Drainage Impact Assessment

Project Title:

Burgh Road, Aylsham

Anglian Water Services contact:

Rob Morris

Senior Growth Planning Engineer

Thorpe Wood House

Thorpe Wood

Peterborough

PE3 6WT

Mobile Number: 07702341018

Our reference number: 17563

13 January 2017

1. Summary

This report has been undertaken in response to an enquiry from Keir Living Limited to determine the impact of flows from the site at Burgh Road, Aylsham on the performance of the existing foul sewer network and develop a feasible foul drainage solution. It should be read in conjunction with the pre-planning report dated 19 October 2016, which indicated that a direct connection to the public foul sewer system is likely to have a detrimental effect on the existing sewerage network.

The analysis has been performed on the foul system only. There has been no consideration of the surface water flows as this is not within the scope of the study.

The additional foul flows from the development site comprising 300 dwellings were modelled connecting to manhole reference no. TG20261602 (grid ref: TG 20141 26680) located on Burgh Road.

The study concludes that the development will cause detriment to the capacity of the sewer system and will result in increased flood risk detriment downstream of the proposed connection point.

In order to mitigate the impact of the proposed development upon the network the following option is recommended:

- Provide 194m^3 of off-line storage at the connection location. Alternatively this storage requirement could be located within the development site and delivered by the customer.

The predicted total capital scheme cost for the required off-site mitigation proposal only is £460,629 with an indicative developer contribution of £96,475. The predicted total embodied carbon (tCO_2e) is 61.97. The predicted water footprint (m^3H_2Oe) is 41.10.

The topography of the site indicates that a gravity regime is feasible. Due to the proximity of the site boundary to the connection point it is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network.

The contents of this report and costs supplied are an estimate based on a solution generated by a desktop hydraulic model. These are estimated figures which are not to be relied upon without further detailed investigations.

2. Hydraulic Modelling and Solutions

The proposed development site is located off Burgh Road on the eastern edge of Aylsham (see Figure 1). Foul flows from the site drain to Aylsham Water Recycling Centre (WRC) located to the east of the town. The proposed development comprises 300 residential dwellings only.

To enable the analysis to be performed, the existing hydraulic model for Aylsham was used. This was updated to include recent changes to the system.

Modelling assumptions can be found in APPENDIX 1.

