mayer brown

RESIDENTIAL DEVELOPMENT
LAND SOUTH OF THORLEY DRIVE,
CHEADLE
STOKE-ON-TRENT

FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

JANUARY 2016

the journey is the reward

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LAND SOUTH OF THORLEY DRIVE
CHEADLE
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FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

JANUARY 2016

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Prepared by:	AP / JS
Approved by:	PZ
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Residential Development
Land South of Thorley Drive, Cheadle
Stoke-on-Trent
Flood Risk Assessment and Drainage Statement

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1 Introduction

Context

1.1 Mayer Brown has been instructed by Providence Land Ltd to undertake a Flood Risk Assessment (FRA) and Drainage Statement to support the planning application for up to 60 residential dwellings at land south of Thorley Drive, Cheadle, Stoke-on-Trent.

1.2 The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF, March 2012) and the associated Planning Practice Guidance that accompanied the NPPF on issues relating to flood risk and Sewers for Adoption 7th Edition, as the application site is over 1 hectare in size.

1.3 This report considers the risk of flooding to the proposed residential dwellings and assesses any impact to the surrounding catchment resulting from the proposed development, in addition to setting out the design principles and indicative detail for surface and foul water drainage to serve the proposed development.

1.4 The results of the Walkover Drainage Survey, completed by Mayer Brown in November 2014, have also been incorporated into this report.

Site Locations and Features

1.5 The site is located to the south of Thorley Drive, Cheadle, Stoke-on-Trent, Staffordshire. Refer to the site location plan in **Appendix A.**

1.6 The nearest postcode is ST10 1SN and the approximate grid reference is E_401934, N_342866.

1.7 The site is bound by Thorley Drive to the north, Ashbourne Road to the east and farmland to the south and west.

1.8 The total site area is 2.2ha and is currently Greenfield. The site falls in two directions, it generally slopes from east to the west, with levels ranging from 178.75mAOD in the east to 167.41mAOD at the western site boundary, and the north east corner of the site falls to the north, to 171.80mAOD in the northern corner of the site. Refer to the topographical survey in **Appendix B.**

1.9 The Geoenvironmental Assessment undertaken in June 2013, refer to **Appendix C**, provides Borehole records for the site. The Borehole records confirm that clay and mudstone are the superficial strata at the site.

1.10 The site is currently accessed via two field access gates along the south eastern end of the site frontage to Ashbourne Road and via a short spur off Thorley Drive.

Development Proposals

1.11 The development proposals include the erection of up to 60 residential dwellings, private drives, roads and landscaping. The proposed site layout can be found in **Appendix D.**

1.12 Vehicular access to the site will take the form of a new junction along Ashbourne Road, located approximately 70m south-east of the junction with Thorley Drive.

1.13 Surface and foul water arrangements for the proposed development will be considered in Section 4 of this report.

Flood Zone Allocation

1.14 The Environment Agency (EA) Flood Map shown in Figure 1.1 below confirms that the site is located in Flood Zone 1.

1.15 Areas located in Flood Zone 1 have less than a 0.1% chance of flooding occurring each year from fluvial and tidal sources.

