Babergh & Mid Suffolk District Council
Addendum to Water Cycle Study

Final Report

October 2020

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Contract

This report describes an addendum to work commissioned by Babergh & Mid Suffolk District Council in February 2020. Richard Pardoe of JBA Consulting carried out this work.

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Purpose

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Executive summary

In February 2020, JBA Consulting was commissioned by Babergh & Mid Suffolk District Council to undertake a Water Cycle Study (WCS) to inform the Babergh & Mid Suffolk Joint Local Plan (JLP). This study assessed the potential issues relating to future development within Babergh & Mid Suffolk and the impacts on water supply, wastewater collection and treatment and water quality. The Water Cycle Study was required to assess the constraints and requirements that will arise from potential growth on the water infrastructure.

The study used a growth scenario that was based on every potential allocation coming forward during the JLP period, representing a "worst-case" in each wastewater catchment.

Two issues were identified that required further study:

- Many Water Recycling Centres (WRCs) would need an increase in their permit, and/or upgrades to treatment capacity, in order to accommodate growth.
- Discharge from WRCs is likely to cause a deterioration in water quality downstream. In many cases this could be prevented by improvements in treatment processes. However, in five cases this could not be prevented, and in a further case whilst the deterioration was not significant, growth in the local plan period could prevent good ecological status being achieved in the future.

The WCS recommended that further investigation of wastewater capacity and water quality be undertaken using a growth scenario based on the Reg. 19 JLP allocations.

The growth scenario was therefore updated and the impact on the various assessments in the WCS reported. Three assessments were recommended to be repeated:

- Wastewater treatment
- Water quality
- Environmental impact

The original study found that, of the WRCs serving growth, 48 of the 91 WRCs would be close to or exceeding their flow permit during the plan period. Using the revised growth forecast based on the Reg. 19 JLP allocations, this was reduced to 43 WRCs.

Six WRCs were identified in the original study as having a potential water quality issue during the JLP period. At five WRCs (Chantry, Diss, Hadleigh, Halesworth and Thurston) the modelling predicted a greater than 10% deterioration in water quality, that could not be prevented by treatment at the technical achievable limit (TAL). At Mendlesham WRC, there was a risk that growth alone could prevent good ecological status being achieved under the Water Framework Directive (WFD) in the future (following improvements in water quality elsewhere in the catchment).

The water quality modelling was repeated using the updated Reg. 19 JLP growth scenario and additional updated assumptions provided by the Environment Agency (EA) and Anglian Water. In the updated results, the reduced growth forecast meant that a large deterioration was no longer predicted at Chantry and Hadleigh WRCs. Diss WRC no longer served any JLP allocations therefore it did not require an assessment. Growth alone in the Mendlesham WRC catchment s unlikely to prevent good ecological status being achieved in the future.

A detailed investigation of water quality at Halesworth and Thurston WRCs, using the EA's RQP modelling tool and the latest water quality data from the EA database, showed that deterioration in ammonia concentration at Halesworth was predicted to be reduced below 10% in the JLP scenario. At Thurston WRC, deterioration was predicted to remain higher than 10%, however this can be prevented through improvements in treatment processes.

The updated assumptions provided by the EA in new modelling identified an additional issue at Ringshall WRC, which was not identified in the original study. Deterioration was predicted to be greater than 10% in ammonia and it could not be prevented by improvements in

treatment technology. Ringshall WRC is a small works with a descriptive permit that is not adequately modelled within SIMCAT, and there was insufficient data to model it as an individual site in RQP. Growth at this WRC is unlikely to be accommodated at the existing WRC and so an alternative solution is required – either a new WRC or pumping to a neighbouring WRC catchment, such as Stowmarket or Needham Market. Early engagement with Anglian Water is required in order to ensure a solution is in place.

The environmental assessment conducted in the main study predicted a significant deterioration in water quality in many watercourses adjacent to protected sites, such as Sites of Special Scientific Interest (SSSIs). However, it also showed that this could be prevented in every case by improvement in treatment processes at WRCs upstream.

The assessment was repeated using the updated JLP Reg. 19 growth scenario. There was no change to the conclusions of the original study.

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1 Introduction

1.1 Purpose of the addendum

The main Water Cycle Study (WCS) report completed in October 2020 was based on a scenario of all identified potential development sites coming forward during the joint local plan (JLP) period, representing a "worst case" scenario in each wastewater catchment.

This work identified a number of issues:

- Many Water Recycling Centres (WRCs) would need an increase in their permit and/or upgrades to treatment capacity in order to accommodate growth
- Discharge from WRCs is likely to cause a deterioration in water quality downstream, in many cases this could be prevented by improvements in treatment processes, however in five cases this could not be prevented, and in a further case whilst the deterioration was not significant, growth in the local plan period could prevent good ecological status being achieved in the future.

The WCS recommended that further investigation of water quality be undertaken using a growth scenario based on the Reg. 19 JLP allocations.

1.2 General approach

The site tracker spreadsheet (Appendix A to the original WCS report) was amended to create a scenario where just the sites identified as Reg. 19 JLP allocations were adopted (alongside sites with extant planning permission, recent completions and windfall). Neighbouring authority growth was also retained in this scenario. This is considered to be a "realistic" representation of the level of growth during the joint local plan period.

A new forecast for water demand and wastewater was then created and the impact on the original assessments reported.

The water quality modelling was repeated using this new scenario, incorporating additional advice provided by the Environment Agency. Where the EA modelling tool SIMCAT identified issues in the new scenario, these were investigated further using the EA's RQP tool, or a load standstill approach.

No changes have been made to the sites with extant planning permission or recent completions, and the distribution of windfall used in the original study has been retained. Neighbouring authority growth where infrastructure is shared across boundaries is also assumed to be unchanged.

Anglian Water advised that Rattlesden workhouse WRC is now a sewage pump station transferring wastewater flow to Elmswell WRC. This has been taken into account in this addendum.

Unless stated, the methodology contained in the original study has been used, and the WCS report should be referred to for additional detail.

2 Impact on original assessments

2.1 Overview

Using the updated growth scenario, the probable impact on each assessment in the original study was reported and the requirement for further work defined. This is summarised in Table 2.1 below. It was found that further study of wastewater treatment capacity, water quality and environmental impact was required. All other conclusions in the original study would be unchanged.