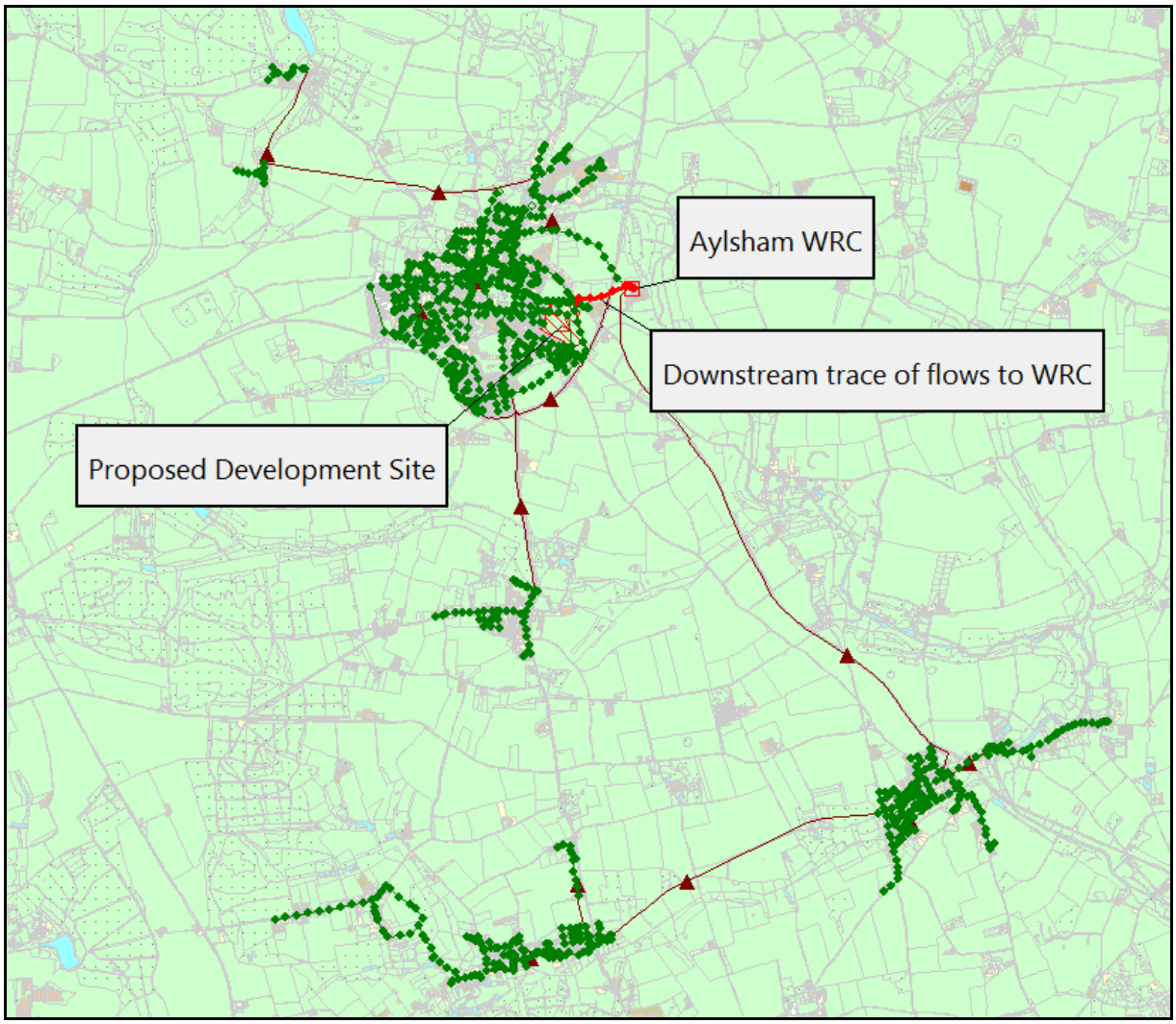

Figure 1: Showing the location of the development site and the proximity of the WRC

Proposed connection point

The proposed connection point for the development is manhole TG20261602 (grid ref: TG 20141 26680) located on Burgh Road. (see Figures 2 and 2a). The diameter of the sewer to which the proposed development will connect is 225mm. A review of the site topography indicates that a gravity regime is feasible.

