ADDENDUM

JBA Project Code	2018s0874
Contract	Aylesbury Vale Water Cycle Study
Client	Aylesbury Vale District Council
Date	June 2019
Author	Emily Jones / Richard Pardoe
Reviewer	Paul Eccleston
Subject	Water Cycle Study Addendum: Additional Sites, May 2019.

1 Introduction

The Vale of Aylesbury Local Plan is at examination and, following the hearings the Inspector, in his Interim Findings of August 2018[1], indicated the plan's total delivery of housing should be increased from 28,830 to 31,500 homes. However, since then, following further consideration in Discussion Document 5 (2 December 2018), and the Council's response to that in February 2019[2], in March 2019[3] the Inspector has confirmed the following:

- he has agreed with AVDC's suggested figure of 30,100 as the overall target for the VALP.
- new allocations will be needed for 511 homes.
- the 511 homes can be met entirely by an allocation in the Milton Keynes area and this would adequately address the specific recommendation of paragraph 37 in his Interim Findings. The source for identifying the allocation is entirely within the Council's discretion.
- To find a site for 511 homes, the Council has focused its attention on the sites identified on pages 248-254 of the HELAA report v4.
- Since March 2019, the Council has extended its search criteria to identify a site with capacity to supply 1,117 additional homes. The increase from 555 to 1,117 homes takes account of shortfalls elsewhere in the VALP delivery.

Aylesbury Vale District Council (AVDC) has identified three sites from the HELAA that have been promoted to the Council and which it considers are the most likely from those in the HELAA to be able to accommodate the additional housing requirements: GRB002, NLV020 and WHA001.

In 2017, Aylesbury Vale District Council completed a Water Cycle Study (WCS)[4] which assessed the suitability of water supply and infrastructure, within the district, for planned future growth. AVDC commissioned JBA Consulting to prepare an addendum to the 2017 Water Cycle Study to assess the water and wastewater impacts of including this additional growth within the VALP.

2 Development Scenario

AVDC officers have provided notional scenarios of residential units to be tested on each site for the purposes of this WCS addendum, based on a maximum site capacity. For the purposes of the WCS addendum work, AVDC also asked JBA to test a maximum of 2,000 additional dwellings from all sites and their impact on water cycle infrastructure. This was in the context of the Inspector's Interim Findings of August 2018. The scenarios were provided before the Council knew that only around 1,117 homes would be required on one site. These scenarios are therefore more than is needed to meet the VALP requirements and were tested before the completion of evidence base updates and what the VALP itself may set out as a site capacity.

The additional growth is on top of that already identified in the VALP Proposed Submission including commitments.

Table 2-1 lists the three sites tested, and their locations are shown in Figure 2-1. The scenario of up to 2,000 residential units within one or a combination of these sites, and this target was used for the water resource and water recycling capacity assessments. For the water supply and used water (wastewater) collection assessments, the capacity of the individual sites was considered.

[1] ED166 Inspector's Interim findings 29 August 2018
https://www.aylesburyvaledc.gov.uk/sites/default/files/page_downloads/ED166%20Interim%20findings%2029%20August%202018%20.pdf

2 ED180B AVDC Response to Discussion Document D5: Implementing Interim Findings
https://www.aylesburyvaledc.gov.uk/sites/default/files/page_downloads/ED180B%20AVDC%20Response%20to%20D5%20Implementing%20Interim%20Findings_1.pdf

3 ED181 AVDC Inspector's reply to AVDC's response to D5
https://www.aylesburyvaledc.gov.uk/sites/default/files/page_downloads/ED181%20AVDC%20Inspector%27s%20reply%20to%20AVDC%27s%20response%20to%20%20D5%20.pdf

