelling Capacity	Population Capacity/OR	1,565	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	370	dwellings
Additional Population	Phf = Hf*OR	888	PE
Additional Flow from Housing	PGhf = Phf*Gf	111	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	28	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	139	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	1,642	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	2,305	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	448	m3/d
FtFT Capacity	FTFT - fFTft	2,965	m3/d
DWF Capacity	mDWF\DWF	21	%
Population Capacity		2,867	PE
Dwelling Capacity	Population Capacity/OR	1,195	dwellings

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Element	West Burton WWTW Volumetric Capacity Assessment	22/09/2010	D124351
Originator	Checked	Revision Suffix / Date	Orig / Check
SK			

Site Name: West Burton
Receiving Watercourse: River Trent
Grid Reference: 480443,386423
Consent Reference: T/69/45540/R

Base Data - Provided by ST (October 2010)			
Total PE		2,006	PE
Domestic PE	Pd	2,006	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	582	m3/d
Flow to Full Treatment Consent	FtFT		m3/d
Measured Dry Weather Flow	mDWF	375	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	269	m3/d
Infitration	I = 0.25*PG	67	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	336	m3/d
Calculated FtFT	3PG*I*3E	874	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	207	m3/d
FtFT Capacity	FTFT - Calculated FtFT		m3/d
DWF Capacity	mDWF\DWF	36	%
Population Capacity		1,325	PE
Dwelling Capacity	Population Capacity/OR	552	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	120	dwellings
Additional Population	Phf = Hf*OR	288	PE
Additional Flow from Housing	PGhf = Phf*Gf	36	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	9	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	0	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	0	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	45	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	420	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	991	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	162	m3/d
FtFT Capacity	FTFT - fFTft		m3/d
DWF Capacity	mDWF\DWF	28	%
Population Capacity		1,037	PE
Dwelling Capacity	Population Capacity/OR	432	dwellings

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Job Title	Bassetlaw Water Cycle Study - Detailed Study					Date	Project Number
Element	**Worksop-Manton WWTW Volumetric Capacity Assessment**					22/09/2010	D124351
Originator	Checked	Revision	Suffix	Orig			
SK			Date	Check			

Site Name: Worksop-Manton
Receiving Watercourse: River Ryton
Grid Reference: 461200,379200
Consent Reference: T/75/45222/R

Base Data - Provided by ST (October 2010)			
Total PE		57,794	PE
Domestic PE	Pd	57,794	PE
Holiday PE	Ph		PE
Trade Flow	E		m3/d
Dry Weather Flow Consent	DWF	10,227	m3/d
Flow to Full Treatment Consent	FtFT	32,227	m3/d
Measured Dry Weather Flow	mDWF	11,783	m3/d

Parameters		
Consumption		
Gd Domestic	0.134	m3/d
Gh Holiday	0.055	m3/d
Gc Commercial	0.028	m3/d
Gi Industry	0.028	m3/d
Gf Future Domestic	0.125	m3/d
Dwelling Occupancy		
OR Occupancy Rate	2.4	people

Current Calculated Flow (for Reference Only)			
Population Consumption	PG = (Pd*Gd)+(Ph+Gh)	7,744	m3/d
Infitration	I = 0.25*PG	1,936	m3/d
Trade Flow	E	0	m3/d
Calculated DWF	PG+I+E	9,680	m3/d
Calculated FtFT	3PG*I*3E	25,169	m3/d

Current Headroom Calculations			
DWF Capacity	DWF - mDWF	-1,556	m3/d
FtFT Capacity	FTFT - Calculated FtFT	7,058	m3/d
DWF Capacity	mDWF\DWF	-15	%
Population Capacity		-9,958	PE
Dwelling Capacity	Population Capacity/OR	-4,149	dwellings

Future Housing Allocations			
Number of Dwellings	Hf	2,000	dwellings
Additional Population	Phf = Hf*OR	4,800	PE
Additional Flow from Housing	PGhf = Phf*Gf	600	m3/d
Additional Infiltration from Housing	Ihf = 0.25*PGHf	150	m3/d