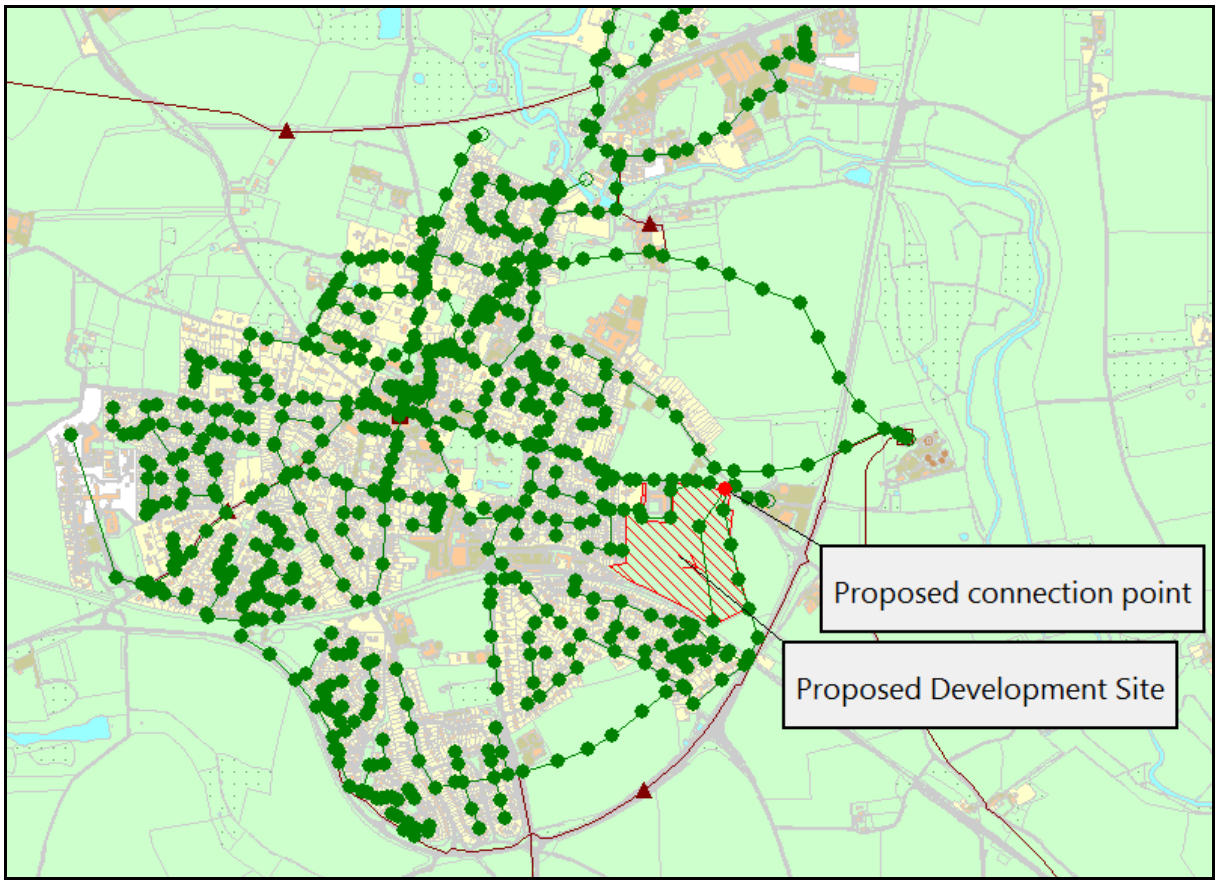

Figure 2: Showing the location of the proposed connection point

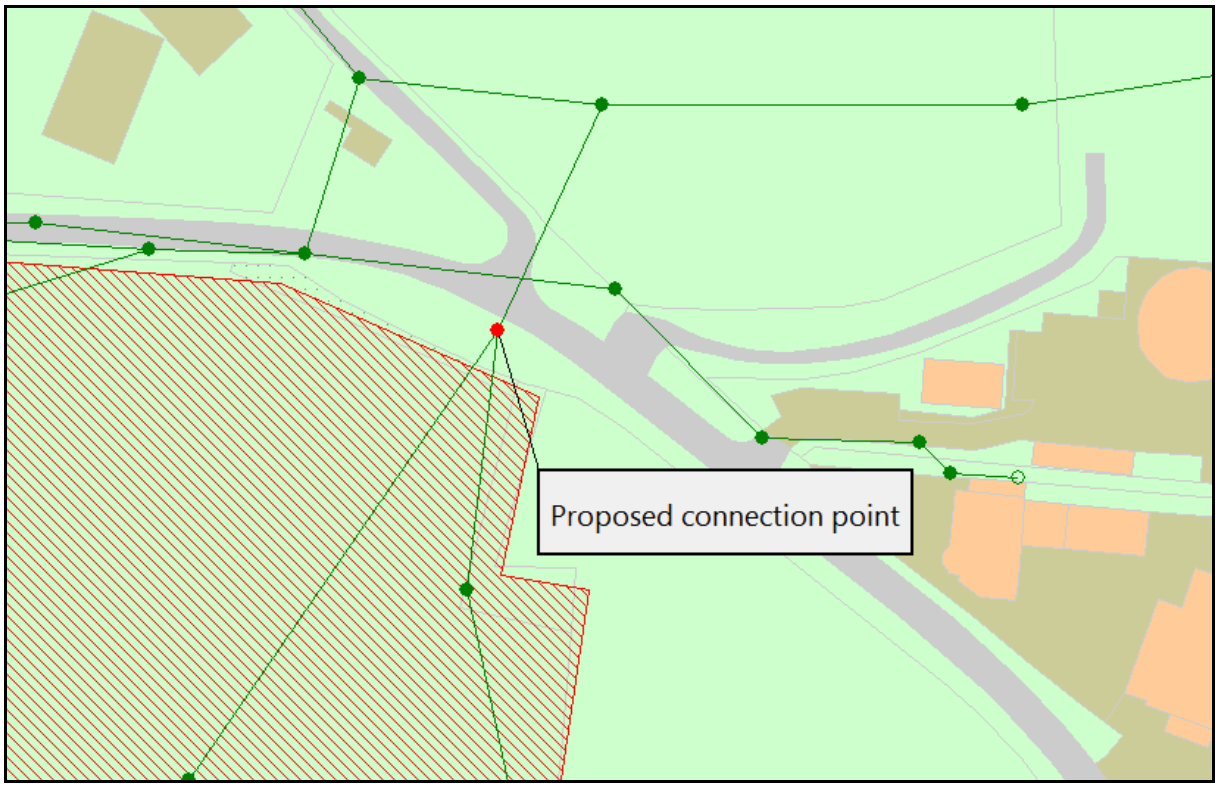

Figure 2a: Showing the location of the proposed connection point (close-up)

Hydraulic modelling

The hydraulic model was run to determine the existing sewer performance during a 1 in 20 year critical duration storm. The model was then re-run with the estimated flows from the site connecting to manhole TG20261602 via a gravity connection.

