

## **ENVIRONMENT**

Beechcroft Land Limited  
Land to the North of Droitwich Spa  
Worcestershire  
Flood Risk Assessment

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## **EXECUTIVE SUMMARY**

This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance. It has been produced on behalf of Beechcroft Land Limited in respect of a planning application for Land to the North of Droitwich Spa, Worcestershire (approximate grid reference: SO889654).

This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented.

The site is located partially within Flood Zone 3; the nearest Environment Agency (EA) Main River is the Elmbridge Brook located immediately south of the site. Development within the site is shown to be elevated approximately 5m above the Flood Extents associated with the Elmbridge Brook.

The majority of the site is shown to be at a very low risk of surface water flooding. There is an isolated area of higher risk in the northwest of the site associated with a topographical depression. This risk has associated offsite flows shown to be conveyed along the A442. These extents are understood to be an exaggerated representation of risk due to the presence of highway drainage along Kidderminster Road which the mapping does not account for.

The proposed development has been sequentially arranged to locate residential development outside of the surface water flood risk. It is recommended that finished floor levels are generally raised a minimum of 150mm above surrounding ground levels to help mitigate the risk of flooding from surface water. Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.

The proposed development has been assessed across a further range of potential flood risk sources; these include canals, groundwater, reservoirs and large waterbodies and sewers. None of these sources were found to present a potential barrier to development.

The development will discharge surface water to the Elmbridge Brook at the equivalent greenfield QBAR rate. Attenuated surface water storage will be provided with capacity for the 1 in 100-year storm with an allowance for climate change.

Foul water will be drained separately from surface water into the existing foul sewer network in the south of the site. Capacity for this connection has been confirmed by the local sewerage undertaker.

In compliance with the requirements of NPPF, and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff discharging from the site.

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## 1. INTRODUCTION

- 1.1 This FRA has been prepared in accordance with the requirements set out in the NPPF and the associated Planning Practice Guidance. The FRA has been produced on behalf of Beechcroft Land Limited in respect of a planning application for a proposed residential development at Land to the North of Droitwich Spa, Worcestershire.
- 1.2 This FRA is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals. Summary information is included as **Table 1.1**.

**Table 1.1: Site Summary**

<b>Site Name</b>	Land to the North of Droitwich Spa
<b>Location</b>	Worcestershire
<b>NGR (approx.)</b>	SO889654
<b>Application Site Area (ha)</b>	16.3 (approximate)
<b>Development Type</b>	Residential
<b>Flood Zone Classification</b>	Flood Zone 1, 2 and 3.
<b>NPPF Vulnerability</b>	More Vulnerable
<b>Environment Agency Office</b>	West Midlands
<b>Lead Local Flood Authority</b>	Worcestershire County Council
<b>Local Planning Authority</b>	Wychavon District Council

### Sources of Data

- i. Topographical Survey by Bury Associates Ltd, Ref – BA19201014-06
- ii. OS Explorer Series mapping
- iii. Local Authority Surface Water Flood Risk Maps
- iv. South Worcestershire Strategic Flood Risk Assessment
- v. Worcestershire County Council Preliminary Flood Risk Assessment
- vi. Worcestershire County Council Strategic Flood Risk Assessment
- vii. Worcestershire County Council Local Flood Risk Management Strategy
- viii. South Worcestershire Development Plan
- ix. Severn Trent Sewer Records
- x. Severn Trent Pre-Development Enquiry

xi. British Geological Survey Drift & Geology Maps

## Existing Site

- 1.3 The site is situated approximately 2.4km north of Droitwich Spa. The site is bound to the west by the Kidderminster Road (A442) and Doverdale Park. The northern boundary is adjacent to a small area of residential development. Immediately east of the site is a railway line and Elmbridge Brook runs along the southern boundary. The site's location is illustrated within **Figure 1.1**.



**Figure 1.1: Site Location**

- 1.4 The site is comprised of grassland and is considered entirely greenfield. There is no known existing formal drainage features on site. It is expected that the area drains naturally via infiltration and runoff to the west towards the A442 and south into the Elbridge Brook.
- 1.5 The topographical survey (**Appendix 1**) shows the site to generally fall to the south with levels ranging from approximately 44.06m Above Ordnance Datum (mAOD) in the north to approximately 31.22mAOD in the south. A portion of the site to the north west is shown



to fall in a westerly direction towards Kidderminster Road, with levels shown to range from approximately 45.50mAOD to 39.94mAOD.

### **Proposed Development**

- 1.6 The site is proposed for an outline application for the erection of up to 102 dwellings with associated parking, landscaping and access.
- 1.7 The site will be accessed from the A442, Kidderminster Road along the north-west boundary of the site. An illustrative masterplan is included in **Appendix 2**

## 2. FLOOD RISK PLANNING POLICY

### National Planning Policy Framework

- 2.1 The NPPF<sup>1</sup> sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. Planning Practice Guidance is also available online<sup>2</sup>.
- 2.2 The Planning Practice Guidance sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where possible and stresses the importance of preventing increases in flood risk off site to the wider catchment area.
- 2.3 The Planning Practice Guidance also states that alternative sources of flooding, other than fluvial (river flooding), should be considered when preparing an FRA.
- 2.4 The Planning Practice Guidance includes a series of tables that define Flood Zones (Table 1), the flood risk vulnerability classification of development land uses (Table 2) and 'compatibility' of development within the defined Flood Zones (Table 3).
- 2.5 This FRA is written in accordance with the NPPF and the Planning Practice Guidance.

### Flood Map for Planning

- 2.6 With particular reference to planning and development, the Flood Map for Planning identifies Flood Zones in accordance with Table 1 of the Planning Practice Guidance. Further details on the Flood Zone classifications are outlined in **Table 2.1**.