Table 2.1 Impact of new scenario on original assessments

Original Assessment	Impact of revised growth scenario	Further study required in addendum?
Water resources	The original assessment was based on the proposed JLP level of growth which is not changed in the addendum.	**No**
Water supply	This was carried out by Essex & Suffolk Water (ESW) and Anglian Water (AW) on a site by site basis and did not take into account the cumulative impact of growth	**No**
Wastewater network	This was carried out by AW on a site by site basis and did not take into account the cumulative impact of growth	**No**
Wastewater treatment	This assessment assumed the "worst-case" of every identified potential allocation coming forward. The addendum estimate of growth will change the forecast at many of the WRCs in the study area.	**YES** – Headroom capacity assessment should be repeated.
Odour	Original assessment was done as a site by site assessment and is unchanged in the addendum scenario.	**No**
Water quality	This assessment assumed the "worst-case" of every identified potential allocation coming forward. The addendum estimate of growth will change the forecast at many of the WRCs in the study area and therefore the downstream impact is likely to change.	**YES** – Water quality modelling should be repeated with the new forecast.
Flood risk	No issues were identified in the original study and as the addendum contains a reduction in flow at affected WRCs, the conclusions will be unaffected.	**No**

Original Assessment	Impact of revised growth scenario	Further study required in addendum?
Environmental impact	This assessment assumed the "worst-case" of every identified potential allocation coming forward. The addendum estimate of growth will change the forecast at many of the WRCs in the study area and therefore the downstream impact is likely to change. In most cases this is likely to reduce the impact, however the changes made to the modelling following input from the EA could increase ammonia concentration in some cases.	**YES** – The environmental impact should be updated using the latest water quality modelling results.

3 Wastewater treatment

3.1 Updated headroom assessment

The original study reported that of the 91 WRCs expected to serve growth during the local plan period 48 were predicted to exceed or be close to exceeding their permit during the plan period. This was based on an assessment of available "headroom", i.e. the difference between the current discharge and permitted discharge from each WRC, and whether there was capacity to accommodate the planned growth.

This assessment was repeated using the updated forecast, and the number of WRCs predicted to exceed or be close to exceeding their permit has reduced to 43. The full list of WRCs, with the updated headroom assessment is contained in Table 4.5.

Table 3.1 Updated headroom assessment based on Reg. 19 Allocations

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Ashbocking-Mill Field	Ashbocking	No flow measurement	21 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Yes
Bacton-Finingham Lane	Bacton	191	417 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Badwell Ash	Badwell Ash, Walsham-le-Willows, Hunston	729	282 houses	Green		No
Bedfield	Bedfield, Tannington	No flow measurement	7 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Bentley	Bentley	70	57 houses	Green		No
Bildeston	Bidleston, Hitcham	391	159 houses	Green		No
Botesdale	Botesdale, Rickinghall	278	304 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP9 (2035)
Boxford	Boxford	391	21 houses	Green		No
Brantham	Brantham, Stutton, Tattingttone	1305	528 houses	Green		No

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Brent Eleigh	Brent Eleigh	No flow data	2 houses (Extant planning permissions)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	N/A
Brettenham	Brettenham	No flow data	6 houses (Extant planning permissions)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	N/A
Brundish-Crown Corner	Brundish, Wilby	No flow data	2 houses (Extant planning permissions)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	N/A
Bures-Wissington Rd	Bures St Mary	239	17 houses	Green		No
Chantry	Belstead, Copdock and Washbrook, Sproughton, Wherstead	8,684	1,009 houses	Green		No
Chelmondiston	Woolverstone, Chelmondiston	120	88 houses	Green		No
Cockfield (Great Green)	Cockfield	Descriptive permit – no flow data	10 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Cockfield-Green Lane	Cockfield	Descriptive permit – no flow data	32 houses	Amber	No flow measurement at this WRC so headroom unknown.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
			(extant planning permissions only)		Enhancement to treatment capacity may be required.	
Cockfield-McKenzie Place	Cockfield	Descriptive permit – no flow data	53 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Cockfield-Windsor Grn	Cockfield, Hinderclay	Descriptive permit – no flow data	2 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Cotton	Cotton, Finningham, Wickham Skeith	328	54 houses	Green		No
Debenham	Debenham	294	296 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Dedham	Stratford St Mary	224	5 houses (extant planning permissions only)	Green		No
Diss	Diss, Palgrave	11,778	45 houses (extant planning permissions only)	Green		No
East Bergholt	East Bergholt	529	245 houses	Green		No
Elmsett	Aldham, Elmsett	177	69 houses	Green		No

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Elmswell	Tostock, Woolpit, Drinkstone	718	1,773 houses 68,000m^2 employment space	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Erwarton	Erwarton	Descriptive permit – no flow data	11 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Eye-Hoxne Rd	Wilby, Eye, Stradbroke, Mellis, Yaxley	4,008	813 houses 40,000m^2 employment space	Green		No
Gedding	Gedding	70	4 houses (extant planning permissions only)	Green		No
Gislingham	Gislingham	378	52 houses (extant planning permissions only)	Green		No
Glemsford	Glemsford, Stanstead	1,558	77 houses	Green		No
Gosbeck-White Gate Cottages	Gosbeck	Descriptive permit – no flow data	1 house (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Great Bricett	Great Bricett	Descriptive permit – no flow data	62 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Great Cornard	Great Cornard, Chilton	3,985	914 houses	Green		No
Great Finborough	Onehouse, great Finborough	201	49 houses	Green		No
Great Wenham	Capel St Mary, Wenham Magna, Holton St Mary, Raydon	1,097	892 houses	Green		No
Groton-Castlings Heath	Groton	Descriptive permit – no flow data	1 house (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Gt Waldingfield	Great Waldingfield, Little Waldingfield, Chilton	361	90 houses	Green		Yes – exceeds in AMP7 (2025)
Hadleigh	Hadleigh	488	920 houses 24,000m^2 employment space	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Halesworth	Laxfield	1,499	94 houses	Green		No
Haughley-Old St	Haughley, Wetherden	782	216 houses	Green		No
Hawstead	Hartest	410	1 house (extant planning permissions only)	Green		No
Henley	Henley	80	49 houses	Green		No
Hintlesham-Wilderness H	Hintlesham	288	40 houses	Green		No
Holbrook	Holbrook, Harkstead	840	74 houses	Green		No
Hoxne	Hoxne	108	45 houses	Green		No
Ipswich-Cliff Quay Raeburn	Whitton, Barham, Claydon, Bramford, Great Blakenham, Wherstead	23,532	2,260 houses	Green		No
Kenton-Garneys Cls	Kenton	Descriptive permit – no flow data	5 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Kersey	Kersey	Descriptive permit – no flow data	1 house	Amber	No flow measurement at this WRC so headroom unknown.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
			(extant planning permissions only)		Enhancement to treatment capacity may be required.	
Lavenham	Lavenham, Brent Eleigh	Already exceeding permit	124 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – already exceeds
Lindsey-Frogs Hall	Lindsey	Descriptive permit – no flow data	7 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Long Melford	Acton, Long Melford	2,911	607 houses	Green		No
Mendham	Mendham	No flow data	9 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Mendlesham	Mendlesham, Wetheringsett	154	210 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Metfield	Metfield	No flow data	34 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Milden-Powny Street	Milden	Descriptive permit – no flow data	1 house (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Monks Eleigh	Milden, Monk Eleigh	134	34 houses	Green		No