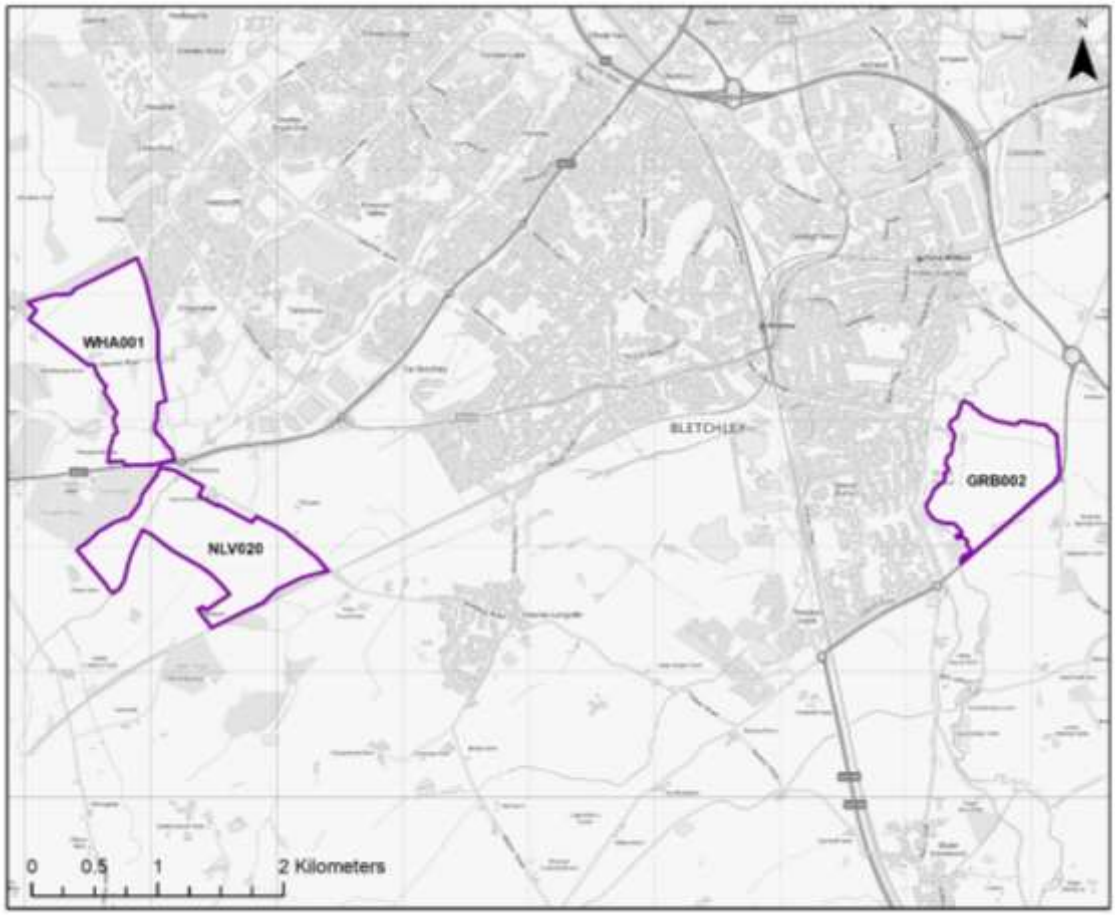
4..Aylesbury Vale District Council. (2017) Water Cycle Study: Phase 1 Available online at:
https://www.aylesburyvaledc.gov.uk/sites/default/files/page_downloads/Aylesbury%20Vale%20Water%20Cycle%20Study%20Pase%201%20%28Final%29%20v2.0.pdf. Accessed on: 11/03/19

The water quality assessment was carried out as a final stage of the development of this addendum, at which point the Council was working towards identifying a site to allocate 1,117 homes. It was therefore agreed that the water quality modelling reported in section 5.2 should test an increased allocation of 1,200 homes in North East Aylesbury Vale.

Table 2-1: Additional sites under consideration

Site Ref	Site Address	Residential Units Tested
NLV020	Land At Weasel's Lodge, Surrounding Farm Land	1100
GRB002	Land at Eaton Leys, west of the A4146, south of Watling Street and east of the River Ouzel	1200
WHA001	Shenley Park, Shenley Road	1600

Figure 2-1: Additional sites under consideration



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All of the sites would receive water and wastewater services from Anglian Water and be served by Cotton Valley Water Recycling Centre (WRC).

3 Water Resources

The 2017 WCS reviewed Anglian Water's 2015 Water Resource Management Plan (WRMP). Whilst this plan remains in place, Anglian Water have published their 2019 revised draft Water Resource Management Plan[5] (revised dWRMP) which, subject to regulatory approval, will be implemented from 2020. This revised dWRMP is reviewed below, with an emphasis on the Ruthamford South Water Resource Zone (WRZ) which supplies the north of Aylesbury Vale district.

3.1 The Supply-Demand Balance

The supply-demand balance, across the Anglian Water supply area, is under great pressure from the effects of population growth, climate change, sustainability reductions and the requirement to increase resilience to drought. The pressures increase the need to invest into demand management and supply-side options across the company. Overall, the impact of the above issues equates to 290 Megalitres per day (Ml/d) by 2045 which is equal to approximately one quarter of the total daily distribution (2017/18). Without demand and supply interventions, this would result in a decline from a company-wide surplus of 144 Ml/d surplus in 2020, to a deficit of -146 Ml/d by 2045. The impacts are not uniformly distributed across the supply area, however Ruthamford South Water Resource Zone (WRZ), which serves the northern half of Aylesbury Vale district, is predicted to be one of the WRZ's that is significantly affected. Table 3-1 shows the predicted supply-demand deficit and improvement upon the supply-demand balance, taking account of the planned actions.