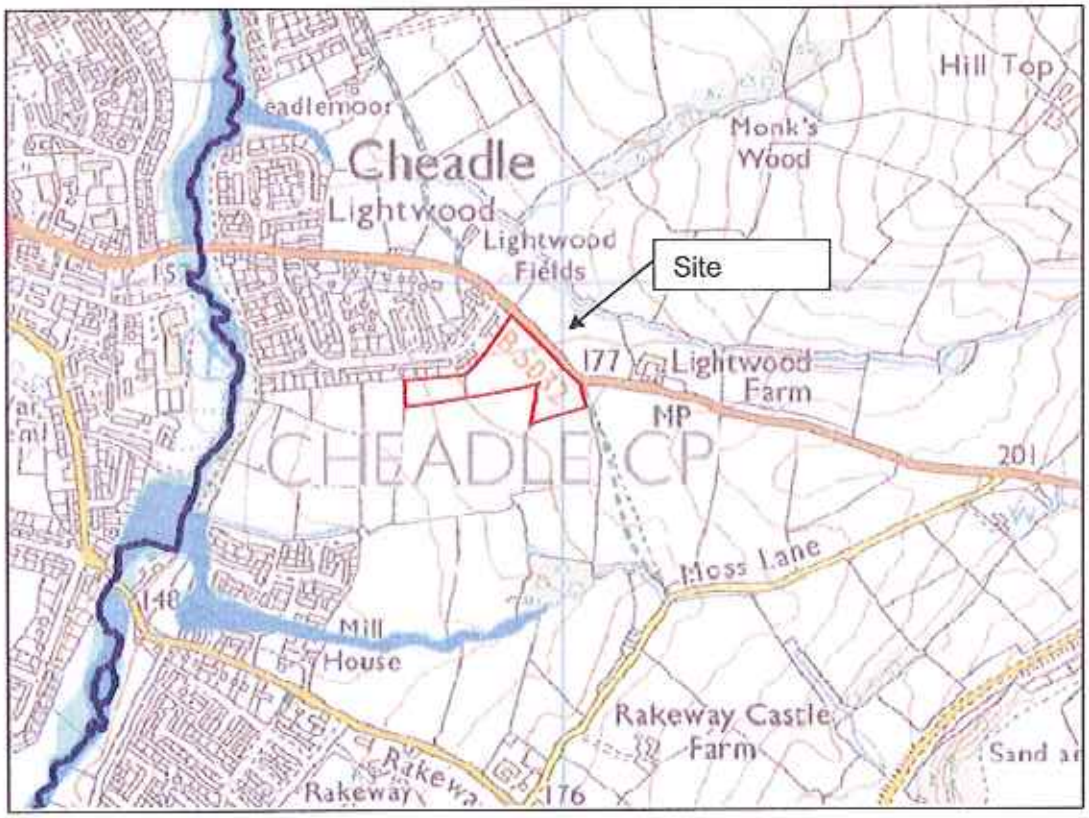


Figure 1.1: EA Flood Map for Planning (Rivers and Sea)

1.16 Table 2 of the National Planning Policy Framework Technical Guidance (TGNPPF) provides information on the Vulnerability Classification of various developments. The proposed use of the portable building falls in the "more vulnerable" classification of the table. Table 3 in TGNPPF details the compatibility of the use of the site with the different flood zone classifications. Comparing the More Vulnerable use with FZ1, it can be seen that the Exception and Sequential tests are not required.

Influences of Climate Change

1.17 The influence of Climate Change on rivers and watercourses is likely to increase the frequency of flood events and the overall volume of water that passes the site.

1.18 When considering surface water runoff from a site the increase in peak rainfall intensity varies over the lifetime of the development. Assuming a building lifetime of 100 years, 30% increase in rainfall intensities should be applied to the calculations.

2 Sources of Information

Flood Zone Maps and Flood Defence Data

2.1 The EA Flood Map confirms that the site is located in Flood Zone 1. Areas located in Flood Zone 1 have less than a 0.1% chance of flooding occurring each year from fluvial and tidal sources.

Watercourses and Ponds

2.2 The site is located within the vicinity of two watercourses. A tributary of the Cecilly Brook is located approximately 100m east of Ashbourne Road and the Cheadlemill Brook, a tributary of the River Tean, is located approximately 300m west of the site. A pond is located approximately 90m to the south of the site; a small ditch runs west from the pond towards the Cheadlemill Brook.

Historic Flooding

2.4 The FRA produced by Mayer Brown in May 2014 for this site recorded that the Level 1 Strategic Flood Risk Assessment (SFRA) prepared by Halcrow in 2007 on behalf of Staffordshire Moorlands District Council shows no history of flooding at the site.