**Table 2.1: Flood Zone Classifications**

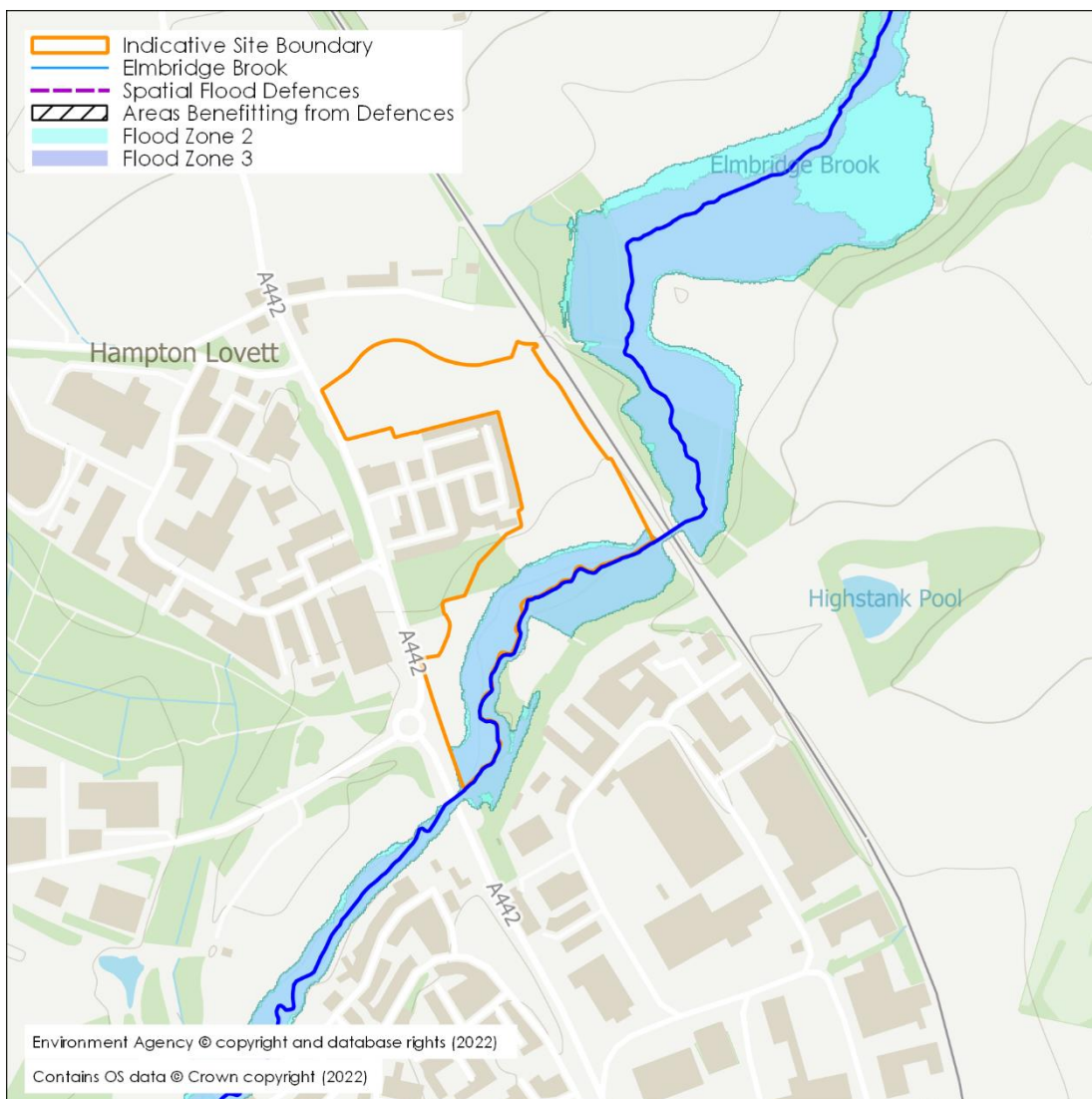
Flood Zone	Description
Flood Zone 1 (Low Probability)	Land having less than a 1 in 1000 annual probability of river or sea flooding (<0.1% Annual Exceedance Probability).
Flood Zone 2 (Medium Probability)	Land having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1% AEP); or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1% AEP).
Flood Zone 3a (High Probability)	Land having a 1 in 100 or greater annual probability of river flooding (>1% AEP); or land having a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP). This is represented by "Flood Zone 3" on the Flood Map for Planning.
Flood Zone 3b (The Functional Floodplain)	Flood Zone 3b (The Functional Floodplain) is defined as land where water must flow or be stored in times of

<sup>1</sup> Revised National Planning Policy Framework, Ministry of Housing, Communities & Local Government, amended 2021

<sup>2</sup> Planning Practice Guidance: <https://www.gov.uk/government/collections/planning-practice-guidance>

Flood Zone	Description
	flood. This is not identified or separately distinguished from Zone 3a on the Flood Map for Planning.

2.7 The site is shown to be located partially within Flood Zone 3, as shown in **Figure 2.1**.



**Figure 2.1: EA Flood Map for Planning**

### The Design Flood

- 2.8 The Planning Practice Guidance identifies that new developments should be designed to provide adequate flood risk management, mitigation, and resilience against the 'design flood' for their lifetime.
- 2.9 This is a flood event of a given annual flood probability, which is generally taken as fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or tidal flooding with a 0.5% annual probability (1 in 200 chance each year),

against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

## Climate Change

- 2.10 Predicted future changes in peak river flows caused by climate change are provided by the EA<sup>3</sup>, with a range of projections applied to regionalised 'River Basin Districts', which are further subdivided into Management Catchments.
- 2.11 The site falls within the Severn Middle Worcestershire Management Catchment of the Severn River Basin District. **Table 2.2** identifies the relevant peak river flow allowances from this Management Catchment.