Table 3-1: Ruthamford WRZ supply-demand balance (adapted from the dWRMP)

Baseline supply-demand balance at 2045 (Ml/d)	Baseline supply-demand balance with demand management at 2045 (Ml/d)	Supply-demand balance with demand management and supply-side scheme at 2045 (Ml/d)	Supply-side scheme description
-36.17	-10.18	0.00	Potable water transfer between South Lincolnshire WRZ and Ruthamford North WRZ

3.2 The Preferred Plan

The preferred plan aims to provide the best value for customers over a long-term period. The plan will prioritise demand management and maximise the use of existing resources whilst delivering resilience to drought events. The demand-management will be achieved through smart metering combined with behavioural change, leakage reduction and additional water efficiency activity. Utilisation of these strategies will equate to savings of 123 Ml/d by 2045. Savings per strategy are:

- Smart metering: 51 Ml/d
- Leakage reduction: 106 Ml/d
- Water efficiency: 30 Ml/d

3.3 Per Capita Consumption

The Preferred Plan will, overall, reduce per capita consumption (PCC). Anglian Water estimate that, by 2045, average PCC will have declined to 120 l/h/d which is 12% lower than 2017-2018.

[5] Anglian Water (2019) Revised Draft Water Resource Management Plan 2019. Accessed online at https://www.anglianwater.co.uk/about-us/draft-water-resources-management-plan-2019.aspx on 06/03/2019.

3.4 Population and Household Growth

The revised dWRMP does not include full technical appendices, which will be published with the final plan. A detailed break-down of housing and employment growth considered within the Ruthamford South WRZ was not, therefore, available to analyse. The plan does, however, predict that population growth will, between 2017 and 2045, account for a 13% increase in water demand in Ruthamford South WRZ. The 2017 WCS included a comparison of property and population projections used in the 2015 WRMP with estimates from the Ministry of Housing, Community and Local Government (DCLG)[6]. This is restated below in Table 3-1, which indicates that DCLG projected growth may be some 21,000 units greater than that projected by Anglian Water's current plan.[7]. It is expected that the revised dWRMP will have reviewed future demand, considering the latest DCLG and Local Plan based estimates, and taken these into account into the demand forecasts.

Table 3-1: Comparison of Housing Projections from Anglian Water 2015 WRMP and DCLG 2015 for Ruthamford South

	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
DCLG 2015 Housing Projections	24,369	27,757	26,455	24,615	18,086	121,282
Anglian Water 2015 WRMP estimates	18,500	20,000	20,000	21,000	21,000	100,500

Based on tables 4-4 and 4-5 of the 2017 WCS.

3.5 Conclusion

Whilst it has not been directly evidenced that there would be capacity within Anglian Water's revised dWRMP for Ruthamford South to accommodate an additional 2,000 dwellings within Aylesbury Vale, this would be a relatively small increase on the anticipated housing growth within the zone. Within the period of their emerging plan, Anglian Water would have options to intensify or bring forward initiatives to address both demand (through demand management measures) and supply (through the proposed transfer from Ruthamford North. It is therefore concluded that the availability of water resources would not be a constraint to allocating 2,000 additional homes in the VALP. This does not lessen the need to protect and enhance water resources and promote water efficiency on all developments through policy I5 of the VALP.

Anglian Water reviewed a draft of this addendum, and confirmed that *"there is sufficient headroom within the Ruthamford North Water Resource Zone as outlined in the Revised Draft WRMP in the event that 2,000 dwellings were to come forward in Aylesbury Vale area. (The anticipated water consumption from an additional 2,000 dwellings is only a fraction of this uncertainty allowance for this WRZ.)"*

4 Water supply

Anglian Water provided RAG assessments for water supply at the three sites. Table 6-1 shows the comments. Overall, all sites were classed as "Amber" meaning that they would require infrastructure upgrades for water supply, but no significant constraints to providing this infrastructure have been identified. The assessments were made on an individual site basis, so the potential combined impacts of two or more sites being developed was not considered.

5 Water recycling (wastewater treatment)

The three sites considered in this addendum would all be served by Cotton Valley WRC. This treatment works is located within Milton Keynes Borough and primarily serves Milton Keynes, along with small areas within Aylesbury Vale and Central Bedfordshire. The 2017 Aylesbury Vale WCS did not consider headroom capacity or water quality

[6] Department for Communities and Local Government (2016) 2014-Based Household Projections, 2012 - 2039. Available online at https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections. Accessed on 08/02/2018

[7] Water Resources Management Plan 2015. (2015). Anglian Water. Accessed online at: https://www.anglianwater.co.uk/_assets/media/WRMP_2015.pdf

impacts at Cotton Valley WRC, because the total committed and proposed housing (2,584 units) within Aylesbury Vale that would drain to this works was small relative to the growth planned within Milton Keynes Borough (29,750).. Analysis of Cotton Valley WRC *is* included within the 2017 Milton Keynes WCS[8], which has, therefore, been used to inform this assessment.

5.1 Headroom Assessment

The WRC headroom capacity assessment in the Milton Keynes WCS (table 4-3, page 20) was calculated based upon development of 29,981 dwellings which translated to a total Dry Weather Flow (DWF), after growth, of 61,411 m^3/d. After this growth, headroom capacity is estimated to be 16,589 m^3/d, equating to the potential for an additional 54,507 dwellings within the WRC catchment. Consequently, based upon these figures within the Milton Keynes WCS, it is considered that there is sufficient headroom capacity within the WRC to accommodate the additional 2,000 homes being considered for allocation within Aylesbury Vale.