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
			(extant planning permissions only)			
Nayland	Stoke by Nayland, Leavenheath	261	95 houses	Green		No
Nedging-Crowcroft Rd	Nedging-with-Naughton	No flow data	22 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Needham Market	Creeting St Mary, Needham Market, Barking, Coddenham	2,161	783 houses	Green		No
Norton (Suffolk)	Norton	38	52 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Oakley-Dross Ln	Brome & Oakley	129	16 houses	Green		No
Old Newton	Old Newton	288	146 houses	Green		No
Pettaugh-Debenham Wy	Pettaugh	Descriptive permit – no flow data	11 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Preston St Mary	Preston St Mary	No flow data	14 houses	Amber	No flow measurement at this WRC so headroom unknown.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
			(extant planning permissions only)		Enhancement to treatment capacity may be required.	
Redgrave-Crackthorn Bridge	Redgrave	237	16 houses	Green		No
Redlingfield	Redlingfield	No flow data	1 house (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Ringshall	Ringshall, Great Bricett	No flow data	51	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Shimpling	Lawshall	486	57 houses	Green		No
Shotley-Overhall Fm	Shotley	1,281	387 houses	Green		No
Somersham (Suffolk)	Somersham	368	37 houses	Green		No
Sproughton-Church L	Bramford, Sproughton	17	1,173 houses 200,000m^2 employment space	Amber	Development in this catchment may drain to Ipswich Cliff Quay which has capacity.	Yes – exceeds in AMP6 (2020)
Stanningfield	Cockfield	195	15 houses	Green		No
Stoke Ash-Roman Wy	Stoke Ash, Thwaite	No flow data	21 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Stonham Aspal	Stonham Aspal, Stonham Parva, Stonham Earl	241	98 houses 20,000m^2 employment space	Green		No
Stowmarket	Battisford, Stowmarket, Stowupland, Combs	130	3,152 houses 360,000m^2 employment space	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP6 (2020)
Sudbury	Sudbury, Long Melford, Great Cornard, Chilton	4,042	487 houses	Green		No
Thorndon-Catbridge	Thorndon, Occold	257	81 houses	Green		No
Thorpe Morieux-Post Office	Thorpe Morieux	Descriptive permit – no flow data	4 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Thurston	Thurston, Hessett, Beyton	1,150	1,599 houses	Amber	Enhancement to treatment capacity likely to be required	Yes – exceeds in AMP7 (2025)
Thwaite-Wickham Rd (Sufk)	Thwaite	Descriptive permit – no flow data	5 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Wattisfield	Wattisfield, Botesdale, Rickinghall	167	15 houses	Green		No
Westhorpe	Westhorpe	No flow data	11 houses	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Weybread	Weybread, Fressingfield	162	76 houses	Green		No
Whatfield	Elmsett	224	1 house	Green		No
Wilby-Barley View	Wilby	Descriptive permit – no flow data	2 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Wingfield	Wingfield	Descriptive permit – no flow data	8 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown
Worlingworth	Worlingworth	77	31 houses	Green		No
Wortham-Mellis Rd	Wortham	Descriptive permit – no flow data	4 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown

WRC	Areas served by WRC	Estimated Headroom (Housing units)	Potential growth over Local Plan period*	RAG (JBA assessment)	Comments	Is DWF predicted to exceed permitted flow before 2045? (JBA assessment)
Wyverstone	Wyverstone	Descriptive permit – no flow data	9 houses (extant planning permissions only)	Amber	No flow measurement at this WRC so headroom unknown. Enhancement to treatment capacity may be required.	Unknown

4 Water quality

4.1 Summary of issues identified

The original WCS report identified six WRCs where there were potential water quality issues. At five WRCS (Chantry, Diss, Hadleigh, Halesworth and Thurston) the modelling predicted a greater than 10% deterioration in one or more determinands that could not be prevented by treatment at the technical achievable limit (TAL). At Mendlesham WRC, whilst the deterioration was not significant, there was a risk that growth alone could prevent good ecological status being achieved under the Water Framework Directive (WFD) in the future (following improvements in water quality elsewhere in the catchment). Table 4.1 summarise the WCS findings and defined the need for further study on each of those WRCs.

Table 4.1 Summary of Water Quality issues identified in original study

WRC	Issue identified in WCS	Further analysis required
Chantry WRC	Deterioration in BOD is predicted to be >10% but remains at High WFD status. This cannot be prevented through treatment at TAL.	Forecast for this WRC is reduced in addendum scenario - modelling should be re-run using the revised growth scenario
Diss WRC	Deterioration in Ammonia is predicted to be >10% but remains at High WFD status. This cannot be prevented through treatment at TAL.	This WRC is no longer serving any allocations in the JLP and so no further analysis is required.
Hadleigh WRC	Deterioration in Ammonia is predicted to be >10% but remains at High WFD status. This cannot be prevented through treatment at TAL.	Forecast for this WRC is reduced in addendum scenario - modelling should be re-run using the revised growth scenario
Halesworth WRC	Deterioration in Ammonia is predicted to be >10% but remains at High WFD status. This cannot be prevented through treatment at TAL.	Forecast for this WRC is reduced in addendum scenario - modelling should be re-run using the revised growth scenario
Mendlesham WRC	Growth could prevent good ecological status being achieved for phosphate.	Forecast for this WRC is reduced in addendum scenario - modelling should be re-run using the revised growth scenario
Thurston WRC	Deterioration in Ammonia is predicted to be >10% but remains at High WFD status. This cannot be prevented through treatment at TAL.	Forecast for this WRC is reduced in addendum scenario - modelling should be re-run using the revised growth scenario

4.2 Results

4.2.1 Re-run of modelling

The SIMCAT models used in the original study were updated using the new growth forecast based on the Reg. 19 JLP allocations. These were then re-run following the same methodology outlined in the original study. A summary of the results is found in Table 4.2. At Chantry and Hadleigh WRCs the reduction in flow in the new growth scenario resulted in a lower deterioration in water quality downstream, and at Mendlesham WRC the modelling showed that growth alone is unlikely to prevent good ecological status being achieved in the future. No further analysis is required at these WRCs. Diss WRC does not serve any Reg. 19 JLP allocations and so an assessment is no longer required. However, water quality would continue to be a constraint to growth within this catchment.

At Halesworth and Thurston WRCs the issues identified in the original work remained after re-running the model and so further investigations were required. See sections 4.2.2 and 4.2.4.

The detailed results for each WRC are reported in Table 4.3. In the original model, an assumed permit value was used to calculate additional pollutant load at WRCs with descriptive permits. The Environment Agency advised that the value used (5mg/l for ammonia) was too low and a permit value of 10mg/l was therefore built into the updated model. This increased the ammonia load downstream of these WRCs, and so in two locations: Brettenham WRC and Ringshall WRC, issues were identified that were not found in the original study.