**Table 2.2: Peak River Flow Allowance for the Severn Middle Worcestershire Management Catchment within the Severn River Basin District**

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	25%	38%	67%
Higher Central	16%	21%	40%
Central	12%	15%	30%

- 2.12 When determining the appropriate allowance for use in a FRA the Flood Zone classification, flood risk vulnerability and the anticipated lifespan of the development should be considered. **Table 2.3** provides a matrix summarising the EA's guidance on determining the appropriate allowance(s).

**Table 2.3: Application of the Appropriate Climate Change Allowance**

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Use the central allowance where a location may fall within Flood Zone 2 or 3 in the future.				
2	Use the higher central allowance	Use the central allowance			
3a	Use the higher central allowance	Development should not be permitted	Use the central allowance		
3b	Use the higher central allowance	Development should not be permitted			Use the central allowance

<sup>3</sup> Environment Agency, Flood risk assessments: climate change allowances: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-1>

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
If development is considered appropriate by the local authority when not in accordance with Flood Zone vulnerability categories, then it would be appropriate to use the higher central allowance.					

2.13 The site is located partially within Flood Zone 3, the proposed development is classified as 'more vulnerable, and it has an anticipated lifespan of up to 100 years. Therefore, the Central allowance for the '2080s' epoch should be considered. The Strategic Flood Risk Assessment (SFRA) for the area provides no information regarding future flooding in the area. Due to the difference in elevation between the area of the site proposed for development and Flood Zones, it is not expected to be at fluvial risk in the future; as such the climate allowances have not been considered further in this report.

### Strategic Flood Risk Assessment

2.14 A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future.

2.15 The South Worcestershire Level 1 SFRA<sup>4</sup> has been reviewed in the production of this FRA. The SFRA provides information specific to the site location in the form of fluvial, surface water and groundwater flood risk mapping, as well as records of historical flooding. Information from the Level 1 SFRA will be referenced within **Section 3** where applicable.

2.16 The South Worcestershire Level 2 SFRA<sup>5</sup> was produced to facilitate the application of Sequential and Exception Tests to screen allocated development sites. The proposed application site is not referenced within the Level 2 SFRA.

### Preliminary Flood Risk Assessment

2.17 A Preliminary Flood Risk Assessment (PFRA) is an assessment of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by the Lead Local Flood Authorities.

2.18 The Worcestershire County Council PFRA<sup>6</sup> considers flooding from surface water runoff, groundwater, ordinary watercourses and canals. It also references the historical river flooding which occurred in the local area in June and July 2007. However, no historical instances of flooding at the site are referenced. Information from the PFRA will be referenced within this report where applicable.

2.19 An addendum to the PFRA<sup>7</sup> was produced in December 2017 to provide an update in the understating of flood risk to the county. No significant changes in the assessment if flood risk to the county were reported that are of relevance to the site.

<sup>4</sup> Level 1 Strategic Flood Risk Assessment (JBA Consulting, August 2019)

<sup>5</sup> Level 2 Strategic Flood Risk Assessment (JBA Consulting, December 2012)

<sup>6</sup> Preliminary Flood Risk Assessment (Worcestershire County Council, June 2011)

<sup>7</sup> Preliminary Flood Risk Assessment Addendum (Worcestershire County Council, December 2017)

## Local Flood Risk Management Strategy

- 2.20 A Local Flood Risk Management Strategy (LFRMS) is prepared by a Lead Local Flood Authority to help understand and manage flood risk at a local level.
- 2.21 The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so that they can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.
- 2.22 The Worcestershire County Council LFRMS<sup>8</sup> has been reviewed and will be referenced within this report where applicable.

## Local Plan

- 2.23 The South Worcestershire Development Plan (SWDP)<sup>9</sup> replaced the Local Plans of three partner councils (Malvern Hills, Worcester City and Wychavon) following its adoption in February 2016. The SWDP outlines the objectives for South Worcestershire up to 2030.
- 2.24 Within the SWDP policy *SWDP 28: Management of Flood Risk* outlines the approach required to minimise the impacts from all forms of flood risk. Additionally, policy *SWDP 29: Sustainable Drainage Systems* outlines the standards development proposals must meet.
- 2.25 A review of the SWDP is currently being undertaken and will provide an updated plan period to 2041 and will update the existing SWDP.

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<sup>8</sup> Local Flood Risk Management Strategy (Worcestershire County Council, December 2015)

<sup>9</sup> South Worcestershire Development Plan (Worcestershire County Council, Adopted February 2016)

### 3. POTENTIAL SOURCES OF FLOOD RISK

3.1 Flooding can occur from a variety of sources, or combination of sources, which may be natural or artificial. **Table 3.1** below identifies the potential sources of flood risk to the site in its current condition, and the impacts which the development could have in the wider catchment, prior to mitigation. These are discussed in greater detail in the forthcoming section. The mitigation measures proposed to address flood risk issues and ensure the development is appropriate for its location are discussed within **Section 4**.

**Table 3.1: Pre-Mitigation Sources of Flood Risk**

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			X		The site is located within Flood Zone 3. The Elmbridge Brook flows adjacent to the southern site boundary. The proposed residential development within the site is elevated 5m above the nearest Flood Zone extents.
Coastal				X	The site is not at risk of tidal inundation and this source of flooding will not be considered any further within this report.
Canals				X	The nearest canal is located approximately 1.2km south of the site. The site is elevated above the canal.
Groundwater			X		The site is shown to fall within an area predicted to be at a low susceptibility to groundwater flooding.
Reservoirs and waterbodies			X		The site is shown to fall outside of the risk of reservoir failure mapping extents.
Pluvial runoff			X		The majority of the site is shown to be at a very low risk of surface water flooding. An area of higher risk is shown to be located in the northwest of the site
Sewers			X		Topography surrounding the site suggests that any exceedance flows would be directed away from the site.
Effect of Development			X		Development will not result in impedance of surface water.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
on Wider Catchment		X			The development will increase the area of impermeable surfaces leading to a potential increase in runoff.