Future Employment			
Number of Commercial Jobs	Ecf	3494	Jobs
Number of Industrial Jobs	Eif	0	Jobs
Additional Flow from Employment	Eef = (Ecf*Gc)+(Eif*Gi)	98	m3/d

Future Calculated Flow			
Additional DWF from Future Dev	aDWF = PGhf + Ihf +Eef	848	m3/d
Future Calculated DWF	fDWF = mDWF + aDWF	12,631	m3/d
Future Calculated FtFT	fFTfT=cFtFT+3PGhf*Ihf*3Eef	27,413	m3/d

Future Headroom Calculations			
DWF Capacity	DWF - fDWF	-2,404	m3/d
FtFT Capacity	FTFT - fFTft	4,814	m3/d
DWF Capacity	mDWF\DWF	-24	%
Population Capacity		-15,386	PE
Dwelling Capacity	Population Capacity/OR	-6,411	dwellings

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Appendix E – Wastewater Quality Consent Modelling Parameters

RQP modelling has been undertaken for Retford, Norton and Worksop-Manton and modelled to achieve compliance with WFD Standards for 'good ecological status'. Gamston, Harworth, North Wheatley and Rampton WwTW discharge to small watercourses which are not monitored by the Environment Agency. For these works, a load standstill modelling exercise has been undertaken (see tables below) to calculate the consents required to ensure there is no increase in discharged load as a result of future growth.. Cells are highlighted where no upstream monitoring information was provided and/or current upstream quality is poor and therefore good (green) mid-class estimates based on the proposed WFD standards have been used.

WwTW	Receiving Watercourse	Upstream River Flow			Upstream Water Quality					WwTW Future Flow		Current WwTW Consent		Downstream Water Quality Objective		Future WwTW Consent (mg/l)
		Gauge	Mean (Ml/d)	95%ile (Ml/d)	WQ SMPT	Determinand	Mean (mg/l)	St Dev (mg/l)	90%ile (mg/l)	Mean (Ml/d) (DWF x 1.25)	St Dev (Ml/d) (Mean x 0.3)	Consent (mg/l)	%ile	Objective (mg/l)	%ile	
GAMSTON	RIVER IDLE BYPASS STREAM	None	-	-	(EA website)	BOD	2.22	1.32	3.23	0.093	0.028	25	90%ile	4	90%ile	17
						Ammonia	0.08	0.08	0.12			-	90%ile	0.3	90%ile	6.5
						P	0.085	0.085	-			-	Mean	0.12	Mean	3.5
HARWORTH	TRIB OF RIVER TORNE	None	-	-	37423570	BOD	1.213	0.326	1.643	2.812	0.844	25	90%ile	5	90%ile	17
						Ammonia	0.077	0.098	0.167			10	90%ile	0.6	90%ile	6.5
						P	0.070	0.044	0.124			-	Mean	0.12	Mean	3
NORTH WHEATLEY	WHEATLEY BECK	None	-	-	40307040 (downstream)	BOD	1.379	0.906	2.483	0.183	0.055	20	90%ile	4	90%ile	17
						Ammonia	0.043	0.034	0.082			10	90%ile	0.3	90%ile	8
						P	0.085	0.085	-			-	Mean	0.12	Mean	4
NORTON	RIVER POULTER	28044 - Poulter at Cuckney	27.65	14.52	(EA website)	BOD	1.47	0.81	2.12	0.143	0.043	25	90%ile	4	90%ile	25
						Ammonia	0.06	0.04	0.09			15	90%ile	0.3	90%ile	15
						P	0.085	0.085	-			-	Mean	0.12	Mean	-
RAMPTON	SEYMOUR DRAIN	None	-	-	40634270 (downstream)	BOD	1.556	0.430	2.123	0.541	0.162	25	90%ile	4	90%ile	22
						Ammonia	0.192	0.321	0.433			10	90%ile	0.3	90%ile	9
						P	0.085	0.085	-			-	Mean	0.12	Mean	4.5
RETFORD	RIVER IDLE	28045 - Meden/ Maun at Bothamsall/Haughton & 28036 - Poulter at Twyford Bridge	201.31	87.78	(EA website)	BOD	2.19	1.51	3.29	6.967	2.090	30	90%ile	4	90%ile	7.5
						Ammonia	0.070	0.080	0.120			5 (Summer)/ 10 (Winter)	90%ile	0.3	90%ile	5
						P	0.085	0.085	-			2	Mean	0.12	Mean	1
WORKSOP-MANTON	RIVER RYTON	28049 - Ryton at Worksop	38.02	7.43	38641290	BOD	1.781	0.690	2.682	15.789	4.737	15	90%ile	5	90%ile	10
						Ammonia	0.137	0.157	0.291			3	90%ile	0.6	90%ile	1.2
						P	0.085	0.085	-			2	Mean	0.12	Mean	0.15