Table 4.2 Summary results water quality results

WRC	Update to WCS conclusions	Further analysis required
Issues identified in original study		
Chantry WRC	The change in growth forecast has meant that deterioration can now be prevented through treatment at TAL.	None
Diss WRC	The updated modelling shows that deterioration in ammonia remains >10% and cannot be prevented through treatment at TAL. However, this WRC does not serve any growth from allocation in the draft JLP, and the majority of growth is from outside of BMSDC.	This WRC is no longer serving any allocations in the JLP and so no further analysis is required.
Hadleigh WRC	The change in growth forecast has meant that deterioration can now be prevented through treatment at TAL.	None
Halesworth WRC	The updated modelling shows that deterioration remains at greater than 10% for ammonia (within High WFD status). This cannot be prevented through treatment at TAL.	Further investigation of this WRC is required using RQP. See section 4.2.2.
Mendlesham WRC	Updated modelling shows that growth alone is unlikely to prevent	None

WRC	Update to WCS conclusions	Further analysis required
	the reach specific WFD target for Good Ecological Status being achieved in the future should upstream water quality be improved.	
Thurston WRC	The updated modelling shows that deterioration remains at greater than 10% for ammonia (within High WFD status). This cannot be prevented through treatment at TAL.	Further investigation of this WRC is required using RQP. See section 4.2.4.
New issues identified		
Brettenham WRC	The updated modelling has resulted in an increased deterioration in Ammonia which cannot now be prevented through treatment at TAL.	Investigation of the SIMCAT model indicates that this WRC is not well represented – further analysis is required. See section 4.2.3.
Ringshall WRC	The updated modelling has resulted in an increased deterioration in Ammonia which cannot now be prevented through treatment at TAL.	Investigation of the SIMCAT model indicates that this WRC is not well represented – further analysis is required. See section 4.2.3.

Table 4.3 Detailed water quality results

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Bacton (Suffolk) WRC	No	No	N/A	Risk that reach specific phosphate target may not be met	
Badwell Ash WRC	Predicted deterioration is >10% for Ammonia	No	Yes	No - BOD/AMM	Unable to assess P
Bedfield WRC	No	No	N/A	No	
Bentley WRC	Predicted deterioration is >10% for Ammonia	No	Yes	No	
Bildesdon WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Botesdale WRC	No	No	N/A	No	
Boxford WRC	No	No	N/A	No	
Brent Eleigh WRC	No	No	N/A	Unable to assess BOD/AMM	No - P

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Brettenham WRC	Predicted deterioration is >10% for Ammonia	Ammonia may deteriorate from High to Good	No - Ammonia deterioration remains >10% within High class	Unable to assess BOD/AMM	No - P
Bures WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Chantry WRC	No	No	No	No	
Cockfield Great Green WRC	Predicted deterioration is >10% for Ammonia	No	Yes	Unable to assess BOD/AMM	No - P
Cotton WRC	Predicted deterioration is >10% for Phosphate	Ammonia may deteriorate from Good to Moderate	Yes	No	
Crackthorn Bridge WRC (Redgrave)	No	No	N/A	No	
Debenham WRC	Predicted deterioration is >10% for Ammonia	Ammonia may deteriorate from High to Good	Yes	No	
Dedham WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?
Diss WRC	Predicted deterioration is >10% for Ammonia	No	No - Ammonia deterioration remains >10% within High class	No
East Bergholt WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No
Elmsett WRC	No	No	N/A	No
Elmswell WRC	No	Predicted class deterioration from Good to Moderate for BOD	Yes	No
Eye WRC	No	No	N/A	No
Gedding WRC	No	No	N/A	No
Gislingham WRC	No	No	N/A	No
Glemsford WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Gosbeck WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Great Bricett WRC	Predicted deterioration is >10% for Ammonia and Phosphate	Predicted class deterioration from Good to Moderate for Phosphate	Yes	Unable to assess BOD/AMM	No - P
Great Cornard WRC	Predicted deterioration is >10% for Phosphate	Predicted class deterioration from Moderate to Poor for Phosphate	Yes	No	
Great Finborough WRC	No	No	N/A	No	
Great Waldingfield WRC	No	No	N/A	No	
Great Wenham WRC	Predicted deterioration is >10% for Ammonia, BOD and Phosphate	No	Yes	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Groton-Castlings HeathWRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Hadleigh WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Halesworth WRC	Predicted deterioration is >10% for Ammonia and BOD	No	No - Ammonia deterioration remains >10% within High class	No	
Haughley WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Hawstead WRC	No	No	N/A	No	
Henley WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Hoxne WRC	No	No	N/A	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Kenton WRC	Predicted deterioration is >10% for Ammonia	No	Yes	Unable to assess BOD/AMM	No - P
Kersey WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Lavenham WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Lindsey Frogs Hall WRC	Predicted deterioration is >10% for Phosphate	No	Yes	Unable to assess BOD/AMM	No - P
Long Melford WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Mendham WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Mendlesham WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Metfield	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	Unable to assess	No - P

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Milden Powney Street WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Monks Eleigh WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Nayland WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Nedging Crowcroft Rd WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	Unable to assess BOD/AMM	No - P
Needham Market WRC	Predicted deterioration is >10% for Ammonia, BOD and Phosphate	Ammonia may deteriorate in class from High to Good	Yes	No	
Norton (Suffolk) WRC	Predicted deterioration is >10% for Phosphate	Ammonia may deteriorate in class from Good to Moderate	Yes	No - BOD/AMM	Unable to assess P
Oakley-Dr WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Old Newton WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Pettaugh WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Preston St Mary WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Redlingfield WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Ringshall WRC	Predicted deterioration is >10% for Ammonia and Phosphate	Ammonia may deteriorate in class from High to Good	No - Ammonia deterioration remains >10% within High class	Unable to assess BOD/AMM	No - P
Shimpling WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Somersham WRC	No	No	N/A	No	
Sproughton WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	Yes	No	
Stoke Ash WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Stonham Aspal WRC	Predicted deterioration is >10% for Ammonia, BOD and Phosphate	No	Yes	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Stowmarket WRC	Predicted deterioration is >10% for Ammonia, BOD and Phosphate	No	Yes	Risk that reach specific phosphate target may not be met	
Hintlesham WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Stanningfield WRC	No	No	N/A	No - BOD/AMM	Unable to assess P
Sudbury WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Thorndon WRC	No	No	N/A	No	
Thorpe Morieux	No	No	N/A	Unable to assess BOD/AMM	No - P
Thurston WRC	Predicted deterioration is >10% for Ammonia and Phosphate	No	No - Ammonia deterioration remains >10% within Good class	No - BOD/AMM	Unable to assess P
Thwaite WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Wattisfield WRC	No	No	N/A	No	
Westthorpe WRC	No	No	N/A	No	

WRC	Could the development cause a greater than 10% deterioration in WQ for one or more determinands?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?	Could the development prevent the water body from reaching Good class?	
Weybread	No	No	N/A	No	
Whatfield WRC	Predicted deterioration is >10% for Phosphate	No	Yes	No	
Wilby WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Windsor Green WRC	No	No	N/A	No	
Wingfield WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Worlingworth WRC	Predicted deterioration is >10% for Ammonia	No	Yes	No	
Wortham Mellis Rd WRC	No	No	N/A	Unable to assess BOD/AMM	No - P
Wyverstone WRC	No	No	N/A	No	

4.2.2 Halesworth WRC

The SIMCAT modelling predicts a deterioration of 32% in ammonia concentration downstream of Halesworth WRC. Treatment at the technically achievable limit reduces this deterioration to 21% which would be unacceptable under the Water Framework Directive.

