SEWER IMPACT STUDY

X4503 – 793

SMG 1651

PROPOSED CONNECTION AT GREEN LANE, BICESTER

FOUL AND SURFACE WATER SYSTEM

V2.0 April 2015

Prepared by:	Prashanth Krishnamoorthy
Checked by:	Umesha Halekote
Reviewed by:	Graham Moralee
Approved by:	Mike Carroll

Network & Process Modelling Group
Thames Water Utilities Ltd
Power House, Island Road
Reading, Berkshire
RG2 0RP

Asset Management

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1.0 Introduction

The following report was commissioned by Thames Water's Developer Services to investigate the capacity within the existing foul and surface water network and to ascertain the impact of a proposed new connection on the foul and surface water network at Green Lane, Bicester.

The scope of the study is to undertake a preliminary desktop study based upon an existing hydraulic model.

The scope of the study includes:

- Carry out a manhole survey, pumping station survey and a short-term flow survey
- Build a new hydraulic model of the surface water network
- Model enhancement with manhole and pumping station survey data
- Verify the model using flow survey data
- Check the current performance of the existing network during both dry and wet weather events
- Add development flows to the model and check the impact of additional flow to the sewer network during both dry and wet weather events
- Suggest possible options to allow flows to be accepted into the existing network with no detriment to existing levels of service. It should be noted that these options are indicative and are likely to be subject to change based on site conditions, other utilities and requirements of third parties. However, the options indicate the feasibility of connecting the site to the sewerage system and the ability of the sewerage system to accept the development.

2.0 Background

The proposed new development is on a Greenfield site and the Developer proposes to accommodate 45 new housing units. The development area is situated in the village of Chesterton, locatd to the southwest of Bicester.

The development area is bounded by Green Lane to the south and the A4095 to the west.

The foul flow from the development area has been calculated, using the latest Thames Water guidelines, as an average gravity flow of 2.06l/s. The surface water flow from the development area has been provided by the Developer as a peak flow of 6l/s.

The preferred connection manholes have been identified as SP55218205 for the foul flows and SP55218203 for the surface water flows, both located located to the south of the development site. A plan showing the location of the development and connection point is provided in Appendix A.

3.0 Existing Sewerage System and Treatment Works

The area in the vicinity of the development site is served by a separate foul and surface water sewer network.

From the development site, foul flows in the development area gravitate in a south-easterly direction towards Audley House Sewage Pumping Station (SPS), from where they are pumped to the gravity network draining to Fire Station (Chesterton) SPS.

From here, flows are lifted directly to Bicester Sewage Treatment Works (STW), located approximately 2km downstream of the development site.

Foul flows travel through sewers ranging from 150mm diameter to 250mm diameter sewer from the development area towards Bicester STW.

Surface water flows in the development area gravitate in a south-easterly direction along Green Lane before discharging to Gagle Brook.

Surface water flows travel through sewers ranging from 150mm diameter to 600mm diameter sewer from the development area towards Gagle Brook.

The local foul and surface water sewers are shown in the plan provided in Appendix B.

4.0 Thames Water Drainage Requirements

It is necessary to provide separate foul and surface water drainage systems and to ensure that each system is connected to an appropriate drainage system.

This study considers the impact of both foul and surface water flows discharging from the new development.

As the Developer proposes to connect both foul and surface water flows into the existing network, this report covers the impact of both the foul and surface water flows from the proposed development on the existing sewer networks adjacent to and downstream of the proposed development.

Additional development flows should not cause new or additional flood risk to the existing system in either dry or wet weather.

5.0 Sewer Impact Assessment

Assessment of the hydraulic loading of the foul and surface water network was carried out by means of an existing hydraulic model of the foul network and a newly built hydraulic model of the surface water network.

The model was enhanced with the results of a manhole and pumping station survey carried out in the study area. A flow survey was also completed to enable a verification exercise to be completed, and to confirm the current flows in the sewer network.

The proposed new development area and connection point details were added to the model and the assessment completed to identify the impact of the proposed new development.