Future Consent Risk Assessment			Colour coding definition
BOD (95%ile)	Ammonia (95%ile)	Phosphorus (95%ile)	
No Change	No Change	No Change	No change required to existing consent
> $10mgl^{-1}$	> $3mgl^{-1}$	No consent or ≥ $2mgl^{-1}$	Consent Achievable (within BAT)
> $5mgl^{-1}$ and ≤ $10mgl^{-1}$	> $1mgl^{-1}$ and ≤ $3mgl^{-1}$	> $1mgl^{-1}$ and < $2mgl^{-1}$	Consent within BAT but difficult to achieve
≤ 5 mgl^{-1}	≤ $1mgl^{-1}$	≤ $1mgl^{-1}$	Consent Unachievable with current technology

Load Standstill Modelling Results

Gamston WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	52	0.065	25	10	5	1.6	0.7	0.3	0.0	0.0	0.0
Future (2026)	75	0.094	25	50	10	2.3	4.7	0.9	0.7	4.0	0.6

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	0.094	17.3	6.9	3.5	1.6	0.7	0.3

Harworth WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	1,517	1.896	25	10	5	47.4	19.0	9.5	0.0	0.0	0.0
Future (2026)	2,249	2.811	25	10	2	70.3	28.1	5.6	22.9	9.2	-3.9

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	2.811	16.9	6.7	3.4	47.4	19.0	9.5

North Wheatley WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	124	0.155	20	10	5	3.1	1.6	0.8	0.0	0.0	0.0
Future (2026)	147	0.184	20	10	2	3.7	1.8	0.4	0.6	0.3	-0.4

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	0.184	16.9	8.4	4.2	3.1	1.6	0.8

Norton WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	92	0.115	25	10	5	2.9	1.2	0.6	0.0	0.0	0.0
Future (2026)	115	0.144	25	10	2	3.6	1.4	0.3	0.7	0.3	-0.3

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	0.144	20.0	8.0	4.0	2.9	1.2	0.6

Rampton WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	388	0.485	25	10	5	12.1	4.9	2.4	0.0	0.0	0.0
Future (2026)	433	0.541	25	10	2	13.5	5.4	1.1	1.4	0.6	-1.3

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	0.541	22.4	9.0	4.5	12.1	4.9	2.4

Retford WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	4,945	6.181	30	10	2	185.4	61.8	12.4	0.0	0.0	0.0
Future (2026)	5,573	6.966	30	10	2	209.0	69.7	13.9	23.6	7.8	1.6

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	6.966	26.6	8.9	1.8	185.4	61.8	12.4

Worksop-Manton WwTW

			Current Quality Consents			Current Load (kg/d)			Increase in Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P	BOD	Amm	P
Current (2010)	11,783	14.729	15	3	2	220.9	44.2	29.5	0.0	0.0	0.0
Future (2026)	12,631	15.789	15	3	2	236.8	47.4	31.6	15.9	3.2	2.1

			Future Quality Consents			Future Load (kg/d)		
Year	Flow (m3/d)	Flow (Ml/d)	BOD	Amm	P	BOD	Amm	P
Future (2026)	2,224	15.789	14.0	2.8	1.9	220.9	44.2	29.5