The model is based on 2010-12 data, which has been updated with the latest discharge from WRCs receiving growth in the study area. Discharge quality was assumed to be unchanged.

Further investigation was undertaken using the EA's River Quality Planning (RQP) tool. This uses the same statistical calculations as SIMCAT, but it addresses individual WRCs in isolation. The use of RQP requires the following data:

- Upstream river flow – obtained using Low Flows 2 for the River Blythe (Hevingham Hall – d/s Halesworth) catchment.
- Upstream water quality – obtained from the EA water quality data archive for sampling point AN-BLY016. This is the closest sampling point upstream of Halesworth WRC. Data from 2015-17 was used (no longer recorded after this date).
- WRC flow – from Anglian Water data
- WRC quality – obtained from the EA water quality data archive (Halesworth STW F/E 2015-2019)

Table 4.4 shows a comparison of the ammonia results from both SIMCAT and RQP modelling approaches. The ammonia concentration used in the SIMCAT model for the Halesworth effluent discharge (mean of 0.505mg/l) is significantly lower than the measured value recorded on the EA data archive (mean 0.828mg/l). This means that the baseline concentration is lower, and therefore the percentage deterioration is lower once additional wastewater from growth during the local plan period is added.

Analysis in RQP predicts that treatment at TAL can prevent deterioration, which was not predicted to be possible in the SIMCAT assessment. This is because the discharge quality for Halesworth contained in the SIMCAT model (0.505mg/l) is close to the accepted TAL of 0.49mg/l (mean). A larger improvement is therefore possible when the measured ammonia discharge is used.

Table 4.4 Comparison of SIMCAT and RQP results for Halesworth WRC

	SIMCAT	RQP
Baseline conc. (mg/l)	0.19	0.50 – 0.55
Predicted future concentration (mg/l)	0.25	0.55 – 0.58
% Deterioration	32%	5.5-8.0%
Predicted concentration after treatment at TAL (mg/l)	0.23	0.35
% Deterioration after treatment at TAL	17%	Deterioration prevented

* The range of values from RQP reflects the uncertainty in the WQ data. Where WQ measurements are below the recordable limit (for example under 0.03mg/l) they are recorded as "<0.03". The true value could be between 0 and 0.03mg/l.

Using the latest available data, it can be seen that ammonia concentration downstream of Halesworth WRC may deteriorate by between 5.5% and 8%, and this can be prevented through treatment at TAL.

4.2.3 Brettenham and Ringshall WRCs

Brettenham and Ringshall WRCs are not well represented in the SIMCAT models. They are both very small works with descriptive permits, there is therefore no recorded data for flow or water quality. In the ammonia/BOD model, pollutants are recorded as a load in (kg) rather than a concentration (mg/l). Additional pollutant load at these WRCs has been calculated using an assumed permit value of 10mg/l for ammonia and 20mg/l for BOD. Both the ammonia/BOD and the phosphate model have a nominal flow of 0.0001Ml/d for each. For this reason, large deteriorations in concentrations of each determinand are predicted in SIMCAT. As the current flow is a nominal almost zero value, treatment at TAL cannot prevent deterioration .

An RQP approach is not appropriate for these WRCs as there is no upstream water quality sampling point, no measured discharge or flow.

In the addendum growth scenario, Brettenham WRC is no longer serving any allocations and so an assessment is not required. At Ringshall 51 houses are forecast. This is likely to exceed the capacity of the existing works.

An alternative solution is therefore likely to be required, either a new WRC for that settlement, or pumping of effluent from Ringshall into the Stowmarket WRC or Needham Market WRC catchments. Early engagement with Anglian Water is essential so a suitable solution can be provided.

4.2.4 Thurston WRC

At Thurston WRC, the SIMCAT model predicts a deterioration in ammonia of 19% during the plan period which cannot be prevented through treatment at the technically achievable limit.

The model is based on 2010-12 data, which has been updated with the latest discharge from WRCs receiving growth in the study area. Discharge quality was assumed to be unchanged.

Further investigation was undertaken using the EA's River Quality Planning (RQP) tool. The use of RQP requires the following data:

- Upstream river flow – obtained using Low Flows 2 for the Packenham Stream catchment.
- Upstream water quality – no water quality sampling points are present upstream of the WRC. Standard practice in these cases is to assume upstream water quality is at mid-good WFD class. However, for Packenham Stream current WFD status is High, so using using mid-Good status could predict a lower percentage deterioration than could be expected. Mid-High status was therefore assumed for the upstream water quality.
- WRC flow – from Anglian Water data
- WRC quality – obtained from the EA water quality data archive (Thurston STW F/E 2015-2019)

Table 4.5 shows a comparison of the ammonia results from both SIMCAT and RQP modelling approaches. The ammonia concentration used in the SIMCAT model for the Thurston effluent discharge (mean of 0.422mg/l) is significantly lower than the measured value recorded on the EA data archive (mean 0.865mg/l). Using a mid-good upstream quality assumption would result in a smaller percentage deterioration than obtained from SIMCAT (approx. 7%), however a mid-High upstream quality assumption means that the percentage deterioration is similar between the two approaches.

Analysis in RQP predicts that treatment at TAL can prevent deterioration, which was not possible in SIMCAT. This is because the discharge quality for Thurston contained in the SIMCAT model (0.422mg/l) is below the accepted TAL of 0.49mg/l (mean) and so this scenario has no effect. A larger improvement is therefore possible when the measured ammonia discharge is used.

Table 4.5 Comparison between SIMCAT and RQP results for Thurston WRC

	SIMCAT	RQP
Baseline conc. (mg/l)	0.31	0.31 – 0.32
Predicted future concentration (mg/l)	0.37	0.37 – 0.39
% Deterioration	19%	19.4-21.9%
Predicted concentration after treatment at TAL (mg/l)	0.37	0.30
% Deterioration after treatment at TAL	19%	Deterioration prevented

Using the latest available data, it can be seen that ammonia concentration downstream of Halesworth WRC may deteriorate by between 19.4% and 21.9%, and this can be prevented through treatment at TAL.

4.3 Conclusions and conclusions

The water quality models were re-run using the updated growth forecast based on the Reg.19 JLP sites. The reduced flows in this forecast mean that deterioration is no longer an issue at Chantry and Hadleigh WRCs. Diss WRC is no longer serving any JLP allocations so does require an assessment. Growth alone in the Mendlesham WRC catchment is unlikely to prevent good ecological status being achieved in the future.

A detailed investigation of water quality at Halesworth and Thurston WRCs using the EA's RQP modelling tool and the latest water quality form the EA database shows that the discharge values for ammonia contained in the SIMCAT model are too low. At Halesworth WRC deterioration is reduced below 10% in the JLP scenario. At Thurston WRC, deterioration is predicted to remain higher than 10%, however this can be prevented through treatment at TAL.

Brettenham WRC does not serve allocations in the JLP and so does not require an assessment.