The following question was posed to Anglian Water for comment; **'Does Anglian Water agree that there is sufficient evidence in the Milton Keynes WCS and in its own assessments to confirm that there is adequate capacity to accommodate flows from 2,000 additional homes within AVDC?'.**

Anglian Water responded: *"We can confirm that currently there is available capacity for a further 2,000 dwellings in the Aylesbury Vale District administrative area draining to Cotton Valley WRC as well as the 29,281 dwellings identified in the Milton Keynes Water Cycle Study. (This is based an assessment of Dry Weather Flow only and has not considered biological capacity at Cotton Valley WRC)."*

In their RAG assessment of the three sites (Table 6-1) also stated, for each site, that *"enhancement to treatment capacity may be required."*

5.2 Water Quality Assessment

The water quality assessment within the Milton Keynes WCS (section 4.7.2 pages 23-24) is based upon the growth figures also used in the headroom capacity assessment. The assessment confirms that with the additional proposed 29,981 dwellings, the increased wastewater flows can be treated without impacting upon water quality objectives. The EA's River Quality Planning (RQP) tool was used in the Milton Keynes WCS. This uses a Monte Carlo mass balance approach to predict water quality at the point of mixing for a WRC. This assessment concluded that the required future permit for BOD (7.09mg/l) is achievable using conventional treatment technology. The required future ammonia permit (1.08mg/l) is close to what is considered the Technologically Achievable Limit (TAL) of 1mg/l, and hence there is a risk that, with an additional 2,000 dwellings in the catchment, the standard of treatment required to prevent a deterioration of Ammonia concentrations in the receiving watercourse may be slightly below Technologically Achievable Limits. As a consequence, the Environment Agency[9] advised that it would be pertinent to quantify the risk posed by the proposed additional dwellings. The EA also provided all of the data required to undertake modelling of the baseline (present-day) impact of discharges from Cotton Valley WRC using the EA's River Quality Planning (RQP) model. Full details of the modelling methodology are included in Appendix B of the main Aylesbury Vale Water Cycle Study report.

AVDC advised (in June 2019) that the water quality assessment should be based on an additional 1,200 homes discharging to the Cotton Valley catchment. The additional effluent flow per dwelling was calculated from the data presented in the Milton Keynes WCS, and used to calculate the additional contribution from Aylesbury Vale (see Table 5-1). Baseline water quality impacts were calculated based on the current DWF from Cotton Valley WwTW, followed by the future impact scenario both with and without the contribution from Aylesbury Vale. This is

[8] Milton Keynes Water Cycle Study. (2017). Milton Keynes Council. Accessed online at: https://www.milton-keynes.gov.uk/assets/attach/48386/Milton%20Keynes%20Water%20Cycle%20Study%202017_v2_Final%20draft%20for%20issue.pdf .

[9] Letter from Environment Agency to Aylesbury Vale District Council dated 06/06/2019, reference WA/2006/000227/CS-15/PO1-L01

summarised for each determinand in Table 5-3. The analysis conducted by JBA is broadly in line with that contained in the Milton Keynes WCS, although some small differences are observed, likely to be due to minor differences in the source data. Detailed results are included within Appendix A.

Table 5-1: Calculation of additional effluent volume as a result of growth in Milton Keynes and Aylesbury Vale

Additional effluent flow from growth (Milton Keynes WCS)	12,122 m^3/d
Growth forecast used in WCS	29,981 dwellings
Additional effluent flow per dwelling	0.404 m^3/d
Growth from Aylesbury Vale	1,200 dwellings
Additional effluent from Aylesbury Vale (effluent flow per dwelling multiplied by number of dwellings)	485 m^3/d
Total additional effluent flow from growth	12,607 m^3/d

5.2.1 Biochemical Oxygen Demand (BOD)

Deterioration is predicted to be 2% in the future growth scenario, and there is no deterioration in WFD class. The deterioration due to the additional growth from Aylesbury Vale is negligible.

5.2.2 Ammonia

The reported Cycle 2 WFD status for Ammonia is High at the downstream sampling point, however the baseline predicted water quality would give a moderate status. This is also reported in the Milton Keynes WCS. This discrepancy is because RQP is predicting the concentration of ammonia at the point of mixing, which is a considerable distance upstream of where the WFD status is assessed. Natural decay of ammonia and additional dilution is likely to occur over this distance, but the effect of this cannot be quantified without catchment scale modelling using SIMCAT. The predicted deterioration, at the point of mixing is 10%, and therefore a permit variation may be required to prevent deterioration.