The model predicts a significant increase in flooding at one manhole which is located at the connection point of the proposed development (see Figure 3). Additional surcharging is not predicted in the network due to the additional flows from the development. There are no hydraulically connected CSOs.

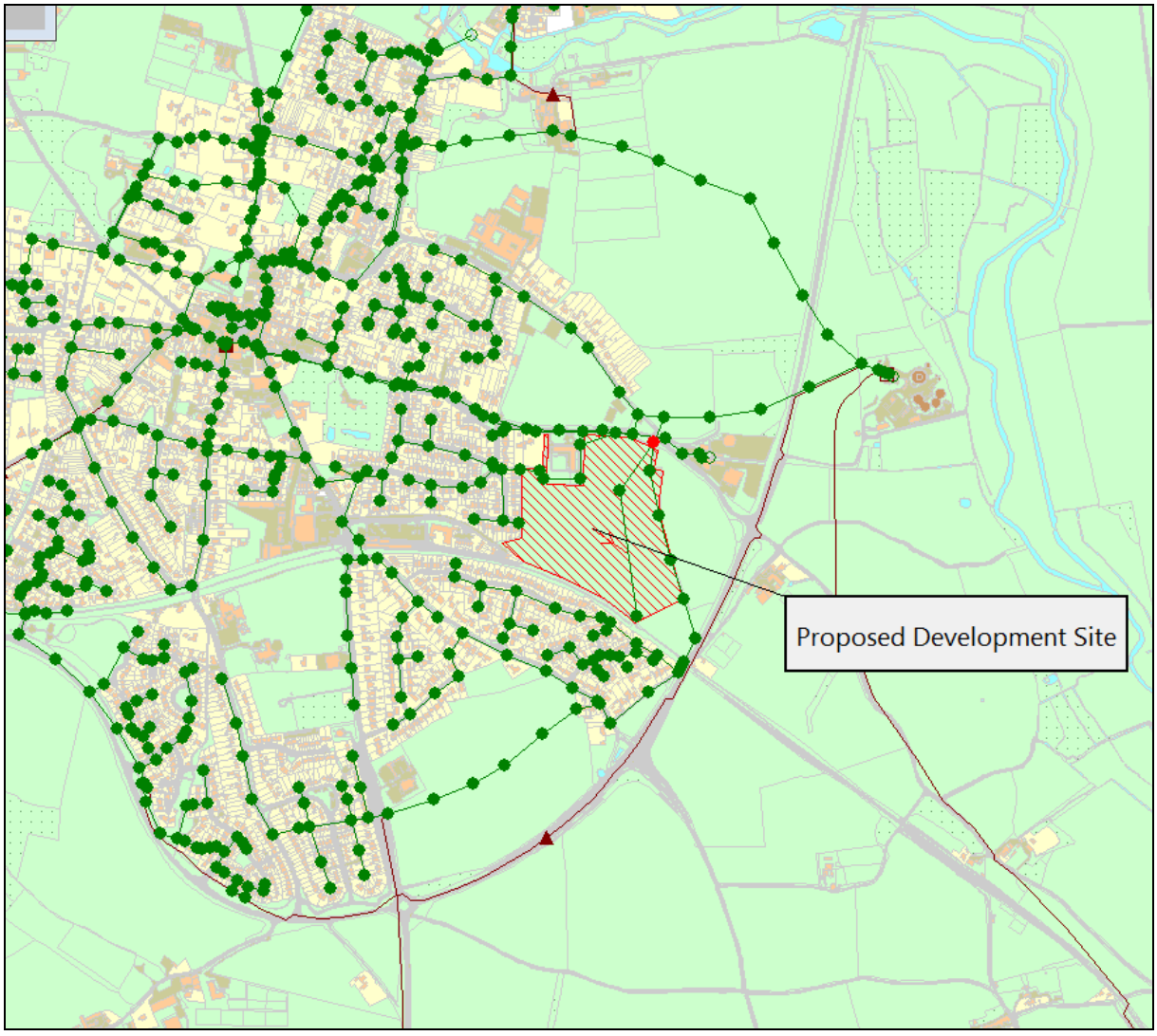

Figure 3: Locations of predicted flooding increase (shown in red)

The level of detriment predicted due to the additional flows from the development means that a mitigation solution will be required to allow the site to connect to the existing sewerage system.