### Fluvial Flood Risk

- 3.2 Flooding from watercourses occurs when flows exceed the capacity of the channel, or where a restrictive structure is encountered, which leads to water overtopping the banks into the floodplain. This process can be exacerbated when debris is mobilised by high flows and accumulates at structures.
- 3.3 The nearest EA Main River is the Elmbridge Brook located adjacent to the south of the site.
- 3.4 The site is located partially within Flood Zone 3, as shown in **Figure 2.1**. The Flood Zone 2 and 3 extents are shown to run along the south of the site. EA Light Detection and Ranging (LiDAR) data shows the proposed residential development within the site to be elevated 5m above the Flood Zone extents. Therefore, fluvial flood risk is not expected to pose a risk to the site now or in the future.
- 3.5 The nearest recorded flood outline is located approximately 8.8km west of the site. These recorded outlines relate to a number of flooding dates associated with the River Severn exceeding capacity. However, the site is shown to be outside of these flood extents. The SFRA indicates there to be no past instances of fluvial flooding at the site,
- 3.6 Overall, the risk of fluvial flooding at the site is considered to be low.

### Flood Risk from Canals

- 3.7 The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders and boreholes and manages water levels by transferring it within the canal system.
- 3.8 Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.
- 3.9 Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 3.10 The nearest canal is the Droitwich Canal located approximately 1.2km south of the site. LiDAR data has been used to determine the position of the site relative to the canal with



respect to elevation. This shows that the site is elevated above the canal by approximately 8m.

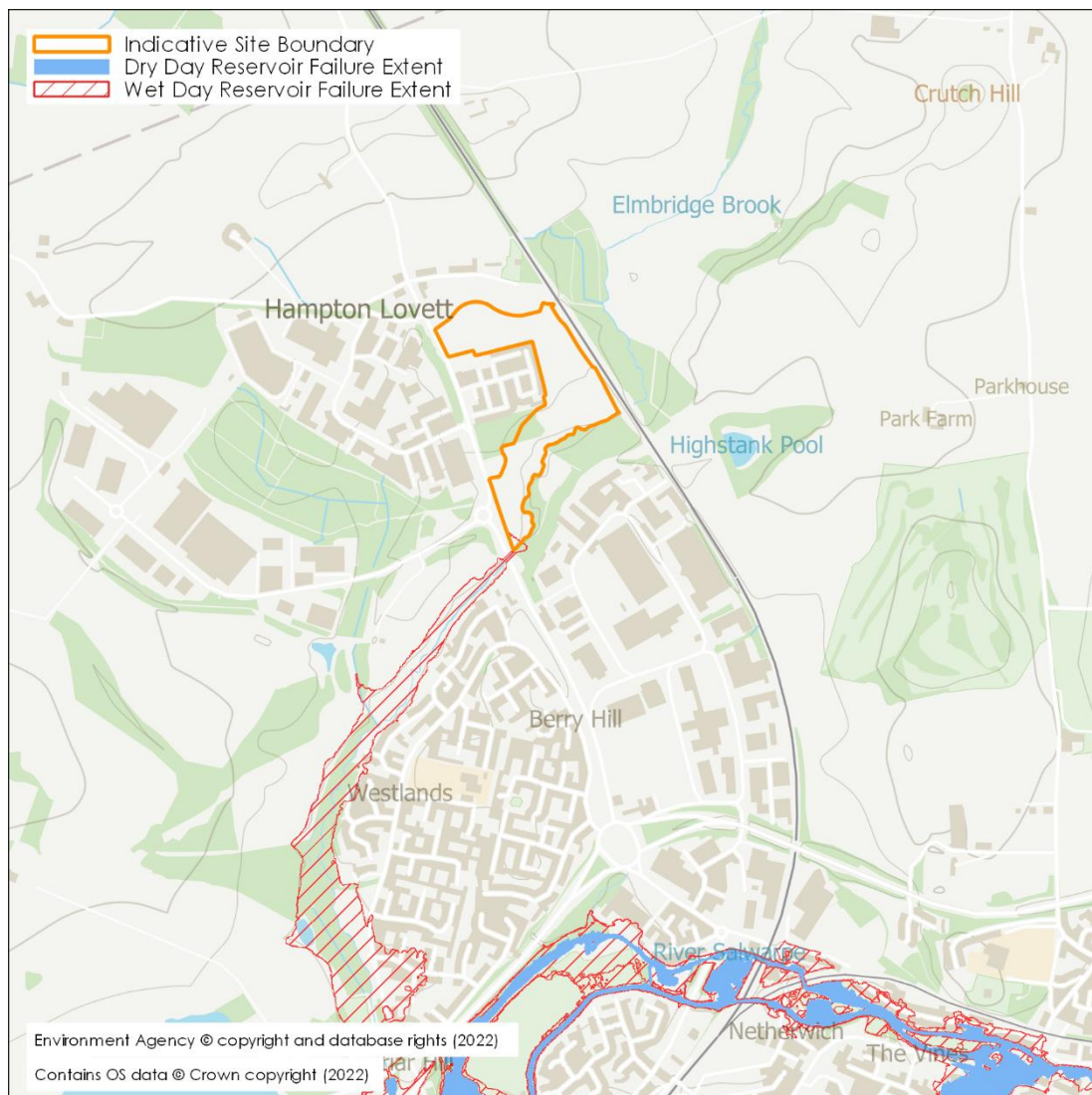
- 3.11 Overall, the risk of flooding from canals at the site is considered to be negligible.