In order for the concentration of ammonia at the point of mixing to achieve the WFD High status, modelling predicts that a permit of 1.01mg/l (as a 95th percentile) would need to be applied. This is essentially equal to the currently agreed Technically Achievable limit (1mg/l) for ammonia. It was, therefore, considered appropriate to test alternative options for setting a permit variation for ammonia at Cotton Valley, in line with the options set out in the EA's operational instruction 50_12 Water Quality Planning: no deterioration and the Water Framework Directive. The results are presented overleaf in Table 5-2. In summary, modelling indicates that a 10% improvement over the existing ammonia concentrations at the point of mixing could be achieved with a permit variation to 2.81mg/l, the first priority option in the EA's guidance. Anglian Water have confirmed that this permit condition would be achievable at Cotton Valley WRC.
A final test was made with growth only from Milton Keynes, excluding the additional 1,200 dwellings in Aylesbury Vale. The modelling indicated that a permit variation to 2.82mg/l would be required in this case, illustrating that the contribution of growth in Aylesbury Vale is negligible compared to the growth in Milton Keynes.

Table 5-2: Options for ammonia permit variation at Cotton Valley WRC

(based on table in Environment Agency (2012) Water Quality Planning: no deterioration and the Water Framework Directive)

Option	Which target	When to use it	Is this approach achievable at Cotton Valley WRC?
1	Current quality + 10%	In most cases it is feasible to achieve the permit limit and it will not result in deterioration beyond the class limit. If determining a new permit use the current upstream quality as the baseline. If determining a permit variation use the current downstream quality as the baseline.	Yes. A 10% improvement in ammonia at the point of mixing is possible with a permit variation to 2.81mg/l (95-percentile). This is within TAL and is therefore considered to be achievable. Anglian Water have confirmed that this would be achievable.
2	Class limit immediately downstream of the discharge	In some cases where it is not feasible to achieve no more than 10% deterioration in the water quality	Potentially. The current waterbody class is High, but this is assessed over 10km downstream at Tyringham Bridge. Natural decay of ammonia and additional dilution is likely to occur over this distance, but the effect of this cannot be quantified without catchment scale modelling using SIMCAT. In order for the concentration of ammonia at the point of mixing to achieve the WFD High status, a permit of 1.01mg/l (as a 95th percentile) would need to be applied. This is equivalent to the current Technically Achievable limit (1mg/l).
3	Achieve a higher standard based on previously established RE class. Historic compliant quality + 10%	Where the baseline WFD class is lower than the historic reported RE class because of a temporary deterioration in the data used to produce the classification.	Method is not applicable in this case
4	Allow 15% of the water body or 1.5 km of classified watercourse length (whichever is the lower amount) to be in worse condition than the overall status	Where the receiving water is little more than a small tributary with little amenity or ecological value so long as deterioration is prevented when the tributary reaches the major watercourse. In other exceptional cases where it is not feasible to set limits using the approach in **1**, **2** or **5** this approach may be used.	Not tested – this would require catchment modelling to determine.
5	Class limit at downstream monitoring point	In some cases where it is not feasible to achieve <10% deterioration in receiving water quality or to achieve the class limit immediately downstream of the discharge.	Not tested – this would require catchment modelling to determine.
6	Current downstream quality + <10%	This approach may be considered, along with **7** below when you want to limit deterioration where there is no lower class limit.	Not tested but achievable on the basis that option 1 is achievable

Option	Which target	When to use it	Is this approach achievable at Cotton Valley WRC?
7	Current downstream quality	Only use in exceptional circumstances, e.g. to prevent a poor or bad water body from getting significantly worse	Not applicable
8	Allow deterioration from High to Good status	Only in exceptional circumstances on the grounds of new sustainable development activity.	Not applicable

5.2.3 Phosphate

The reported Cycle 2 WFD status for Phosphate is Poor at the downstream sampling point. It is also predicted to be poor at the point of mixing, with a deterioration of 8% from the baseline, and no deterioration in class after growth. Assuming upstream flow was at mid-good status for phosphate, treatment at the technically achievable limit would not allow the good ecological status target to be met. It would however allow moderate status to be met.

Table 5-3 Summary of RQP results

Determinand	Baseline (mg/l)	Future scenario (excluding growth from Aylesbury Vale (mg/l)	Future scenario – including Aylesbury Vale (mg/l)	% Deterioration due to growth	Deterioration in WFD Class	Impact of Aylesbury Vale growth on deterioration
BOD (90^{th} %ile)	2.48	2.53	2.53	2%	NO	<1%
Ammonia (90^{th} %ile)	0.78	0.85	0.86	10%	NO	<1%
Phosphate (Mean)	0.60	0.65	0.65	8%	NO	<1%

It is therefore concluded that planned growth in Aylesbury Vale served by Cotton Valley WwTW could be accommodated without impacting on water quality if the environmental permit for ammonia were tightened to achieve a 10% improvement over current concentrations at the point of mixing. Anglian Water have confirmed that the required permit variation is achievable. The contribution of growth in Aylesbury Vale (1,200 homes) has been demonstrated to be negligible when compared to the contribution of growth from Milton Keynes (29,981 homes).

Anglian Water has recently published a Water Recycling Long-Term Plan[10]. This recognises the significant growth expected in and around Milton Keynes, and identifies sewer capacity investment for AMP7 2020-2025, subject to approval of the Business Plan by industry regulator OfWAT.