Mitigation Solution

Mitigation solutions are designed to prevent detriment to the existing sewerage network performance during a 1 in 30 year critical duration storm event.

The proposed mitigation solution comprises:

1. Provide 194m^3 of off-line storage at the connection location.

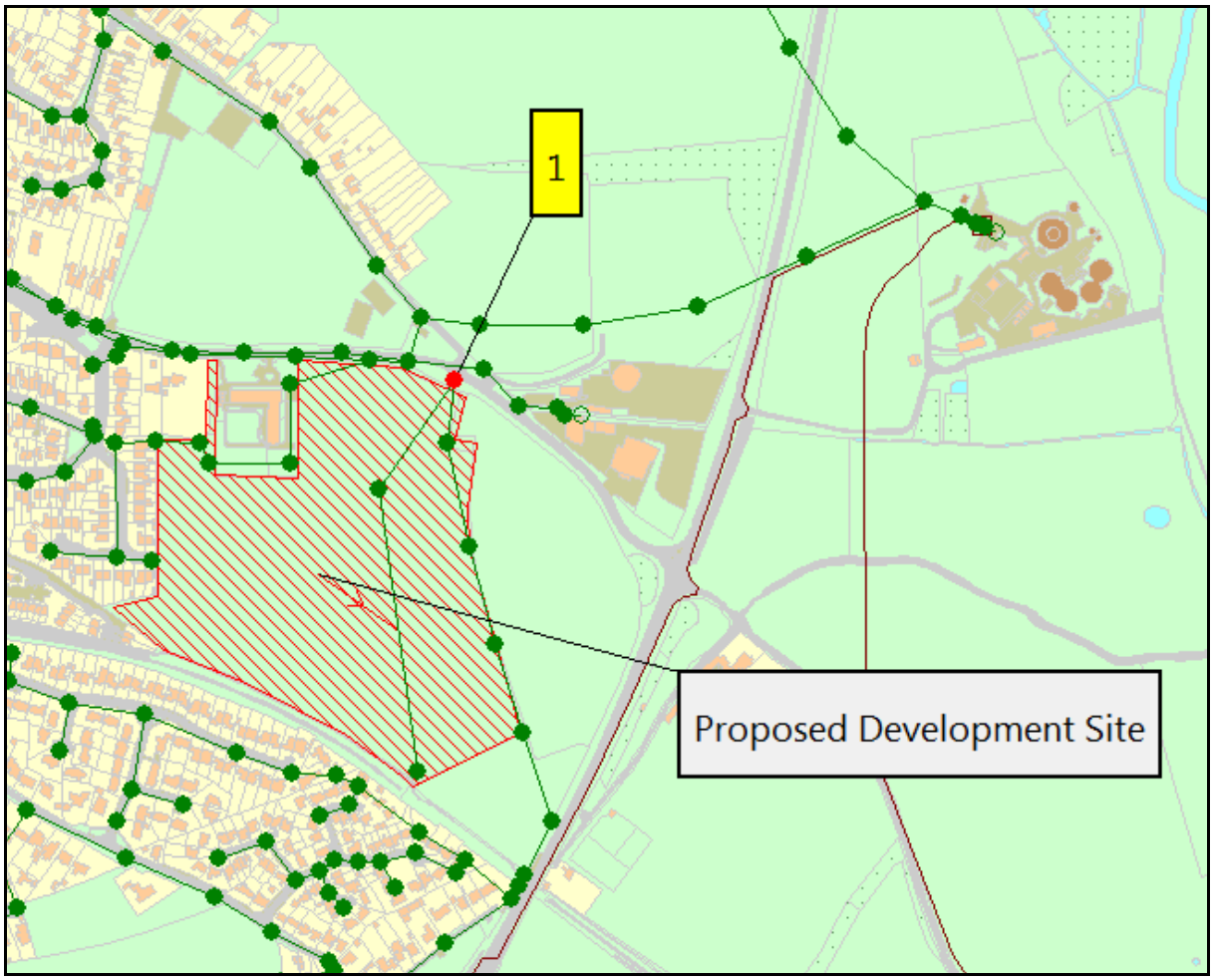

Figure 4: Showing the location of the proposed mitigation solution

This is considered to be a feasible solution for planning application purposes. A detailed design would be required to investigate the solution further.