### **Groundwater Flood Risk**

- 3.12 Groundwater flooding occurs when the water table rises above ground elevations. It is most likely to happen in low lying areas underlain by permeable geology. This may be regional scale chalk or sandstone aquifers, or localised deposits of sands and gravels underlain by less permeable strata such as that in a river valley.
- 3.13 British Geological Survey (BGS) mapping shows that the site is underlain by Sidmouth Mudstone Formation, this is designated by the EA as a Secondary B Aquifer. Secondary B Aquifers are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
- 3.14 There are no superficial deposits expected at the site.
- 3.15 The Level 1 SFRA outlines that there is no data on groundwater flooding within the district; however, it suggests that groundwater flooding is not considered to be a major issue within the South Worcestershire area.
- 3.16 A BGS borehole is located within the south of the site and may provide a representation of the site. No instances of groundwater were recorded up to depths of 10.35m.
- 3.17 Overall, the risk of groundwater flooding at the site is considered to be low.

### **Flood Risk from Reservoirs & Large Waterbodies**

- 3.18 Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 3.19 To help identify this risk, reservoir failure flood risk mapping has been prepared by the EA, this shows the largest area that might be flooded if a reservoir were to fail and release the water it holds on a dry and wet day. A dry day refers to a failure event in which a reservoir releases the water it holds while local rivers are at normal levels. A wet day refers to a reservoir failure event when a reservoir releases water at the same time as the local watercourses are experiencing a fluvial flood event and are at capacity. The map displays a worst-case scenario and is only intended as a guide. An extract of this mapping is shown in **Figure 3.1**.

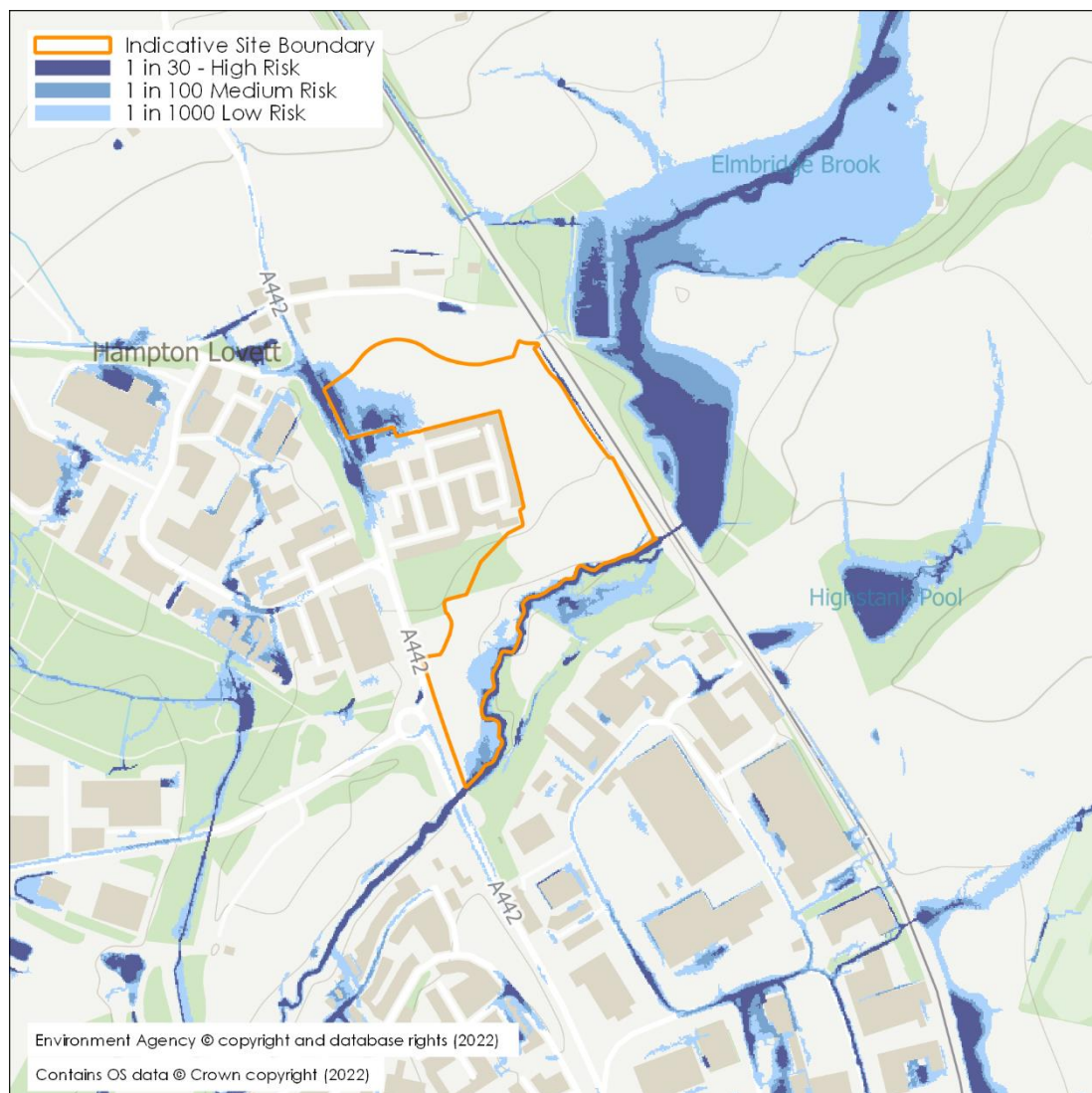


**Figure 3.1: Reservoir Failure Extent**

- 3.20 'Wet day' reservoir failure extents associated with Tardebigge and Westwood Great Pool are shown to encroach a small area in the south of the site. The nearest 'dry-day' flood extent is located approximately 1km south of the site.
- 3.21 Westwood Great Pool is privately owned where Tardebigge is owned by the Canals and River Trust. Based on the safety legislation in place and the maintenance and repair responsibilities of reservoir owners the actual probability of a significant failure is considered to be low
- 3.22 Highstank Pool is a waterbody located approximately 295m east of the site. It is likely that in a breach or overtopping event any flows from this waterbody will be routed away from the site due to the surrounding topography.
- 3.23 Overall, the risk of flooding from these sources is considered to be low.