2.5 However, the latest Level 1 SFRA Update was undertaken by AECOM in October 2015. Refer to **Appendix E**. The map of Historic Flood Events within the SFRA shows no history of flooding at the site.

2.6 The Level 1 SFRA Update assesses and maps all forms of flood risk from river, groundwater, surface water and sewer sources, taking into account future climate change predictions. These will each be addressed in turn.

Tidal and Fluvial Flooding

2.7 A tributary of the Cecilly Brook watercourse is the nearest watercourse to the development and is located approximately 100m east of Ashbourne Road. The Cheadlemill Brook, a tributary of the River Tean, is located approximately 300m west of the site. According to the Fluvial Flood Zones map displayed within the SFRA Update, and the EA Flood Maps, the development site is within Flood Zone 1 and therefore the site is not at risk of flooding from these sources. Refer to the SFRA maps and EA maps located in **Appendix E**.

2.8 The map of Historic Fluvial Flood Events within the SFRA shows no history of flooding at the site.

Groundwater Flooding

2.9 According to the SFRA, there is currently no evidence to suggest that groundwater flooding is a major problem within Staffordshire. It is reported that only one incident of potential groundwater flooding has been recorded by Staffordshire County Council (SCC), which occurred in Leek in July 2013; however it is unknown as to whether the source was groundwater or surface water flow. No records of groundwater flooding were provided by the EA.

Surface Water Flooding

2.10 The Risk of Flooding from Surface Water (uFMfSW) map presented in the SFRA, refer to **Appendix E**, demonstrates that historic flood records show no history of surface water flooding at the development site.

2.11 Additionally, according to EA Flood Maps, the development site has a very low chance of flooding from surface water. Refer to EA Flood Maps in **Appendix E.**

Sewer Flooding

2.12 The SFRA states that no records of sewer flooding (both internally and externally) have been made in Cheadle, with the exception of 12 recorded incidents on Tean Road in the southern extent, and three records in the north western extent of the town. Therefore it can be concluded that there is no history of sewer flooding at the development site. Refer to the Severn Trent Water DG5 Flood Register map in **Appendix E.**

2.13 In April 2013, Severn Trent Water were contacted and confirmed that the area has no historic record of sewer flooding. Refer to **Appendix F.**

Public Sewer Records

2.14 The public sewers within the locality of the site, owned and maintained by Severn Trent Water, are shown in **Appendix F.**

2.15 There are no existing sewers crossing the site.

2.16 The Severn Trent Water sewer plans show a 300mm diameter surface water sewer running west to north east, located at the north eastern boundary of the site.

2.17 There are two 150mm diameter foul sewers located within Thorley Drive, one flows to the west and the other flows to the north east to Ashbourne Road.

Topographical Survey

2.2 The total site area is 2.2ha and is currently Greenfield. The site falls in two directions; it generally slopes from east to the west, with levels ranging from 178.75mAOD in the east

to 167.41mAOD at the western site boundary, and the north east corner of the site falls to the north, to 171.80mAOD in the northern corner of the site. Refer to the topographical survey in **Appendix B.**

3 Flood Risk Assessment

Flood Risk Assessment Methodology and Objectives

3.1 It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works.

3.2 Current guidance on development and flood risk identifies several key aims for a development to ensure that it is sustainable in flood risk terms. These are stated in the EAs Guidance Note 3 on Flood Risk Assessment including:

- Consideration of whether the site falls within the functional flood plain and if so demonstrate that the development meets the vulnerability criteria set out in the NPPF technical guidance;
- Assess flood alleviation measures already in place;
- Assess all potential sources of flooding which may affect the site;
- The impact of flooding on the site;
- Assess how users of the development can avoid exposure to hazardous flooding in and around the development including egress and access routes;
- An assessment of how the layout and form of development minimise flood risk;
- Assess the capacity of any drains or sewers, existing or proposed, on the site during various flood events;
- Assess volume of surface water runoff likely to be generated from the proposed development;
- Demonstrate surface water management proposals according to sustainable drainage principles with the aim of not increasing and where possible reducing run off from the site;
- The likely impact of any displaced water on third parties caused by alterations to ground levels or raising flood embankments;
- The potential impact on form and structure of rivers or coastal areas and the long term stability and sustainability of existing defences;
- Estimates of how climate change could affect probability and intensity of flood events. The hydrological analysis of flood flows and defence standards needs to include allowance for increased rainfall;
- The remaining (known as residual) risks to the site after the construction of any necessary defences and the means of managing those; and

- Consider existing Strategic Flood Risk Assessment carried out by Local Authority.

3.3 The Flood Risk Assessment is undertaken with due consideration of these sustainability aims, and has been prepared to inform the proposed scheme. A development lifetime of 100 years has been assumed.

Project Scope

3.4 In order to achieve the aims outlined above, this Flood Risk Assessment has been undertaken in accordance with current best-practice guidance, including NPPF.

Potential Sources of Flooding

3.5 All potential sources of flooding must be considered for any proposed development. Using the EA flood risk zone mapping, public sewer records, topographical survey and the Staffordshire Moorlands Level 1 SFRA Update, the potential sources of flooding for the site have been reviewed and are summarised in **Table 3.1** below. The relevant EA flood risk zone maps are shown in **Appendix E.**

Potential source	Potential Flood Risk to Site?	Comment
Fluvial flooding	No	The Environment Agency (EA) Flood Map confirms that the site is located in Flood Zone 1. Areas located in Flood Zone 1 have less than 1 in 1000 annual probability of flooding from fluvial and tidal sources.
Tidal flooding	No	The site is not close to the coast.
Flooding from rising / high groundwater	No	According to the SFRA, there is currently no evidence to suggest that groundwater flooding is a major problem within Staffordshire. It is reported that only one incident of potential groundwater flooding has been recorded by SCC, which occurred in Leek in July 2013. No records of groundwater flooding were provided by the EA. The SFRA presents the EA's dataset Areas Susceptible to Groundwater Flooding which indicates where groundwater may emerge. The grid square within which the development site sits is shown to have greater than 75% of the 1km grid square as being susceptible to groundwater flooding. However, it is explained within the SFRA that the data does not show where flooding is likely to occur, but instead should be used to indicate areas for further investigation. Site specific investigation was undertaken in July 2013, the results of which are reported in the Geoenvironmental Assessment shown in **Appendix C.** The Geoenvironmental Assessment confirms that there is no risk of groundwater flooding at the site, therefore the risk of groundwater flooding at the development site can be assessed as low.

Overland flow flooding	No	According to EA Flood Maps, the development site has a very low chance of flooding from surface water. The Risk of Flooding from Surface Water map presented in the SFRA demonstrates that historic flood records show no history of surface water flooding at the development site. The SFRA does state that within Cheadle, surface water is predicted to flow during a 1% AEP event along Ashbourne Road. However, as the site generally slopes from east to west, any overland flow that is generated by surrounding areas, will run away from the proposed properties towards the proposed attenuation pond in the west of the site, which will then discharge into the ditch leading to Cheadlemill Brook. Any overland flow in the north of the site will drain to the north towards Ashbourne Road which will then discharge via the existing carriageway drainage.
Flooding from piped drainage systems	No	According to the SFRA Update, there is no history of sewer flooding at the development site. In April 2013, Severn Trent Water were contacted and confirmed that the area has no historic record of sewer flooding, therefore it can be concluded that the risk of the site flooding from piped drainage systems is low.
Flooding due to infrastructure failure (Reservoirs, lakes etc.)	No	The EA Risk of Flooding from Reservoirs map shows that the site is not at risk of flooding from a reservoir.
Increase in flood risk due to urbanisation of the catchment	No	There is opportunity for increased urbanisation in the locality of the site, however the drainage systems serving these developments would be designed in line with best practice such that discharge would be limited to existing levels. As such there would be no increase in flood risk to the site.