6 Surface water and used water collection (wastewater collection)

Anglian Water provided RAG assessments for surface water and used water collection (their term for wastewater collection) at the three sites. Table 6-1 below shows the comments. Overall, all sites were classed as “Amber” for used water, meaning that they would require infrastructure upgrades, but no significant constraints to providing this infrastructure have been identified. The assessments were made on an individual site basis, so the potential combined impacts of two or more sites being developed was not considered.

[10] https://www.anglianwater.co.uk/siteassets/household/water-recycling-long-term-plan.pdf

There is no capacity to receive the surface water runoff into the existing surface water sewerage systems, and all sites were scored “Red” meaning that there are significant constraints to providing additional capacity. In line with the SuDS surface water discharge hierarchy, surface water from new developments should be discharged to ground or to a watercourse. Connection to a surface water sewer should only be considered where it has been demonstrated that discharge to ground or to a watercourse is not practicable.

All three sites contain and are adjacent to existing watercourses. It is reasonable to expect that these sites would be able to discharge surface water either to ground or to the existing watercourses, subject to demonstrating satisfactory SuDS designs to manage peak flow, volume and water quality. There should, therefore, be no need for these sites to discharge to an existing surface water sewerage system, and therefore the absence of a surface water sewerage system local to these sites with capacity to accept their runoff is not considered to be a significant constraint to their development. The surface water drainage of each site is considered in greater detail in the Level 2 SFRA addendum.

ADDENDUM

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Client	Aylesbury Vale District Council
Date	June 2019
Author	Emily Jones / Richard Pardoe
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Red	Major Constraints to Provision of infrastructure and/or treatment to serve proposed growth
Amber	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required
Green	Capacity available to serve the proposed growth

	Clean Water Supply		Used Water					
Site Ref (dwellings)	**Supply Network RAG**	**Water Comments**	**SW Sewer Connection RAG**	**SW Connection Comments**	**Used Water Capacity RAG**	**WRC Capacity RAG**	**WRC Capacity Comments**	**Overall RAG Rating**
NLV020 (1,100)	Amber	Offsite works are required. Pipework and NRV at Mursley WR to be upsized / reinforced.	Red	There is no capacity to receive surface water flows	Amber	Amber	Enhancement to treatment capacity may be required	Amber
GRB002 (1,200)	Amber	Offsite works are required.	Red	There is no capacity to receive surface water flows	Amber	Amber	Enhancement to treatment capacity may be required	Amber
WHA001 (1,600)	Amber	Reinforcement of the 250mm AC main between the A4146 and the A5.	Red	There is no capacity to receive surface water flows	Amber	Amber	Enhancement to treatment capacity may be required	Amber

Table 6-1: Anglian Water comments concerning the proposed sites

7 Conclusions

7.1 Water resources

Review of the revised Anglian Water WRMP shows that there is a foreseen increase in the supply-demand imbalance, which is likely to increase by 2045. Whilst it has not been directly evidenced that there would be capacity within Anglian Water's revised dWRMP for Ruthamford South to accommodate an additional 2,000 dwellings within Aylesbury Vale, this would be a relatively small increase on the anticipated housing growth within the zone. Within the period of their emerging plan, Anglian Water would have options to intensify or bring forward initiatives to address both demand (through demand management measures) and supply (through the proposed transfer from Ruthamford North. It is therefore concluded that the availability of water resources would not be a constraint to allocating 2,000 additional homes in the VALP.

7.2 Water supply

Anglian Water provided RAG assessments for water supply at the three sites. Overall, all sites were classed as "Amber" meaning that they would require infrastructure upgrades for water supply, but no significant constraints to providing this infrastructure have been identified.

7.3 Water recycling (wastewater treatment)

Based upon an assessment of treatment headroom at Cotton Valley WRC within the Milton Keynes WCS, it is considered that there is sufficient volumetric headroom capacity within the WRC to accommodate the additional 2,000 homes being considered for allocation within Aylesbury Vale. Anglian Water have confirmed this, although have stated that enhancement to treatment capacity may be required, but not constraints to providing this have been identified.

A water quality impact assessment indicates that planned growth within Milton Keynes plus an additional 1,200 dwellings within AVDC could be accommodated for phosphate and BOD with no change of permit. Planned growth could be accommodated without impacting on water quality if the environmental permit for ammonia were tightened to achieve a 10% improvement over current concentrations at the point of mixing. Anglian Water have confirmed that the required permit variation is achievable. The contribution of growth in Aylesbury Vale (1,200 homes) has been demonstrated to be negligible when compared to the contribution of growth from Milton Keynes (29,981 homes).

7.4 Surface water and used water collection (wastewater collection)

All sites were classed as "Amber" for used water, meaning that they would require infrastructure upgrades, but no significant constraints to providing this infrastructure have been identified.

There is no capacity to receive the surface water runoff into the existing surface water sewerage systems, and all sites were scored "Red" meaning that there are significant constraints to providing additional capacity. In line with the SuDS surface water discharge hierarchy, surface water from new developments should be discharged to ground or to a watercourse. Connection to a surface water sewer should only be considered where it has been demonstrated that discharge to ground or to a watercourse is not practicable.