## Pluvial Flood Risk

- 3.24 Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 3.25 Risk of flooding from surface water mapping has been prepared by the EA. This shows the potential flooding which could occur when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. An extract from the mapping is included as **Figure 3.2**.



**Figure 3.2: Surface Water Flood Risk Map**

- 3.26 The majority of the site is shown to be at a very low risk of surface water flooding. There is an area of low to high surface water flood risk present within the north west of the site associated with a topographical depression.
- 3.27 The area at higher risk of surface water flooding is associated with flows originating from Kidderminster Road north of the site and Doverdale Lane to the west. These flows are

likely to be conveyed by Kidderminster Road due to the raised verges adjacent to the road from the west.

- 3.28 It is expected that the surface water mapping in this area is an exaggerated representation of surface water flood risk as the mapping does not consider the highway drainage located along Kidderminster Road as shown in **Figure 3.3**.



**Figure 3.3: Kidderminster Road Highway Drainage**

- 3.1 The proposed access to the site from Kidderminster Road runs through a short stretch of risk at this point. Within the SWDP mapping Kidderminster Road is shown to be at a low to medium chance (1-3.3%) of flooding each year.
- 3.2 The risk associated with these areas of surface water flooding need to be addressed. Mitigatory actions are discussed further within **Section 4**.
- 3.3 An area of low to medium risk of surface water is also shown in the south of the site; these are expected to be a representation of extents associated with the Elmbridge Brook. High risk areas are shown to be confined within the channel of the watercourse and do not encroach the site boundary. The proposed development is set well outside of this area of risk.
- 3.4 Given the vast majority of the site is at a very low risk of surface water flooding, and that the area in the north west is considered to be an overestimation of risk, the overall risk is considered to be medium.

### **Flood Risk from Sewers**

- 3.5 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or as a result of a reduction in capacity due to collapse or blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding

onto the surrounding ground via manholes and gullies, which can generate overland flows.

- 3.6 The local sewerage undertaker is Severn Trent Water. A copy of their sewer records is included in **Appendix 3**. A 150mm public foul water sewer is located in the south of the site. This sewer flows to the south towards the sewer network within the residential development on the northern fringe of Droitwich Spa. Details of the cover and invert levels of this asset are not known.
- 3.7 West of the site is a sewer network comprised of surface water and foul water sewers within the Hampton Lovett Industrial Estate.
- 3.8 Using LiDAR to assess the surrounding topography, it is deemed that any exceedance flows associated with the local sewer networks would flow away from the site.
- 3.9 Overall, the risk of flooding from sewer exceedance at the site is considered to be low.

### **Effect of Development on Wider Catchment**

#### Development Land Use/Drainage Considerations

- 3.10 The proposed development will increase the area of impermeable surfaces on the site. This will result in an increase in surface water runoff, which could increase flood risk downstream unless properly mitigated. Appropriate surface water management is discussed in **Section 4**.

## **4. FLOOD RISK MITIGATION**

- 4.1 **Section 3** has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

### **Sequential Arrangement**

- 4.2 The site is shown to sit entirely within Flood Zone 1. Proposed developed has been sequentially arranged to locate residential development outside areas at risk of surface water flooding.

### **Development Levels**

- 4.3 It is recommended that finished floor levels for all properties are generally raised a minimum of 150mm above surrounding ground levels to mitigate the residual risk of surface water flooding.
- 4.4 No dwellings should be located within topographical depressions.
- 4.5 Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.

### **Safe Access and Egress**

- 4.6 Access and egress to the site along Kidderminster Road is shown to be at risk of surface water flooding. Whilst the risk highlighted in the surface water mapping is expected to be exaggerated as it does not account for highway drainage along Kidderminster Road, the access road is located in the area of lowest risk and is expected to be raised above the depths associated with the surface water flooding.

### **Surface Water Drainage**

- 4.7 To mitigate the development's impact on the current runoff regime it is proposed to incorporate surface water attenuation and storage as part of the development proposals.
- 4.8 Further information on the drainage approach is provided within the accompanying Sustainable Drainage Statement, (ref. HLD-BWB-ZZ-XX-RP-CD-0001).
- 4.9 In brief, the development will continue to discharge surface water to the Elmbridge Brook at the equivalent greenfield QBAR rate. Attenuated surface water storage will be provided with capacity for the 1 in 100-year storm with an allowance for climate change.

## **Foul Water Drainage**

- 4.10 It is proposed to drain foul water from the development separately to surface water.
- 4.11 Foul water will be drained into the existing foul water sewer located on site. The local surface operator has confirmed capacity for the proposed development.
- 4.12 Further information on the drainage approach is provided within the accompanying Sustainable Drainage Statement, (ref. HLD-BWB-ZZ-XX-RP-CD-0001).

## 5. CONCLUSIONS AND RECOMMENDATIONS

- 5.1 This FRA has been prepared in accordance with requirements set out in the NPPF and the associated Planning Practice Guidance. The FRA has been produced on behalf of Beechcroft Land Limited in respect of a planning application for a residential development at Land to the North of Droitwich Spa, Worcestershire
- 5.2 This FRA is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.
- 5.3 This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented. The identified risks and mitigation measures are summarised within **Table 5.1**:

**Table 5.1: Summary of Flood Risk Assessment**

Flood Source	Risk & Proposed Mitigation Measures
Fluvial	<p>The site is located within Flood Zone 1, 2 and 3.</p> <p>The proposed residential development within the site is elevated 5m above the nearest Flood Zone extents and, therefore, is not considered to be at risk of fluvial flooding.</p> <p>There are no ordinary watercourses located within the site.</p>
Coastal/Tidal	The site does not fall within a coastal flood risk zone.
Canals	The site is significantly removed from any canals or artificial waterways.
Groundwater	The site has been identified as being within an area at a low risk of groundwater flooding.
Reservoirs and waterbodies	<p>The small area in the south corner of the site is encroached by 'wet day' reservoir extents. Given the maintenance responsibilities of reservoir owners the risk is expected to be low.</p> <p>Any exceedance flows from the Highstank pool are expected to flow away from the site.</p>
Pluvial runoff	<p>Finished floor levels for all properties should be raised a minimum of 150mm above surrounding ground levels to mitigate the residual risk of surface water flooding.</p> <p>No dwellings should be located within topographical depressions.</p> <p>Ground levels should be profiled to encourage pluvial runoff and overland flows away from the built development and towards the nearest drainage point.</p>
Sewers	Exceedance flows from sewers are expected to flow away from the site
Impact of the Development	Surface water runoff from the development will be controlled appropriately and discharged to the Elmbridge Brook at the equivalent greenfield QBAR rate.