Table 3.1: Potential Risk Posed by Flooding Sources

4 Drainage Strategy

Attenuation Requirements

4.1 As the proposed residential dwellings will be sited on a Greenfield site, the development will increase the impermeable area on site.

4.2 The proposed impermeable area for up to 60 residential dwellings, calculated from the proposed site layout for 51 dwellings, is 0.971Ha.

4.3 New developments should not increase flood risk elsewhere. As this is green field the runoff rate from the new development should be restricted to QBAR as calculated using the IH 124 standard. These calculations are included in **Appendix G**. Green Field Equivalent runoff (QBAR) for a 50ha site in this location as 272.6l/s. Factoring this rate to our site area of 2.2ha gives a QBAR of 12l/s.

4.4 Using the Quick Storage Estimate element of the microdrainage package, the amount of storage to attenuate the run off from the approximate impermeable area (0.971Ha) to QBAR (12l/s) for storm events up to the 100 year return period with 30% climate change allowance has been calculated. These calculations are included in **Appendix G**. These indicate a storage volume of 610 cubic metres is required.

Proposed Surface Water Drainage Strategy

4.5 The impermeable areas have been measured from the site layout and calculated as 0.971Ha. New developments should not increase flood risk elsewhere, therefore the run-off rate from the new development should be restricted to QBAR.

4.6 The Building Regulations Part H prescribes a hierarchal approach to surface water discharge. In order of preference, surface water should be discharged as follows:

- Via infiltration
- To watercourse
- To public sewer

Discharge via infiltration

4.7 Georisk Management undertook soakaway testing in June 2013, the results of which are included in the FRA undertaken for the site by Mayer Brown in May 2014. It was reported that soakaway testing confirmed that infiltration drainage is not feasible at the site; during each test no infiltration was recorded.

4.8 Decision: Method of Discharge not appropriate.

Discharge via watercourse

4.9 A tributary of the Cheadlemill Brook is located approximately 225m to the south west of the attenuation pond. According to the topographical survey, it appears that a small ditch runs from the proposed attenuation pond to the south towards this tributary.

4.10 It is proposed that the surface water runoff discharges into the normally dry 'pond' area providing attenuation for the development, shown on the proposed outline drainage strategy in the western area of the site. As the pond area will normally be dry, it will be maintained as any other public amenity area. Attenuated runoff would then discharge into the nearby ditch (precise location, condition and capacity tbc), as shown on the outline drainage strategy, which leads to the tributary of Cheadlemill Brook sited approximately 225m south west of the attenuation pond. It is proposed that a hydrobrake limits discharge from the attenuation pond to the ditch to the QBAR of 12l/s. Refer to **Appendix H**.

4.11 In November 2014 a drainage walkover of the site was undertaken to investigate whether the tributary of the Cheadlemill Brook was in a sufficient condition and had the capacity to convey flows from the site to the Cheadlemill Brook. The level of vegetation around the brook indicated that the brook was well established and received runoff from the development site and the adjacent sports field. It was concluded through calculations of the hydraulic capacity of the brook that it was able to convey a flow of 85.6l/s. As the discharge from the development site is 12l/s, it can be concluded that the brook has sufficient capacity to convey flows. However, the brook was overgrown and it is unknown when the brook was last maintained and whether a maintenance regime is in place. Additionally, it was recommended that prior to detailed design, undertaking a topographical survey and walkover with the local drainage officer of the brook would be prudent.

4.12 Decision: Method of discharge is appropriate pending survey of the nearby ditch and consent from the Environment Agency or Land Drainage Authority.

Discharge via public sewer

4.13 As mentioned above, an existing 300mm diameter surface water sewer runs west to north east, located at the north eastern boundary of the site. Due to topography the surface water from the north east portion of the site could discharge to MH9901.