Ringshall WRC is a small works with a descriptive permit that is not adequately modelled within SIMCAT, and there is insufficient data to model in RQP. Growth at this WRC is unlikely to be accommodated at the existing WRC and so an alternative solution is required – either a new WRC or pumping to a neighbouring WRC catchment such as Stowmarket or Needham Market.

Early engagement with Anglian Water is required in order to ensure a solution is in place.

5 Environmental impact

5.1 Original findings

In the original study, the water quality modelling predicted large deteriorations in water quality in watercourses adjacent to sites with environmental designations such as SSSI etc. In every case, this could be prevented by an improvement in upstream treatment processes.

5.2 Updated results

The modelling results indicate an improvement at every reported site compared to the original results, however there is no change to the original conclusions. The updated impact assessment tables below should be read alongside the catchment maps in section 11 of the original study.

Table 5.1 Catchment A WQ impact assessment

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Bobbitshole, Belstead SSSI (TM149414)	Belstead Brook	Baseline Phosphate Conc. (mg/l)	1.52	1.52
		Future Phosphate Conc. (mg/l)	2.05	1.65
		% Deterioration	35%	9%
		Phosphate Conc. After treatment at TAL (mg/l)	0.25	0.23
		Can deterioration be prevented?	Yes	Yes
Orwell Estuary SSSI (TM221380) Stour and Orwell Estuaries SPA (UK9009121 Stour and Orwell Estuaries Ramsar (UK11067)	River Gipping	Baseline Phosphate Conc. (mg/l)	0.27	0.27
		Future Phosphate Conc. (mg/l)	0.53	0.41
		% Deterioration	96%	52%
		Phosphate Conc. After treatment at TAL (mg/l)	0.15	0.15
		Can deterioration be prevented?	Yes	Yes
	Belstead Brook	Baseline Phosphate Conc. (mg/l)	1.38	1.38
		Future Phosphate Conc. (mg/l)	1.87	1.50
		% Deterioration	36%	9%
		Phosphate Conc. After treatment at TAL (mg/l)	0.24	0.23
		Can deterioration be prevented?	Yes	Yes

Table 5.2 Catchment B WQ impact assessment

Protected site	Adjacent Waterbody	Predicted impact		
			Original	Updated
Cattawade Marshes SSSI (TN090329) Stour Estuary SSSI (TN173327) Stour and Orwell Estuaries SPA (UK9009121) Stour and Orwell Estuaries Ramsar (UK11067)	Stour (d/s R. Brett) GB105036041000	Baseline Phosphate Conc. (mg/l)	0.20	0.20
		Future Phosphate Conc. (mg/l)	0.25	0.24
		% Deterioration	25%	20%
		Phosphate Conc. After treatment at TAL (mg/l)	0.12	0.12
		Can deterioration be prevented?	Yes	Yes
	Stutton Brook	Baseline Phosphate Conc. (mg/l)	0.34	0.34
		Future Phosphate Conc. (mg/l)	0.46	0.45
		% Deterioration	35%	32%
		Phosphate Conc. After treatment at TAL (mg/l)	0.18	0.19
		Can deterioration be prevented?	Yes	Yes
Stour and Copperas Woods, Ramsey (TM193313)	Stour (d/s R. Brett) GB105036041000	Baseline Phosphate Conc. (mg/l)	0.20	0.20
		Future Phosphate Conc. (mg/l)	0.25	0.24
		% Deterioration	25%	20%
		Phosphate Conc. After treatment at TAL (mg/l)	0.12	0.12
		Can deterioration be prevented?	Yes	Yes
Glemsford Pits SSSI (TL838463)	Stour (Wixoe - Lamarsh)	Baseline Phosphate Conc. (mg/l)	0.21	0.21
		Future Phosphate Conc. (mg/l)	0.31	0.31
		% Deterioration	48%	48%
		Phosphate Conc. After treatment at TAL (mg/l)	0.12	0.12
		Can deterioration be prevented?	Yes	Yes
	Glem - Lower	Baseline Phosphate Conc. (mg/l)	0.19	0.19
		Future Phosphate Conc. (mg/l)	0.43	0.41
		% Deterioration	126%	116%
		Phosphate Conc. After treatment at TAL (mg/l)	0.15	0.11
		Can deterioration be prevented?	Yes	Yes

Protected site	Adjacent Waterbody	Predicted impact		
			Original	Updated
Kentwell Woods SSSI (TL846486)	Chad Brook	Baseline Phosphate Conc. (mg/l)	0.19	0.19
		Future Phosphate Conc. (mg/l)	0.41	0.41
		% Deterioration	116%	116%
		Phosphate Conc. After treatment at TAL (mg/l)	0.15	0.11
		Can deterioration be prevented?	Yes	Yes
Lineage Wood & Railway Track, Long Melford SSSI (TL889484)	Chad Brook	Baseline Phosphate Conc. (mg/l)	0.19	0.15
		Future Phosphate Conc. (mg/l)	0.28	0.27
		% Deterioration	47%	80%
		Phosphate Conc. After treatment at TAL (mg/l)	0.13	0.13
		Can deterioration be prevented?	Yes	Yes

Table 5.3 Catchment C WQ impact assessment

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Ramsholt Cliff SSSI (TM297427) Deben Estuary SSSI (TM296434) Deben Estuary SPA (UK9009261) Deben Estuary (UK11017) Ferry Cliff SSSI (TM278486)	Lark - Fynn (d/s confluence) GB105035040300	Baseline Phosphate Conc. (mg/l)	0.30	0.30
		Future Phosphate Conc. (mg/l)	0.30	0.30
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.12	0.12
		Can deterioration be prevented?	Yes	Yes
	Deben (Brandeston Bridge - Melton) GB105035046310	Baseline Phosphate Conc. (mg/l)	0.48	0.48
		Future Phosphate Conc. (mg/l)	0.49	0.48
		% Deterioration	2%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23	0.23
		Can deterioration be prevented?	Yes	Yes
Fox Fritillary Meadow, Framsden SSSI (TM189606)	Tributary of Deben (u/s Brandeston Bridge) GB105035046200	Baseline Phosphate Conc. (mg/l)	0.18	0.18
		Future Phosphate Conc. (mg/l)	0.19	0.19
		% Deterioration	6%	6%

		Phosphate Conc. after treatment at TAL (mg/l)	0.17	0.17
		Can deterioration be prevented?	Yes	Yes