The analysis of the catchment indicates that the foul and surface water networks are responsive to rainfall, with flooding being a risk in the catchment for extreme events.

The impact of the proposed foul and surface water connection was assessed based on the design flows detailed in Section 2.0.

5.1 Foul Sewers

5.1.1 Assessment of Existing Catchment

The hydraulic model indicates that the existing foul network does not have available capacity downstream of the proposed connection manhole. The hydraulic model has been used to assess wet weather scenarios of various durations. During these wet weather events, the hydraulic model predicts network surcharge and flooding to occur.

5.1.2 Assessment of Development Catchment

An analysis has been completed to assess the impact of connecting the flows from the development into the public sewer. An allowance of 2.06l/s average gravity flow was used to represent the development.

Table 1: Proposed Development Connection Details

Connection	Manhole	Diameter of Outgoing Sewer
Development Site	SP55218205	150mm

5.1.3 Foul Water System Improvement Works

The hydraulic model indicates that the foul network does not have available capacity downstream of the proposed connection manhole to accept the proposed development flows. On inclusion of the additional flows from the development site, an increase in the predicted volume of flooding and surcharge on the downstream sewer network is predicted to occur.

One indicative option has been developed to prevent the detrimental impact on the existing system, and allow the development site to connect to the existing sewer network. This option has been developed during a preliminary desktop investigation, using the hydraulic model only. The solution identified is intended to indicate the likely extent and magnitude and the network enhancement required to mitigate the predicted detriment and thus inform negotiations between the Developer and Thames Water over the feasibility and likely cost of the connection. A detailed design is required to confirm the size, location and performance of the indicative option before proceeding with any construction. Detailed design may also indicate alternative options.

Option – On-line Storage (See Appendix C1 for Plan)

- Connect development flows to manhole SP55218205.
- Provide approximately 93m^3 on-line storage between manholes SP56210205 and SP56211202 in Green Lane by upsizing three lengths of existing 150mm diameter pipe to 900mm diameter, for a total length of 147m.

5.2 Surface Water Sewers

5.2.1 Assessment of Existing Catchment

The hydraulic model indicates that the existing surface water network does not have available capacity downstream of the proposed connection manhole. The hydraulic model has been used to assess wet weather scenarios of various durations. During these wet weather events, the hydraulic model predicts network surcharge and flooding to occur.

5.2.2 Assessment of Development Catchment

An analysis has been completed to assess the impact of connecting the surface water flows from the development into the surface water sewer. An allowance of 6l/s gravity flow was used to represent the development.

Table 2: Proposed Development Connection Details

Connection	Manhole	Diameter of Outgoing Sewer
Development Site	SP55218203	225mm

5.2.3 Surface Water System Improvement Works

The hydraulic model indicates that the surface water network does not have available capacity downstream of the proposed connection manhole to accept the proposed development flows. However, the hydraulic model predicts an insignificant increase in network surcharge and flooding on inclusion of the additional development flows.

Therefore, improvements to the surface water network system are not required.

6.0 Risks and Issues

Current understanding of the hydrology of urban environments recognises that the effective pervious area (the pervious proportion of the catchment that produces surface runoff and generates flow in the sewer) is likely to exhibit a dynamic nature in relation to increasing volumes of rainfall, i.e. the more rainfall the greater the resulting effective pervious area is likely to be.

Whilst the hydrological models deployed attempt to simulate this dynamic behaviour, there is a risk that the model, when extrapolated to storm events, will not accurately predict the flows in the system. Therefore, any potential error is multiplied when the system is tested against a large design storm.

7.0 Conclusions

The desktop study has successfully investigated and identified the implications of the proposed new development on a Greenfield site at Green Lane, Bicester to the existing foul and surface water networks.