4.14 Decision: Method of discharge is appropriate. Connection to the public sewer to be agreed with Severn Trent Water via the Section 104 process.

4.15 The previous capacity check undertaken by Severn Trent Water in 2013, confirmed that if soakaways are not possible, a connection to the existing network would be accepted at a restricted rate of 5l/s/ha. Refer to previous Severn Trent Water correspondence in **Appendix F**.

4.16 Severn Trent are to conduct capacity checks on the proposed surface water sewer to determine there is capacity to accept flows. Connection to the public sewer and adoption of the proposed surface water networks will require agreement by Severn Trent Water through the Section 104 process.

4.17 A connection into this sewer will require a Section 106 agreement with Severn Trent.

Proposed Foul Flow Strategy

4.18 The proposed development comprises up to 60 residential dwellings. The foul flow for the development has been calculated based on Sewers for Adoption 7th Edition, which allows 4000l/dwelling/day. Using this rate the peak flow from the site has been calculated as 2.8l/s.

4.19 A 150mm diameter Severn Trent foul sewer located just to the north of the development site flows east to west. It is proposed that the proposed foul network discharges at the above rate to this public foul sewer in the existing chamber, reference MH7805, located on the north west corner of the development site. Refer to **Appendix H**.

4.20 The previous capacity check undertaken by Severn Trent Water in 2013 confirmed that a rate of 1.3l/s could be accommodated within the foul sewer network.

4.21 Due to the increase in foul discharge, Severn Trent Water must confirm whether the proposed rate of 2.8l/s can be accommodated within the network.

4.22 Connection to the public sewer and adoption of the proposed foul network will require agreement by Severn Trent Water through the Section 104 process. Severn Trent are to conduct capacity checks on the proposed foul sewer to determine there is capacity to accept flows from the development.

4.23 A connection into this sewer will require a Section 106 agreement with Severn Trent.

5 Summary

5.1 Mayer Brown has undertaken a Flood Risk Assessment on behalf of Providence Land Ltd in support of proposals to erect up to 60 residential dwellings at land south of Thorley Drive, Cheadle, Stoke-on-Trent. This assessment has been undertaken to ascertain the constraints to the development of this site and to assess the impact of the proposals with respect to flood risk.

5.2 The site lies within Flood Zone 1 when considered against EA Flood Zone Maps and therefore the occurrence of flooding at the site from rivers and the sea is very unlikely.

5.3 This report concludes that the proposed development is not at risk of flooding and will not increase the risk of flooding to surrounding catchments if developed following the guidance within this document.

5.4 Having completed a Level 1 flood risk assessment, it is clear that further Level 2 or 3 assessments are not required.