Table 5.4 Catchment D WQ impact assessment

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Stanley and Alder Carrs, Aldeby SSSI (TM433927)	Waveney (Elingham Mill - Burgh St. Peter)	Baseline Phosphate Conc. (mg/l)	0.32	0.32
		Future Phosphate Conc. (mg/l)	0.32	0.32
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.25	0.25
		Can deterioration be prevented?	Yes	Yes
Hoxne Brick Pit SSSI (TM175766)	Gold Brook	Baseline Phosphate Conc. (mg/l)	0.60	0.60
		Future Phosphate Conc. (mg/l)	0.60	0.60
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.59	0.59
		Can deterioration be prevented?	Yes	Yes
Geldeston Meadows SSSI (TM396916) Broadland Ramsar (UK11010) The Broads SAC (UK0013577) Broadlands SPA (UK9009253)	Waveney (Elingham Mill - Burgh St. Peter)	Baseline Phosphate Conc. (mg/l)	0.36	0.36
		Future Phosphate Conc. (mg/l)	0.36	0.36
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.25	0.25
		Can deterioration be prevented?	Yes	Yes
Barnby Broad & Marshes SSSI (TM477910)	Waveney (Elingham Mill - Burgh St. Peter)	Baseline Phosphate Conc. (mg/l)	0.39	0.39
		Future Phosphate Conc. (mg/l)	0.40	0.39
		% Deterioration	3%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.21	0.21
		Can deterioration be prevented?	Yes	Yes
Sprat's Water and		Baseline Phosphate Conc. (mg/l)	0.37	0.37

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Marshes, Carlton Colville SSSI (TM506922) Broadland Ramsar (UK11010) The Broads SAC (UK0013577) Broadlands SPA (UK9009253)	Waveney (Elingham Mill - Burgh St. Peter)	Future Phosphate Conc. (mg/l)	0.37	0.37
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.20	0.20
		Can deterioration be prevented?	Yes	Yes

Table 5.5 Catchment E WQ impact assessment

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Knettishall Heath SSSI (TL951804)	Little Ouse (Hopton Common to Sapiston Confl) GB105033043100	Baseline Phosphate Conc. (mg/l)	0.29	0.29
		Future Phosphate Conc. (mg/l)	0.33	0.30
		% Deterioration	14%	3%
		Phosphate Conc. After treatment at TAL (mg/l)	0.23	0.23
		Can deterioration be prevented?	Yes	Yes
Barnham Heath SSSI (TL882798)	Sapiston River GB105033043070	Baseline Phosphate Conc. (mg/l)	0.76	0.76
		Future Phosphate Conc. (mg/l)	0.91	0.86
		% Deterioration	20%	13%
		Phosphate Conc. After treatment at TAL (mg/l)	0.42	0.40
		Can deterioration be prevented?	Yes	Yes
	Little Ouse (Hopton Common to Sapiston Confl) GB105033043100	Baseline Phosphate Conc. (mg/l)	0.19	0.19
		Future Phosphate Conc. (mg/l)	0.21	0.19
		% Deterioration	11%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.16	0.16
		Can deterioration be prevented?	Yes	Yes

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
Thetford Golf Course & Marsh SSSI (TL845873)	Little Ouse River GB105033043400	Baseline Phosphate Conc. (mg/l)	0.25	0.26
		Future Phosphate Conc. (mg/l)	0.28	0.27
		% Deterioration	12%	4%
		Phosphate Conc. After treatment at TAL (mg/l)	0.21	0.21
		Can deterioration be prevented?	Yes	Yes
Weeting Heath SSSI (TL758877)	Little Ouse River GB105033043400	Baseline Phosphate Conc. (mg/l)	0.19	0.20
		Future Phosphate Conc. (mg/l)	0.22	0.21
		% Deterioration	16%	5%
		Phosphate Conc. After treatment at TAL (mg/l)	0.16	0.16
		Can deterioration be prevented?	Yes	Yes
Barnham Cross Common SSSI (TL865813)	Little Ouse (Hopton Common to Sapiston Confl) GB105033043100	Baseline Phosphate Conc. (mg/l)	0.36	0.36
		Future Phosphate Conc. (mg/l)	0.43	0.40
		% Deterioration	19%	11%
		Phosphate Conc. After treatment at TAL (mg/l)	0.24	0.23
		Can deterioration be prevented?	Yes	Yes
Cavenham - Icklingham Heaths SSSI (TL751732)	Lark (Abbey Gardens to Mildenhall) GB105033043051	Baseline Phosphate Conc. (mg/l)	0.22	0.22
		Future Phosphate Conc. (mg/l)	0.22	0.22
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.22	0.22
		Can deterioration be prevented?	N/A	N/A
Lackford Lakes SSSI (TL809705)	Lark (Abbey Gardens to Mildenhall) GB105033043051	Baseline Phosphate Conc. (mg/l)	0.29	0.29
		Future Phosphate Conc. (mg/l)	0.29	0.29
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.29	0.29

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
		Can deterioration be prevented?	N/A	N/A
	Culford Stream GB105033043030	Baseline Phosphate Conc. (mg/l)	0.60	0.60
		Future Phosphate Conc. (mg/l)	0.60	0.60
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.60	0.60
		Can deterioration be prevented?	N/A	N/A
Pakenham Meadows SSSI (TL934686)	Pakenham Stream GB105033043300	Baseline Phosphate Conc. (mg/l)	1.39	1.39
		Future Phosphate Conc. (mg/l)	1.75	1.68
		% Deterioration	26%	21%
		Phosphate Conc. After treatment at TAL (mg/l)	0.18	0.18
		Can deterioration be prevented?	Yes	Yes
West Stow Heath SSSI (TL792714)	Lark (Abbey Gardens to Mildenhall) GB105033043051	Baseline Phosphate Conc. (mg/l)	0.29	0.29
		Future Phosphate Conc. (mg/l)	0.29	0.29
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.29	0.29
		Can deterioration be prevented?	N/A	N/A
Breckland Forest SSSI (TL819835) Breckland Farmland SSSI (TL760783) Breckland SPA (UK9009201) Breckland SAC (UK0019865)	Lark (Abbey Gardens to Mildenhall) GB105033043051	Baseline Phosphate Conc. (mg/l)	0.22	0.22
		Future Phosphate Conc. (mg/l)	0.22	0.22
		% Deterioration	0%	0%
		Phosphate Conc. After treatment at TAL (mg/l)	0.22	0.22
		Can deterioration be prevented?	N/A	N/A
	Little Ouse River GB105033043400	Baseline Phosphate Conc. (mg/l)	0.25	0.26
		Future Phosphate Conc. (mg/l)	0.28	0.27
		% Deterioration	12%	4%

Protected site	Adjacent Waterbody	Predicted Impact		
			Original	Updated
		Phosphate Conc. After treatment at TAL (mg/l)	0.21	0.21
		Can deterioration be prevented?	Yes	Yes
Blo' Norton and Thelntham Fens SSSI (TM019788) Waveney & Little Ouse Valley Fens SAC (UK0012882)	Little Ouse (Thelnetham to Hopton Common) GB105033043110	Baseline Phosphate Conc. (mg/l)	0.36	0.36
		Future Phosphate Conc. (mg/l)	0.43	0.37
		% Deterioration	19%	3%
		Phosphate Conc. After treatment at TAL (mg/l)	0.24	0.24
		Can deterioration be prevented?	Yes	Yes

Catchments F and G did not have any likely impacts which had not changed in this assessment.

6 Summary and Conclusions

Changed to the conclusions of the original study relating to the addendum forecast are included in Table 6.1 below. Unless stated, conclusions in the original report in other topic areas still apply.

