Appendix A: Foul Water Study (Thames Water, February 2015)

SEWER IMPACT STUDY

X4503 – 682

SMG 1586

PROPOSED CONNECTION AT
ARCHES SPRING AND THIEVES LANE, HERTFORD

FOUL WATER SYSTEM

v3.0 Feb 2015

Prepared by: Girija Mulay
Reviewed by: Umesha Halekote
Approved by: Graham Moralee

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

Contents

Appendices

1.0 Introduction

The following report was commissioned by Thames Water's Developer Services to investigate the capacity within the existing foul network and to ascertain the impact of two proposed new connections on the foul network at Arches Spring, Welwyn Road, Hertford for proposed residential developments at Archers Spring and Thieves Lane.

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

The scope of the study includes:

- Carry out a manhole survey and a short-term flow survey
- Model enhancement with manhole survey data
- Verify the model local to the development site using flow survey data
- Check the current performance of the network during a 1 in 20 year return period storm
- Add development flows to the model and check the impact of additional flow to the network during a 1 in 20 year return period storm
- Propose indicative solutions to allow flows to be accepted into the existing network with 'no detriment' impact.

2.0 Background

The proposed new development is on a Greenfield site and the Developer proposes to accommodate a total of 700 new housing units across two plots along Welwyn Road. The development area is situated in the town of Hertford, Hertfordshire, located approximately 48km to the north of London.

To the north of Welwyn Road, the development plot is bounded by Bentley Road and Perrett Gardens to the east. To the south of Welwyn Road, the development plot is bounded by Thieves Lane to the east. The northern plot is hereby referred to as the Arches Spring development area and the southern plot is referred to as the Thieves Lane development area.

A total of seven connection scenarios were identified by the Developer. They are:

- Scenario 1 - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL30134201 (Bentley Road).
- Scenario 2 - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL31122803 (Welwyn Road).
- Scenario 3 - Connect the foul flows from 350 residential properties on the Arches Spring development area and 350 residential properties on the Thieves Lane development area to manhole 61_473 (TL30127303) (Hertingfordbury Road).

- Scenario 4a - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL30134201 (Bentley Road) and the foul flows from 350 residential properties on the Thieves Lane development area to manhole TL30128601 (Turpins Close).

- Scenario 4b - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL31122803 (Welwyn Road) and the foul flows from 350 residential properties on the Thieves Lane development area to manhole TL30128601 (Turpins Close).

- Scenario 5a - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL30134201 (Bentley Road) and the foul flows from 350 residential properties on the Thieves Lane development area to manhole 61_473 (TL30127303) (Hertingfordbury Road).

- Scenario 5b - Connect the foul flows from 350 residential properties on the Arches Spring development area to manhole TL31122803 (Welwyn Road) and the foul flows from 350 residential properties on the Thieves Lane development area to manhole 61_473 (TL30127303) (Hertingfordbury Road).

The foul flow from the development area has been calculated, using the latest Thames Water guidelines, as an average gravity flow of 4.58l/s for Scenarios 1 and 2, and 7.26l/s for Scenarios 3, 4a, 4b, 5a and 5b.

Indicative connection points for all seven scenarios have been provided by the Developer. The proposed connection details have been provided in Table1 in Section 5.1.2.

A plan showing the location of the development area 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 network.

From the development site, flows would gravitate in a south-easterly direction towards the trunk sewer draining to Rye Meads Sewage Treatment Works (STW). Rye Meads STW is located approximately 12km downstream of the development site.

Flows travel through sewers ranging from 150mm diameter to 1680mm diameter from the development area towards Rye Meads STW.

The local foul 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.

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

from the proposed development are not considered in this report and should not be connected to the foul sewer network. It is the responsibility of the Developer to make provision for the surface water drainage to ground or water courses with the agreement of the responsible authority.

The development should cause no detriment (e.g. additional or new flooding) to the existing system in a 1 in 20 year design rainfall event.

5.0 Sewer Impact Assessment

Assessment of the hydraulic loading of the foul network was carried out by means of an existing verified hydraulic model.

The model was enhanced with the results of a manhole survey carried out in the study area. A flow survey was also completed to enable re-verification of the local network, 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 network is responsive to rainfall, with flooding being a risk in the catchment for extreme events.

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

5.1 Foul Water Sewers

5.1.1 Assessment of Existing Catchment

The hydraulic model indicates that the existing foul network does have available capacity downstream of the proposed connection manholes for anticipated dry weather flow. However, in the 1 in 20 year return period events simulated, 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 4.58l/s average gravity flow for Scenarios 1 and 2 and an allowance of 7.26l/s average gravity flow for Scenarios 3 , 4a, 4b, 5a, and 5b was used to represent the development.

Table 1: Proposed Development Connection Details

Connection	Manhole		Diameter of Outgoing Sewer	
	Arches Spring	Thieves Lane	Arches Spring	Thieves Lane
Scenario 1	TL30134201	×	150mm	×
Scenario 2	TL31122803	×	300mm	×
Scenario 3	61_473 (TL30127303)	61_473 (TL30127303)	825mm	825mm
Scenario 4a	TL30134201	TL30128601	150mm	150mm
Scenario 4b	TL31122803	TL30128601	300mm	150mm
Scenario 5a	TL30134201	61_473 (TL30127303)	150mm	825mm
Scenario 5b	TL31122803	61_473 (TL30127303)	300mm	825mm

5.1.3 Foul System Improvement Works

On inclusion of the additional flows from the development site, the risk of flooding and surcharge on the downstream sewer network is not increased in comparison to the existing catchment. The hydraulic model indicates that the foul network is able to accept the proposed development flows in Scenarios 1, 2, 4a, 4b, 5a and 5b. Therefore, improvements to the existing sewer network would not be required for these connection scenarios.