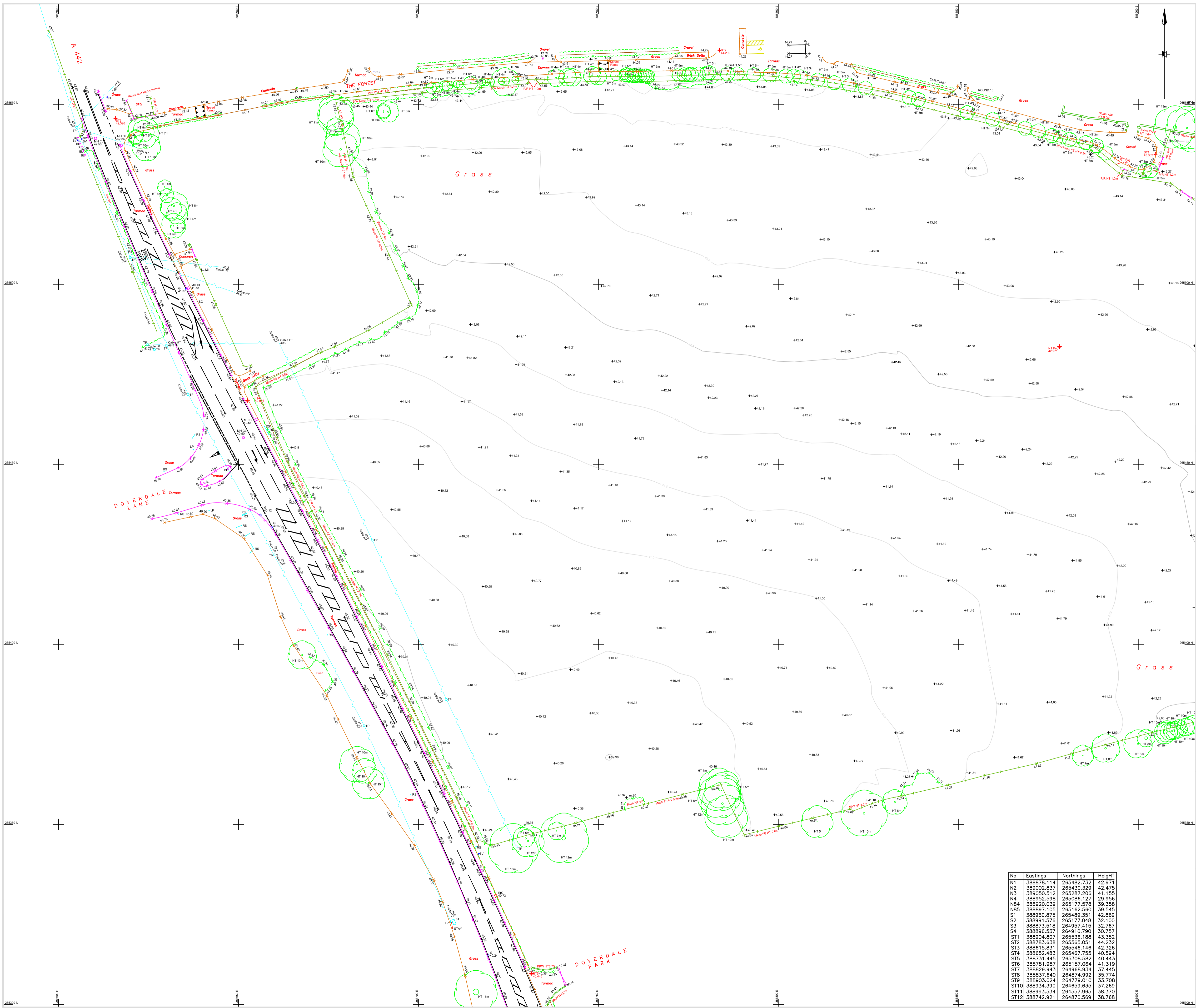


	The foul water from the development will be discharged to the public sewer within the site, which the operator has confirmed has capacity.
This summary should be read in conjunction with BWB's full report. It reflects an assessment of the Site based on information received by BWB at the time of production.	

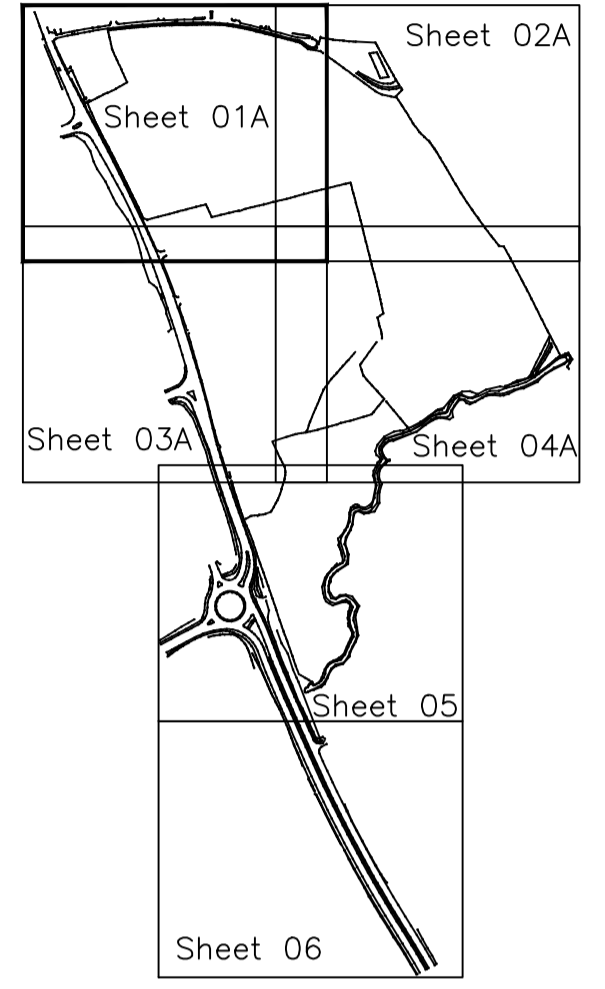
- 5.4 In compliance with the requirements of NPPF, and subject to the mitigation measures proposed, the development could proceed without being subject to significant flood risk. Moreover, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff discharging from the site.