Table 6.1 Conclusions

Topic	Original Conclusion	Updated conclusion
Water Recycling Centres Flow Permit assessment	• JBA performed a flow permit assessment based on a comparison of predicted future discharge by the end of the Local Plan period, and the current flow permit. This assessment was based on every identified potential allocation being developed and so represents a "worst-case" within each wastewater catchment. • There are 91 WRCs that may serve growth during the plan period. Of these, 48 may require a change to their permit and / or an upgrade to capacity in order to accommodate growth. At many of these WRCs, upgrades are currently planned which may alleviate some capacity issues. • Early engagement between the Council Anglian Water is required to ensure that opportunities to accommodate this growth within existing upgrade schemes can be realised, and where upgrades / improvements at WRCs are	Now 43 WRCs that may require a change to their permit and / or an upgrade to capacity in order to accommodate growth. The other conclusions are unchanged.

Topic	Original Conclusion	Updated conclusion
	required, that they are in place prior to occupation of development sites. • Opportunities should also be taken to focus growth in the catchments where there is capacity within a WRCs environmental permit, taking into account the water quality considerations contained in section 9 and 11.	
Water quality impact assessment	• At five WRCs (Chantry, Diss, Hadleigh, Halesworth and Thurston), water quality modelling identified a risk that planned growth could cause a deterioration in water quality, and that it may not be possible to mitigate this with treatment at the technically achievable limit. • At Mendlesham WRC, there is a risk that growth may prevent good ecological status being achieved in the future. • At these works, further mitigation may need to be taken to accommodate growth and options include pumping wastewater to a different WRC or changing the point of discharge to a less sensitive waterbody. Detailed optioneering is beyond the scope of this study and is best undertaken by Anglian Water who have a detailed knowledge of their assets, and the range of options and constraints at each. • The modelling indicates that treatment upgrades would be required at the majority of WRCs in order to accommodate growth without deterioration in water quality downstream. Extensive engagement with Anglian Water is required in order to understand the phasing of growth with WRC upgrades to ensure capacity and upgrades to treatment processes are aligned, and to ensure that required improvements are in place before occupation of any developments. The growth scenario assessed assumes that every development site identified comes forward and so represents a worst case for each wastewater catchment. There may be options to consolidate growth within	The water quality models were re-run using the updated growth forecast based on the Reg.19 JLP sites. The reduced flows in this forecast mean that deterioration is no longer an issue at Chantry and Hadleigh WRCs, Diss WRC is no longer serving any JLP allocations so does require an assessment Growth alone in the Mendlesham WRC catchment is unlikely to prevent good ecological status being achieved in the future. A detailed investigation of water quality at Halesworth and Thurston WRCs using the EA's RQP modelling tool and the latest water quality form the EA database shows that the discharge values for ammonia contained in the SIMCAT model are too low. At Halesworth WRC deterioration is reduced below 10% in the JLP scenario At Thurston WRC, deterioration is predicted to remain higher than 10%, however this can be prevented through treatment at TAL. Brettenham WRC does not serve allocations in the JLP and so does not require an assessment. Ringshall WRC is a small works with a descriptive permit that is not adequately modelled within SIMCAT, and there is insufficient data to model in RQP. Growth at this WRC is unlikely to be

Topic	Original Conclusion	Updated conclusion
	catchments that have more environmental capacity, and this should be considered alongside the capacity assessment in section 7.	accommodated at the existing WRC and so an alternative solution is required – either a new WRC or pumping to a neighbouring WRC catchment such as Stowmarket or Needham Market. Early engagement with Anglian Water is required in order to ensure a solution is in place.
Environmental Constraints and Opportunities	• A number of protected sites such as SSSIs and Priority Habitats are found within or downstream of the study area that should be carefully considered in future plan making. This is particularly significant for Chantry, Diss, Hadleigh, Halesworth and Mendlesham, where the water quality impact assessment has identified that it would not be possible to mitigate the water quality impacts of the proposed growth. • WRCs serving growth within Babergh and Mid Suffolk are point sources of pollution in the study area. • There is potential for additional discharge from WRC to impact sites with environmental designations (see Section 9). The Water Quality model used in section 9 was used to predict the water quality in rivers adjacent to protected sites. A significant deterioration was predicted adjacent to many sites, however in every case this could be completely prevented by improvements in treatment processes at WRCs upstream. • Development sites within Babergh and Mid Suffolk could also be sources of diffuse pollution from surface runoff. • SuDS are required on all sites and their design must consider water quality as well as quantity. • Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites • Opportunities exist for these SuDS schemes to offer multiple benefits	No change from original conclusions Reference to WRCs where deterioration cannot be prevented can be ignored.

Topic	Original Conclusion	Updated conclusion
	of flood risk reduction, amenity value and biodiversity. • Babergh and Mid Suffolk District Councils as LLFA should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors • In the wider area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk reduction, water quality and habitat creation.	

7 Recommendations

Table 7.1 Recommendations

Topic	Recommendation	Responsible	Timeline
Wastewater treatment	Recommendations unchanged from original study		
Water Quality	Identify options to accommodate growth at Ringshall WRC	AW	Aligned with projected growth plan
Environmental	Recommendations unchanged from original study		

Appendices

A A comparison of SIMCAT and RQP modelling methods

SIMCAT is a catchment scale model that is good at measuring the cumulative impact of growth served by multiple sewage treatment works. Babergh & Mid Suffolk is covered by two SIMCAT models: The East Anglian model and the Wash model.

It contains a headwater input of water and pollutants at the top of a watercourse, then diffuse inputs all along its length. Every sewage discharge is included, as well as other specific inputs from industry and agriculture. The model is first calibrated to the flow gauges on the larger rivers so the quantity of water throughout is approximately correct – then it is calibrated to water quality sampling points. This calibration is a very lengthy process so not something that would be done within the scope of a water cycle study covering only a small part of the total model area. JBA would therefore update as little as possible to avoid recalibration.

SIMCAT is a very useful tool for highlighting where the risks are in a catchment – especially where there are multiple inputs on the same watercourse.

RQP uses the same statistical calculations as SIMCAT but it does it for a single discharge. In simple terms the software is provided with the upstream flow and pollutant concentration, the volume and quality of a sewage discharge is then added, and the resulting downstream concentration is reported.

To use RQP an estimate is needed of upstream river flow. This is done using the flow estimation software Low Flows 2, based on the area of the catchment, geology etc. The latest water quality monitoring data from the EA is obtained from which we then calculate the upstream concentration – this can be quite a lengthy process as the data usually needs to be "cleaned" before statistics such as the mean, 90th percentile and standard deviation can be obtained.

The RQP approach whilst useful to investigate individual WRCs was not considered for use in this study as the primary way of assessing water quality impact due to the large number of WRCs in the study area serving growth (91 WRC). It also does not take into account other discharges upstream, for instance in the case of a river with three tributaries, each with a sewage treatment works - individually RQP may show that they do not cause a significant deterioration in water quality, but considered together, the deterioration downstream could be significant making SIMCAT the more useful tool at a catchment scale, and RQP useful for checking individual WRCs such as Thurston where SIMCAT has identified a risk.

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