APPENDICES

APPENDIX A: WATER QUALITY IMPACT MODELLING

A.1 Cotton Valley WRC with growth in Milton Keynes and Aylesbury Vale

Water Quality Assessment Datasheet | Cotton Valley WRC

STW	Cotton Valley WRC
Catchment	Thames
STW Point Code	CVALLEY
Assessment Date	27/06/2019
Receiving Water	River Great Ouse
WFD Waterbody ID	GB105033047923 - Ouse (Newport Pagnell to Roxton)
Upstream Sample Point	05M03 - R.OUSE B526 RD.BR.NEWPORT PAGNELL
Downstream Sample Point	11M02 - R.OUSE TYRINGHAM BRIDGE

Permit Reference Number

AWCNF/10296

Forecast Growth up to 2033 (Housing units)	**31,181 (1,200 from Aylesbury Vale)**

STW Permit limits

Determinand	Unit	Limit	Statistic	Limit 2	Statistic	Comments/Assumptions
Permitted DWF	m3/day	78000	80%ile			
Post-Growth DWF	m3/day					
Max Daily	m3/day		Max Value			
BOD	mg/l	12	95 %ile			
Ammonia	mg/l	5	95 %ile			
Phosphate	mg/l	1	AA			Permit limit of 1 mg/l proposed for AMP7 - tbc

Upstream River data

Determinand	Unit	Mean	SD	90 %ile	95 %ile	Comments/Assumptions
Flow	Ml/d	682.819			71.712	from Low Flows Enterprise [H&T, Feb 2012]. N.B. Flows based on location on main river rather than discharge lagoon.
BOD	mg/l	1.38	0.78			Since last step change. 13/05/04 to 02/05/17
Ammonia	mg/l	0.05	0.1			No step changes, entire data set from 2000 to 09/03/17
Phosphate	mg/l	0.15	0.067			Since last step change. 26/11/06 to 09/03/17

STW discharge data

Determinand	Unit	Mean	SD	Shift Parameter	Samples	Comments/Assumptions
Flow	Ml/d	71.858	22.012	53.894		Observed flow for 2018, provided by EA East Anglia, email of 25/06/2019
Additional Flow due to Growth	Ml/d	12.607				Growth in Milton Keynes (from MK WCS) and AVDC (1,200 homes)
Post-Growth flow	Ml/d	84.465	25.874	63.349		
BOD	mg/l	2.170	1.740			No step changes, entire data set from 2000 to 23/05/17
Ammonia	mg/l	1.790	0.880			Since last step change. 05/03/13 to 22/05/17
Phosphate	mg/l	2.57	1.01			OSM data (total P, det 0348). All data since 2015

Salmonid Fishery (Y/N)	No

WFD Cycle 2

Determinand	Cycle 2 (2016)	Statistic	Unit	Standard	D/S sampling point +10%	No deterioration limit	Comments/Assumptions
BOD	High	90 %ile	mg/l	4	No data	4	
Ammonia	High	90 %ile	mg/l	0.3	No data	0.3	
Phosphate	Poor	Annual Average	mg/l	1.057	No data	1.057	

TEST 1. Limit deterioration to 10%

Determinand	Results worksheet	Baseline conc.	Results worksheet	Future conc.	Percentage Deterioration		Comments/Assumptions
BOD	RQP1	2.48	RQP2	2.53	2%		Deterioration is less than 10%.
Ammonia	RQP3	0.78	RQP4	0.86	10%		Deterioration of 10%
Phosphate	RQP5	0.60	RQP6	0.65	8%		Deterioration is less than 10%.

TEST 2. No deterioration in sub-element class

Determinand	Statistic	Unit	Current water body sub-element class	Future discharge quality required to maintain current class	Change to current permit?	Results worksheet	Comments/Assumptions
BOD	95%ile	mg/l	High	N/A	N/A	RQP7	Not assessed as deterioration is 0%
Ammonia	95%ile	mg/l	High	1.01	Yes	RQP8	This assessment is to meet High status *at the point of mixing*
Ammonia	95%ile	mg/l	High	3.14	Yes	RQP18	This assessment is to meet no deterioration at the point of mixing
Ammonia	95%ile	mg/l	High	2.81	Yes	RQP19	This assessment is to meet a 10% improvement on quality at the point of mixing
Phosphate	Annual Average	mg/l	Poor	N/A	N/A	RQP9	Not assessed at deterioration is 0%

TEST 3. Could the development alone prevent the sub-element achieving its Future Target Class if upstream water quality were improved?