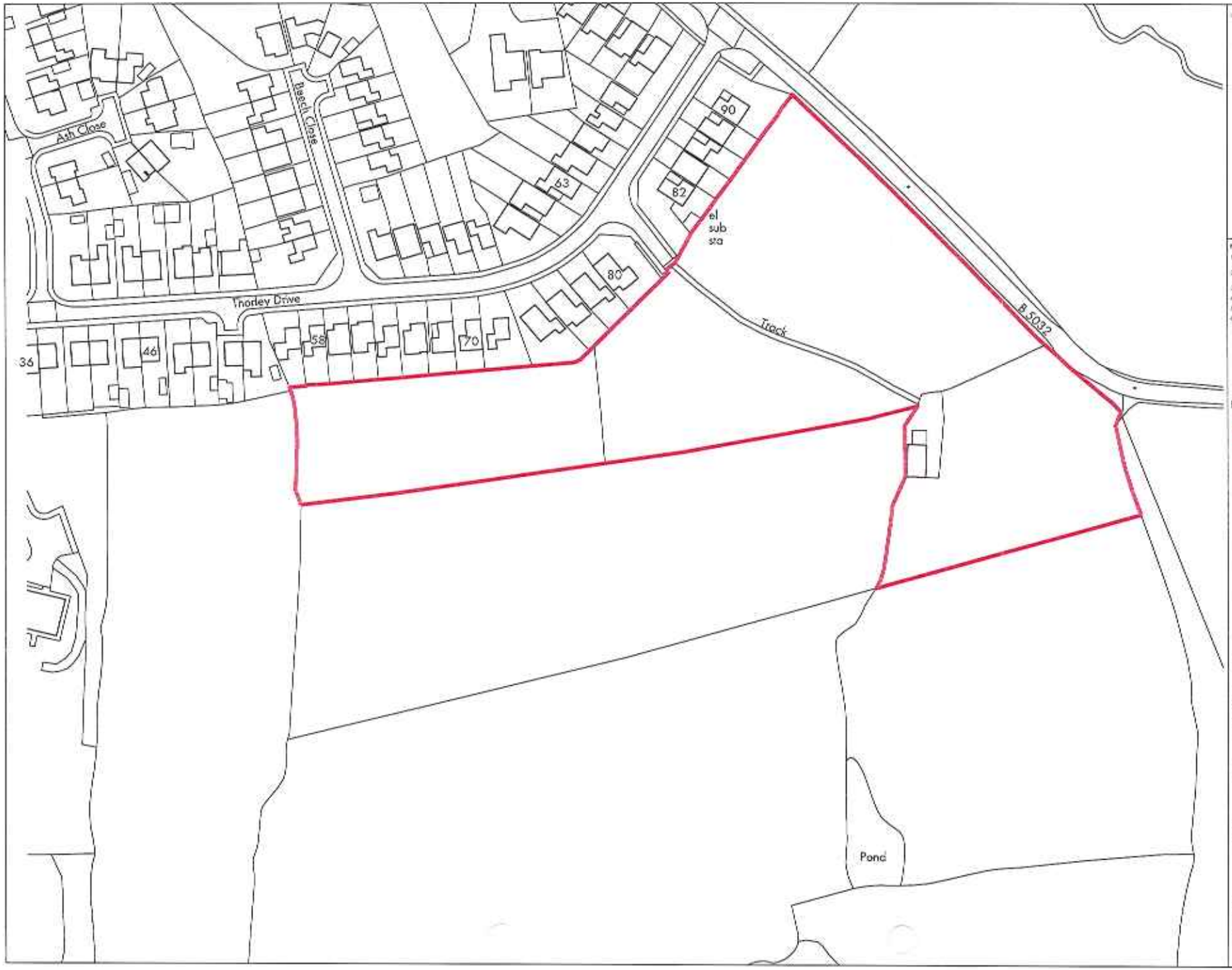
5.5 As this is a green field and the proposed residential dwellings will increase the impermeable area on site, it is proposed that surface water run-off from the site is to be restricted to the Greenfield runoff rate of 12l/s, in order to not increase flood risk elsewhere. The amount of storage to attenuate the run off from the approximate impermeable area to QBAR is 610 cubic metres.

5.6 Soakaway testing has confirmed that infiltration drainage is not feasible for the development.

5.7 It is proposed that surface water discharges to the adjacent drainage ditch. The network of drainage ditches crossing the site run to the Cheadlemill Brook tributary located to the south. This will require approval from the EA and the Land Drainage Authority.

5.8 The foul discharge from the development has been calculated as 2.8l/s. It is proposed to connect to the existing Severn Trent foul sewer, following a capacity check and approval from Severn Trent. A Section 106 agreement will be required.