Connection scenario 3 is predicted to cause detriment to the current level of service provided. Improvements to the existing sewer network would be required for this connection scenario.

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 the 1 in 20 year standard, 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.

The proposed development site is located within the Environment Agency's Risk of Flooding from Surface Water area, and the drainage of the site is therefore at risk of surface water ingress. The Developer should undertake necessary measures to ensure that the foul sewers are adequately protected against surface water ingress.

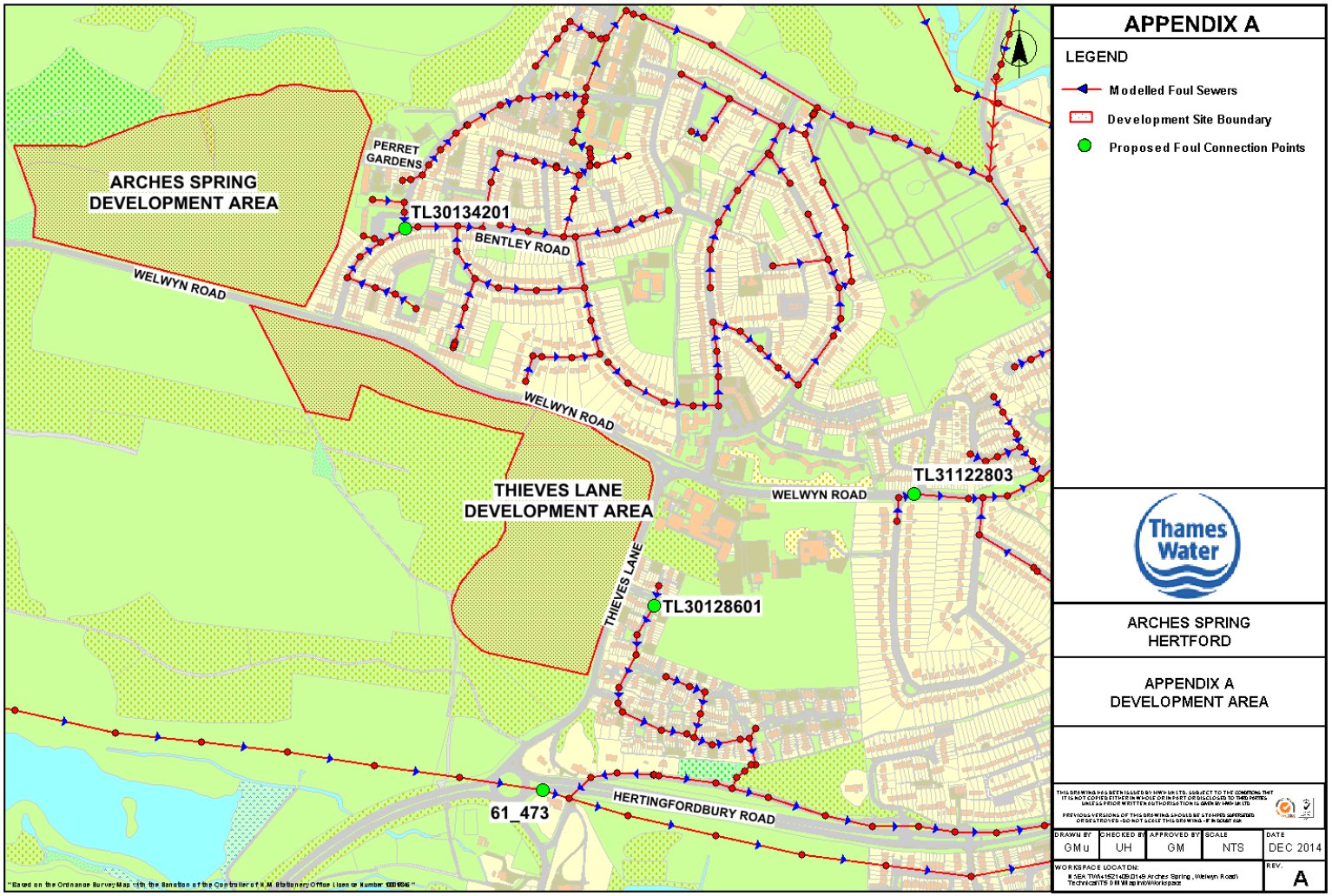
7.0 Conclusions

The desktop study has successfully investigated and identified the implications of the proposed new development on a Greenfield site at Arches Spring and Thieves Lane, Welwyn Road, Herford to the existing foul network.

The hydraulic models for Scenarios 1, 2, 4a, 4b, 5a and 5b predicted that the foul network does have available capacity downstream of the proposed connection manholes to accept the proposed development flows. The additional flow from the development site does not cause any significant increases in predicted flooding or surcharge on the sewer network. Therefore, improvements to the network would not be required.

Connection scenario 3 is predicted to cause detriment to the current level of service provided. Improvements to the existing sewer network would be required for this connection scenario.

Appendix A – Site Plan



Appendix B – Local Sewers