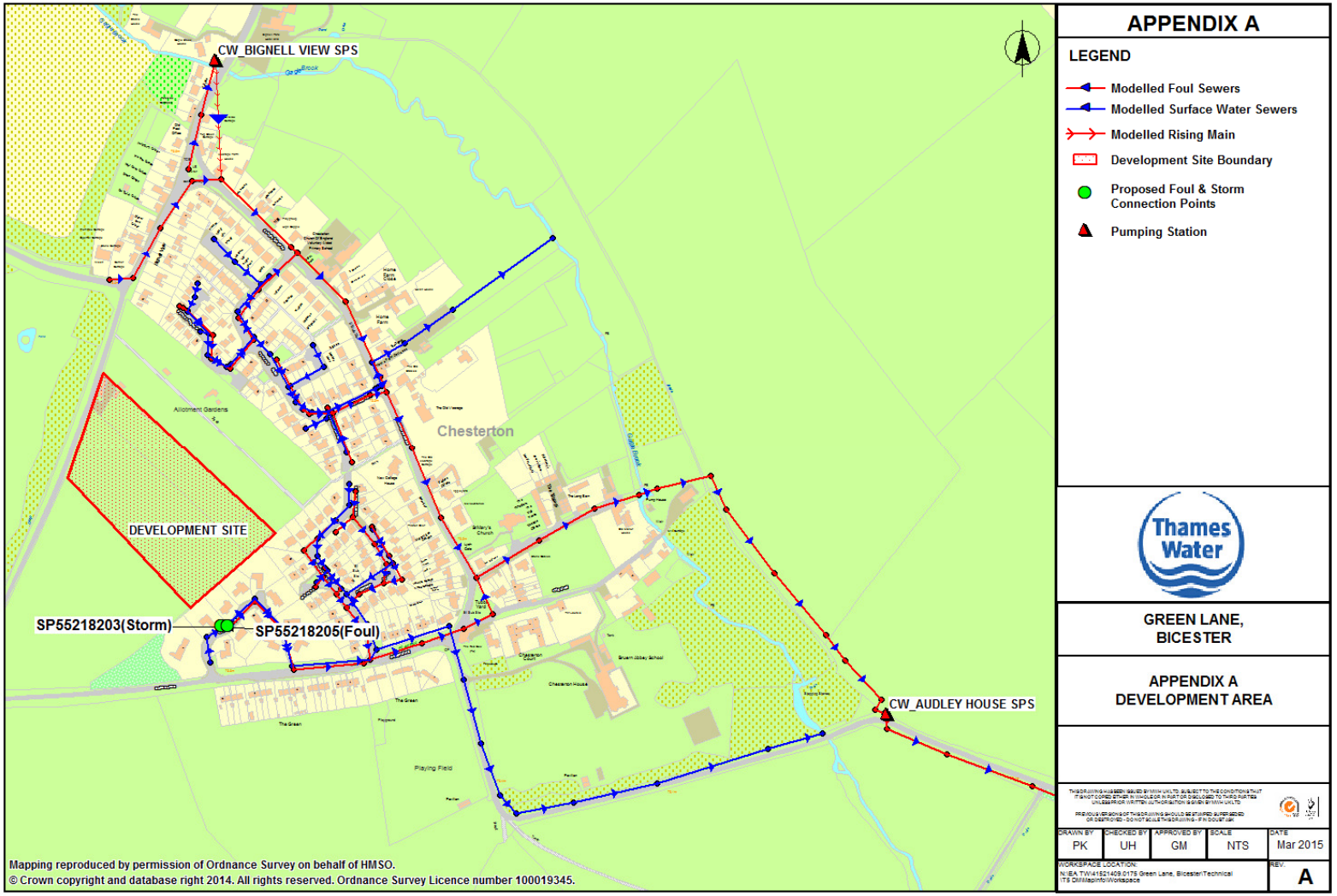
The hydraulic model indicates that the foul network does not have available capacity downstream of the proposed connection manhole to accept the proposed development flows.

Improvements to the existing foul network are required to enable the proposed connection to the sewer network, without causing any detriment to the level of service provided. The proposed indicative option resolves the modelled increase in flooding and surcharge on the sewer network.