Determinand	Target Status	Target conc.	Effluent quality required to achieve target				Comments/Assumptions
			Results worksheet	Present day	Results worksheet	Future	
BOD	High	4	RQP10	N/A	RQP14	N/A	Not tested - currently meeting sub-element target status
Ammonia	High	0.3	RQP11	1.12	RQP15	1.01	
Phosphate	Good	0.081	RQP12	0.16	RQP16	0.15	Assuming "mid-good" upstream of 0.063mg/l for mean and SD

A.2 Cotton Valley WRC with growth in Milton Keynes but not in Aylesbury Vale

Water Quality Assessment Datasheet — Cotton Valley WRC

STW	Cotton Valley WRC
Catchment	Thames
STW Point Code	CVALLEY
Assessment Date	27/06/2019
Receiving Water	River Great Ouse
WFD Waterbody ID	GB105033047923 - Ouse (Newport Pagnell to Roxton)
Upstream Sample Point	05M03 - R.OUSE B526 RD.BR.NEWPORT PAGNELL
Downstream Sample Point	11M02 - R.OUSE TYRINGHAM BRIDGE

Permit Reference Number

AWCNF/10296

Forecast Growth up to 2033 (Housing units)	**29,981 (Milton Keynes only, excludes 1,200 in Aylesbury Vale)**

STW Permit limits

Determinand	Unit	Limit	Statistic	Limit 2	Statistic	Comments/Assumptions
Permitted DWF	m3/day	78000	80%ile			
Post-Growth DWF	m3/day					
Max Daily	m3/day		Max Value			
BOD	mg/l	12	95 %ile			
Ammonia	mg/l	5	95 %ile			
Phosphate	mg/l	1	AA			Permit limit of 1 mg/l proposed for AMP7 - tbc

Upstream River data

Determinand	Unit	Mean	SD	90 %ile	95 %ile	Comments/Assumptions
Flow	Ml/d	682.819			71.712	from Low Flows Enterprise [H&T, Feb 2012]. N.B. Flows based on location on main river rather than discharge lagoon.
BOD	mg/l	1.38	0.78			Since last step change. 13/05/04 to 02/05/17
Ammonia	mg/l	0.05	0.1			No step changes, entire data set from 2000 to 09/03/17
Phosphate	mg/l	0.15	0.067			Since last step change. 26/11/06 to 09/03/17

STW discharge data

Determinand	Unit	Mean	SD	Shift Parameter	Samples	Comments/Assumptions
Flow	Ml/d	71.858	22.012	53.894		Observed flow for 2018, provided by EA East Anglia, email of 25/06/2019
Additional Flow due to Growth	Ml/d	12.122				Growth in Milton Keynes (from MK WCS)
Post-Growth flow	Ml/d	83.980	25.725	62.985		
BOD	mg/l	2.170	1.740			No step changes, entire data set from 2000 to 23/05/17
Ammonia	mg/l	1.790	0.880			Since last step change. 05/03/13 to 22/05/17
Phosphate	mg/l	2.57	1.01			OSM data (total P, det 0348). All data since 2015

Salmonid Fishery (Y/N)	No

WFD Cycle 2

Determinand	Cycle 2 (2016)	Statistic	Unit	Standard	D/S sampling point +10%	No deterioration limit	Comments/Assumptions
BOD	High	90 %ile	mg/l	4	No data	4	
Ammonia	High	90 %ile	mg/l	0.3	No data	0.3	
Phosphate	Poor	Annual Average	mg/l	1.057	No data	1.057	

TEST 1. Limit deterioration to 10%

Determinand	Results worksheet	Baseline conc.	Results worksheet	Future conc.	Percentage Deterioration		Comments/Assumptions
BOD	RQP1	2.48	RQP2	2.53	2%		Deterioration is less than 10%.
Ammonia	RQP3	0.78	RQP4	0.85	9%		Deterioration of 10%
Phosphate	RQP5	0.60	RQP6	0.65	8%		Deterioration is less than 10%.

TEST 2. No deterioration in sub-element class

Determinand	Statistic	Unit	Current water body sub-element class	Future discharge quality required to maintain current class	Change to current permit?	Results worksheet	Comments/Assumptions
BOD	95%ile	mg/l	High	N/A	N/A	RQP7	Not assessed as deterioration is 0%
Ammonia	95%ile	mg/l	High	0	Yes	RQP8	Not assessed - see assessment with AVDC growth included
Ammonia	95%ile	mg/l	High	0	Yes	RQP18	Not assessed - see assessment with AVDC growth included
Ammonia	95%ile	mg/l	High	2.82	Yes	RQP19	This assessment is to meet a 10% improvement on quality at the point of mixing
Phosphate	Annual Average	mg/l	Poor	N/A	N/A	RQP9	Not assessed - see assessment with AVDC growth included

TEST 3. Could the development alone prevent the sub-element achieving its Future Target Class if upstream water quality were improved?

Determinand	Target Status	Target conc.	Effluent quality required to achieve target				Comments/Assumptions
			Results worksheet	Present day	Results worksheet	Future	
BOD	High	4	RQP10	N/A	RQP14	N/A	Not assessed - see assessment with AVDC growth included
Ammonia	High	0.3	RQP11	0	RQP15	0	Not assessed - see assessment with AVDC growth included
Phosphate	Good	0.081	RQP12	0	RQP16	0.00	Not assessed - see assessment with AVDC growth included