Alternative Solutions

At detailed design stage alternative solutions may also be considered, this may include online storage or sewer upsizing downstream. The most appropriate solution will however be determined at this stage.

Existing Sewer Capacity

This assessment has considered a sensitivity study for a phased delivery of property count, however as the proposed connection point is already at capacity at baseline it is therefore considered that there is no capacity for any flows from the proposed development prior to mitigation measures being fully implemented.

3. Summary of Cost Estimates

The estimated capital cost for the proposed off-site reinforcement only solution is £460,629.

The Water Industry Act enables the developer to benefit from any wastewater revenue generated from the houses they have built. In simplified terms, future revenue from the new dwellings is offset from the developer's contribution. Instead of paying the full contribution the developer pays the difference between their capital contribution and the future revenue. This is calculated on an annual basis for 12 years (see Appendix 2). The developer has the option of paying this annually (relevant deficit) or upfront as a commuted sum (discounted aggregate deficit).

The indicative cost chargeable to the developer for the required mitigation only option following the offsetting of expected future revenue is predicted to be £96,475. This future revenue has been calculated based on build out rate of 50 residential dwellings per year (see Table 1).

Table1: Showing the predicted developer contribution for mitigation only to an estimated capital cost of £460,629

	HOUSEHOLD							
Year	Cumulative Property Build Rate	Cumulative Revenue impact	Revenue Now	Projected Future Revenue	Total Projected Future Revenue	Annual Repayments of the Loan	Projected Relevant Deficit	Commuted Sum
1	50	25	£4,534	£4,534	£4,534	£44,228	£39,694	£38,821
2	100	75	£13,603	£13,905	£13,905	£44,228	£30,323	£29,003
3	150	125	£22,672	£23,692	£23,692	£44,228	£20,537	£19,210
4	200	175	£31,741	£33,909	£33,909	£44,228	£10,319	£9,440
5	250	225	£40,810	£44,574	£44,574	£44,228	£0	£0
6	300	275	£49,879	£55,702	£55,702	£44,228	£0	£0
7	300	300	£54,413	£62,133	£62,133	£44,228	£0	£0
8	300	300	£54,413	£63,534	£63,534	£44,228	£0	£0
9	300	300	£54,413	£64,971	£64,971	£44,228	£0	£0
10	300	300	£54,413	£66,443	£66,443	£44,228	£0	£0
11	300	300	£54,413	£67,952	£67,952	£44,228	£0	£0
12	300	300	£54,413	£69,499	£69,499	£44,228	£0	£0
TOTAL			£489,720	£570,849	£570,849	£530,741	£100,873	£96,475

Conveyance costs

The modelling has identified that a gravity regime to convey flows from the site to the connection point is feasible.

The connection point is close to the site boundary and it has therefore been assumed that the developer will provide the infrastructure to convey the flows from the site to the respective connection point. Consequently, this report does not include any costs for the conveyance of flows.

The contents of this report and costs supplied are an estimate based on a solution generated by a desktop hydraulic model. These are estimated figures which are not to be relied upon without further detailed investigations.

4. Summary and recommendation

Assumed flows from the site at Burgh Road, Aylsham have been modelled connecting via pump to the existing foul drainage system to manhole reference no. TG20261602 (grid ref: TG 20141 26680) and detriment to the existing performance has been predicted. To mitigate against this a feasible foul drainage solution is proposed comprising:

- Provide 194m^3 of off-line storage at the connection location.

Table 2: Showing estimated costs of proposals

Proposed pre-planning solution	Estimated Capital Cost	Predicted Developer Contribution	Predicted Total Embodied Carbon (tCO2e)	Predicted water footprint (m^3H_2O)
Off-site mitigation only	£460,629	£96,475	61.97	41.10

These are considered to be feasible solutions for planning application purposes.

5. Next steps

To proceed with either of these proposals, it is recommended that an application is made under Section 98 of the Water Industry Act. This will enable a detailed design and robust cost to be generated and the scheme to be delivered. An application form is available on our web site at www.anglianwater.co.uk/developers/drainage-services.aspx

Underwriting detailed design

Detailed design commences on receipt of an underwriting agreement. Payment is only sought from the developer if it chooses to abort the work. Otherwise, it is incorporated into the total scheme cost. For the off-site mitigation only scheme, an underwriting of £28,000 will provide detailed options from which a preferred option may be chosen. A cumulative underwriting of £54,000 will take the preferred option to a level of design where it is ready for construction.