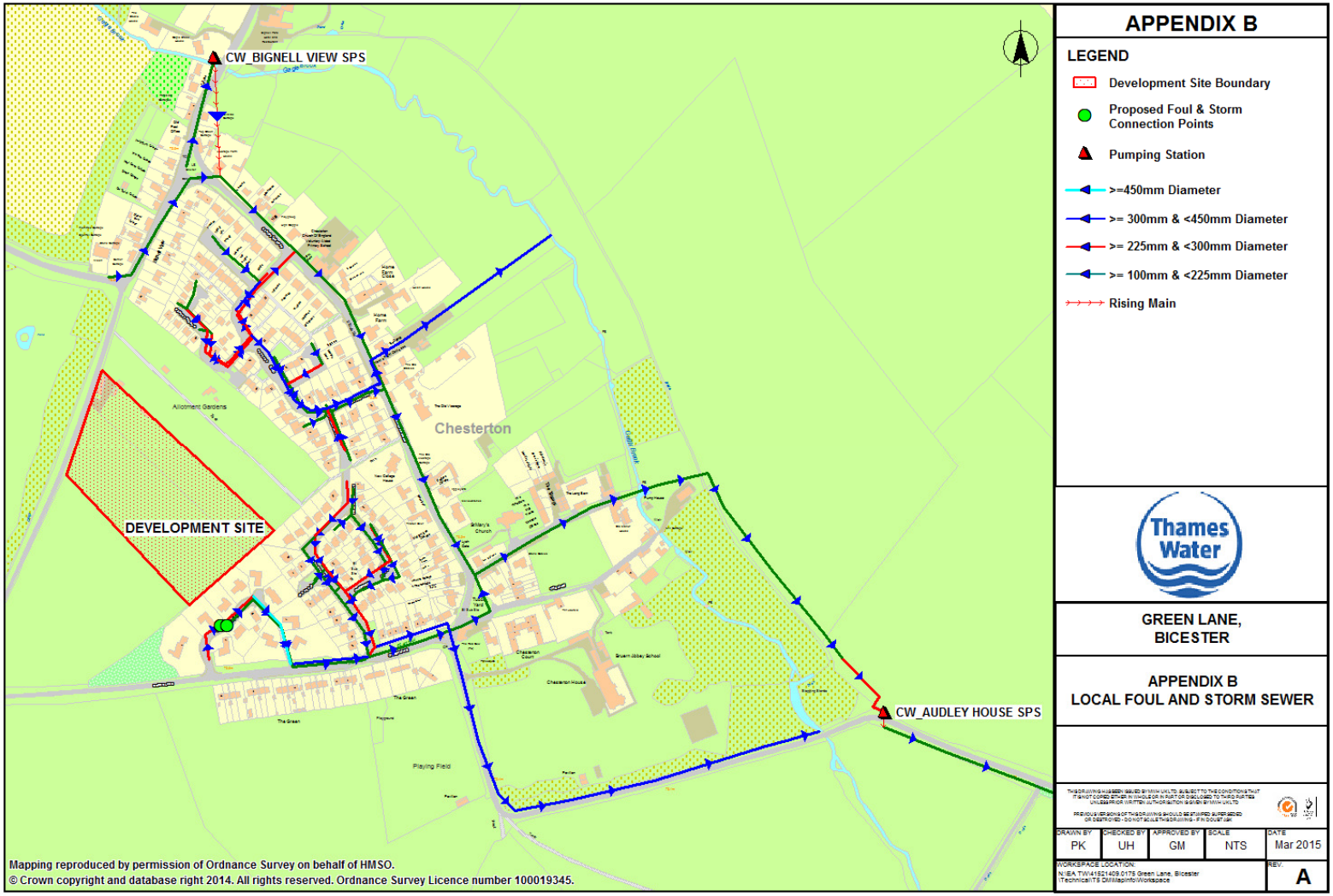
The hydraulic model indicates that there would be an insignificant increase in network surcharge and flooding during wet weather events in inclusion of the additional development flows. Therefore, improvements to the surface water network system are not required.

The issues highlighted and discussed throughout this report are recommendations to Thames Water Utilities and may be altered/added to based upon local operational knowledge of the system.

Appendix A – Site Plan



Appendix B – Local Sewers



Appendix C – Connections and Improvements – Option