APPENDIX A: Site Location Plan



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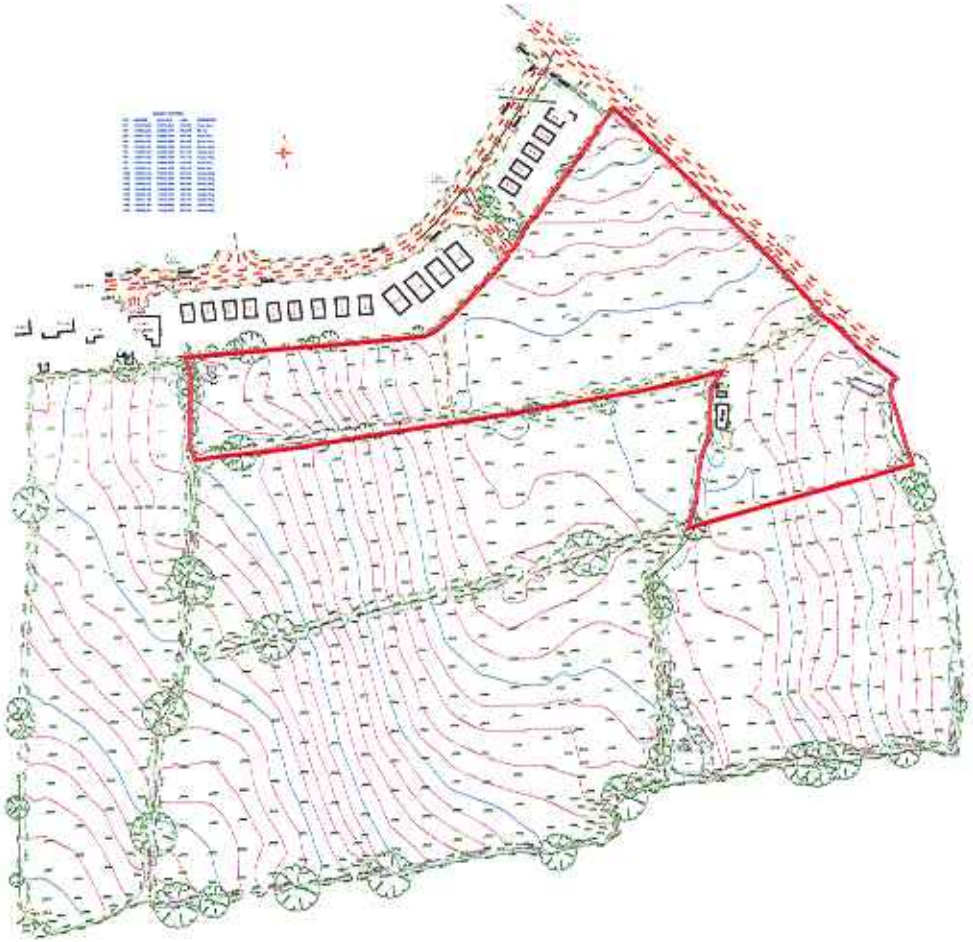
LOCATION PLAN

APPENDIX B: Topographical Survey



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client
Providence Land Limited

project
Land south of Thorley Drive, Cheadle

title
Topographical Survey + Red Line Boundary Plan

scale @ A3	NTS	drawn by	LP	checked by	AP
date	JANUARY 2016	cad file			
drawing number				rev.	-

BARRATT HOMES

Thorley Drive
Cheadle

Topographical Survey

53387/01

B

APPENDIX C: Previous Geoenvironmental Assessment – June 2013

georisk
MANAGEMENT

Innovative Land Development Solutions

GEOENVIRONMENTAL ASSESSMENT

THORLEY DRIVE, CHEADLE
STOKE-ON-TRENT, STAFFORDSHIRE

Report No: 13052/1
Date: June 2013

Prepared for

DAVID WILSON HOMES MERCIA

georisk MANAGEMENT

PROJECT QUALITY ASSURANCE
INFORMATION SHEET

GEOENVIRONMENTAL ASSESSMENT

THORLEY DRIVE, CHEADLE
STOKE-ON-TRENT, STAFFORDSHIRE

Report Status:	**Final**
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