Further work required for section 104 or section 106 applications

Please note, it would be deemed premature by Anglian Water to submit a Section 106 or Section 104 application under the Water Industry Act 1991 to Developer Services prior to a Legal Agreement being signed under Section 98 of the same act ensuring the provision of the necessary upgrade works as identified within this report.

Anglian Water supports sustainable development as set out in the NPPF

The responses made in this report are based on the presumption that your proposed development obtains planning permission. Whilst this report has been prepared to help assess the viability of your proposal, it must not be considered in isolation. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework (NPPF). As a spatial planning statutory consultee, we assist planning authorities in the preparation of a sustainable local plan on the basis of capacity within our water and water recycling (formerly referred to as wastewater) infrastructure. Consequently, any infrastructure needs identified in this report must only be considered in the context of up to date, adopted or emerging local plans. Where local plans are absent, silent or out of date these needs should be considered against the definition of sustainability set out in the NPPF as a whole.

APPENDIX 1.- Development details

Proposed Connection	
Proposed connection location	Burgh Road
Connection sewer or node reference (incl. X&Y)	TG20261602 (grid ref: TG 20141 26680)
Connection sewer diameter	225mm
Connection relative to the development	North-east
Discharge regime	Gravity
Pump discharge rate	N/A
Creep& Storage	
Total creep (5 m^2 per property)	0.15 Ha / 1500m^2
Total development storage (m^3)	180
Pump storage volume, m^3	N/A
Highest Point of development (mAOD)	24.3
Lowest Point of development (mAOD)	17.0

DWF Calculations

	Attribute	Value	Totals	Unit / Calculation
	Development size	8.66		Ha (Digitised Sub-catchment area)
	Residential			
A	Residential dwellings	300		No.
B	Residential occupancy	2.35		No.
C	Residential population (P)	705		No. (A x B)
D	Residential PCC (G)	125		l/h/d
E(avg)	Residential demand - Average		1.02	l/s (C x D)/86400
E(peak)	Residential demand - Peak		2.16	l/s (E(avg) x 2.12)
F	Infiltration		0.25	l/s (0.25 x E(avg))
	Industrial/Trade			
G	Industrial/trade area	0		Ha
H	Industrial/trade discharge per ha	0		l/s
I	Industrial/trade domestic element per ha	0		l/s
J(avg)	Commercial/trade - Average		0	l/s (GxH+GxI)
J (peak)	Commercial/trade- Peak		0	l/s(J(avg) x 3)
	Schools			
K	School PCC	0		l/h/d
L	School occupancy	0		No.
M(avg)	School demand - Average		0	l/s (K x L)/86400
M(peak)	School demand - Peak		0	l/s (M(avg) x 3)
	Other			
N(avg)	Other demand - Average		0	l/s
N(peak)	Other demand - Peak		0	l/s
O(avg)	Total Discharge - Average		1.02	l/s (E(avg)+J(avg)+M(avg)+N(avg))
O(peak)	Total Discharge - Peak		2.16	l/s (E(peak)+J(peak)+M(peak)+N(peak))
	DWF Total - Average		**1.27**	**l/s(O(avg) + F)**
	DWF Total - Peak		**2.41**	**l/s(O(peak) + F)**

APPENDIX 2.- Calculation of relevant deficit and discounted aggregate deficit.

The financial propositions that are available in the Water Industry Act (WIA) are:

- Relevant Deficit (WIA section 100)
- Discounted Aggregate Deficit (WIA section 100A)

Under each option, the cost of installing the required infrastructure is calculated. This cost is then translated into a notional 'loan' to fund the installation. The revenue is then offset over a period of 12 years, taking into account inflation. If the cost of financing the loan exceeds the revenue in any year, then this deficit is charged to the developer.

A2.1 Relevant Deficit

This option takes the actual cost of providing the infrastructure as the basis for a notional loan. On an annual basis (for 12 years) the actual revenue we receive in respect of the infrastructure is then offset against the cost of the annual repayments of the notional loan. The deficit is paid annually by the developer for a period of up to 12 years. This is shown in Figure A2.1 below.

The developer will need to provide an undertaking to pay the deficit each year and also provide security for the estimated annual deficits either in the form of a cash deposit or a bond.

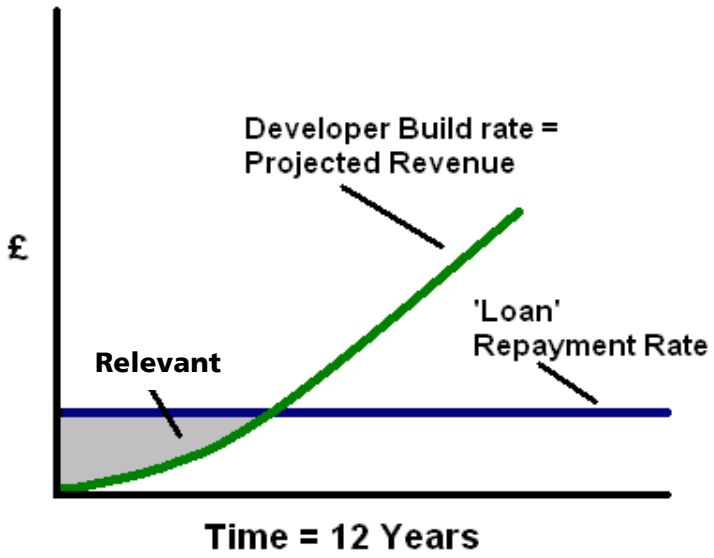

Figure A2.1 – Graphical imagery of a typical Relevant Deficit over 12 years

A2.2 Discounted Aggregate Deficit

This follows the same principles as the Relevant Deficit payment method, except that the deficit will be paid as a single payment and the revenue is estimated from the build rate rather than from the actual revenue.

The yearly relevant deficit is calculated across the 12 years and a discount factor is applied to bring the deficit to its net present value. The deficit is normally reconciled against the security (see below) within 12 months of completing the infrastructure and is payable as a single commuted sum. This can be seen in Figure A2.2.

The developer will need to provide an undertaking to pay the full deficit after reconciliation and a security amount for the estimated deficit either in the form of a cash deposit or a bond. The deficit itself is payable on completion of the water mains following the reconciliation.

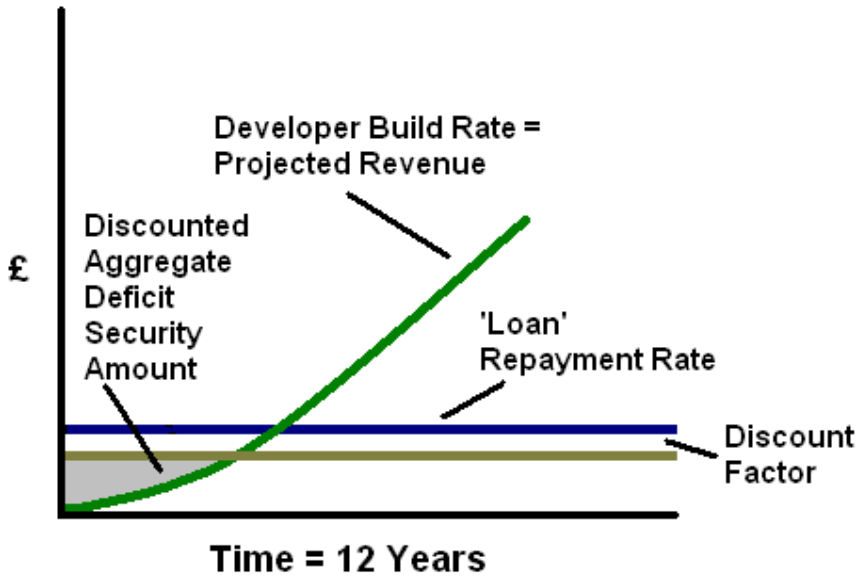

Figure A2.2 – Graphical imagery of a typical Discounted Aggregate Deficit over 12 years

APPENDIX 3.– Embodied carbon and water footprinting

Carbon footprint

In 2006 Anglian Water recognised the impacts of changing climate as one of the most significant challenges facing the organisation. In response we have developed and implemented a strategy of measure, manage and reduce our carbon emissions. We have set ourselves goals to halve our overall greenhouse emissions by 2035 (from 2010 levels).

Water footprinting

Water is our most precious resource and at present we do not fully understand how sustainable each litre of water we supply to our customers is over our full supply chain. In response, we are implementing a strategy of 'water footprinting'.

Primarily water footprinting assesses the impact of human activity on the water environment. The process measures the volumes and scarcity of freshwater consumption including geographical and temporal components in producing a product or service. This is followed by an assessment defining actions required to achieve sustainable and equitable water use especially in water scarcity 'hot spots'.