## **APPENDICES**

**Appendix 1: Topographical Survey**



- NOTES**
1. Levels : Ordnance Survey GPS Datum.
  2. Grid : Ordnance Survey National Grid based on GPS Observations.
  3. North Point indicative only.
  4. Drainage pipe sizes are approximate as gauged from the surface.
  5. Expert identification is advised for tree species.
  6. Boundary detail may not represent the extent of legally conveyed ownership.
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<b>A</b>	<b>Adjacent Roads Added</b>	<b>JR</b>	<b>07/11/14</b>
REVISION	COMMENTS	DRAWN BY	DATE

- KEY**
- INTERNAL FEATURES**
- B BEAM HEIGHT
  - C CEILING HEIGHT (ARROW POINTS UP)
  - D DOOR HEIGHT
  - P PIPE HEIGHT
  - F FLOOR LEVEL
  - H HEAD HEIGHT
  - S SILL HEIGHT
  - SP SPRING HEIGHT
  - ES ELECTRICAL SOCKET
  - SC SLOPING CEILING (ARROW POINTS UP)
  - IH IMMERSION HEATER
  - B BOILER
  - R RADIATOR
  - TS TELEPHONE SOCKET
  - FA FIRE ALARM
  - TV TV SOCKET
  - L LIGHT
- TOPOGRAPHICAL FEATURES**
- AV AIR VALVE
  - BA BARRIER
  - BB BELISHA BEACON
  - BH BORE HOLE
  - BKW BRICK WALL
  - BL BOLLARD
  - Bed BED LEVEL OF STREAM
  - BS BUS STOP
  - BT BRITISH TELECOM COVER
  - B/W BARBED WIRE FENCE
  - CB CONTROL BOX
  - CB CLOSE BOARDED FENCE
  - CCTV CCTV CAMERA
  - CL COVER LEVEL
  - CL CHAIN LINK FENCE
  - CP CATCH PIT
  - CPS CONCRETE PAVING SLABS
  - CTV CABLE TELEVISION COVER
  - CW CONCRETE WALL
  - DP DOWN PIPE
  - EIC ELECTRIC INSPECTION COVER
  - EP ELECTRIC POLE
  - ER EARTH ROD
  - FE FENCE
  - FH FIRE HYDRANT
  - FL FLOOR LEVEL
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  - G GULLY
  - GP GATEPOST
  - GV GAS VALVE
  - HR HAND RAIL
  - HT HEIGHT
  - IC INSPECTION COVER
  - IL INVERT LEVEL
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  - LAL LARCH LAP FENCE
  - LP LAMP POST
  - LT LIGHT
  - MH MANHOLE COVER
  - MK MARKER
  - MKE ELECTRIC MARKER
  - MKF FIRE HYDRANT MARKER
  - MKG GAS MARKER
  - MKT TELEPHONE MARKER
  - MT MULTI TRUNK
  - NB NOTICE BOARD
  - NP NAME PLATE
  - PB POST BOX
  - PP PETROL PUMP
  - P/R POST & RAIL FENCE
  - PT POST
  - P/W POST & WIRE FENCE
  - RE RODDING EYE
  - RP REFLECTOR POST
  - RS ROAD SIGN
  - RW RETAINING WALL
  - SC STOP COCK
  - SIG RAILWAY SIGNAL
  - SP SIGN POST
  - ST STONE WALL
  - SV STOP VALVE
  - SW SURFACE WATER
  - SY STAY
  - TAC TACTILE PAVING
  - TBM TEMPORARY BENCH MARK
  - TGB TELEPHONE CALL BOX
  - TL TRAFFIC LIGHT
  - TM TICKET MACHINE
  - TP TELEPHONE POLE
  - TRP TRIAL PIT
  - UTL UNABLE TO LIFT
  - VT VENT
  - WM WATER METER
  - WO WASH OUT
  - WS SURVEY STATION

No	Eastings	Northings	Height
N1	388878.114	265482.732	42.971
N2	389002.837	265430.329	42.475
N3	389050.512	265287.206	41.155
N4	388952.598	265086.127	29.956
N84	388920.039	265177.578	39.358
N85	388897.105	265182.560	39.545
S1	388960.875	265489.351	42.869
S2	388991.576	265177.048	32.100
S3	388873.518	264957.415	32.787
S4	388886.537	264910.790	30.757
S11	388904.807	265536.188	43.352
S12	388783.838	265565.051	44.232
S13	388615.831	265546.146	42.326
S14	388652.483	265467.755	40.594
S15	388731.445	265308.582	40.445
S16	388781.987	265157.064	41.319
S17	388629.943	264968.934	37.445
S18	388537.640	264874.592	35.774
S19	388903.024	264779.010	33.708
S110	388934.390	264859.635	37.269
S111	388993.534	264557.965	38.370
S112	388742.921	264870.569	38.768

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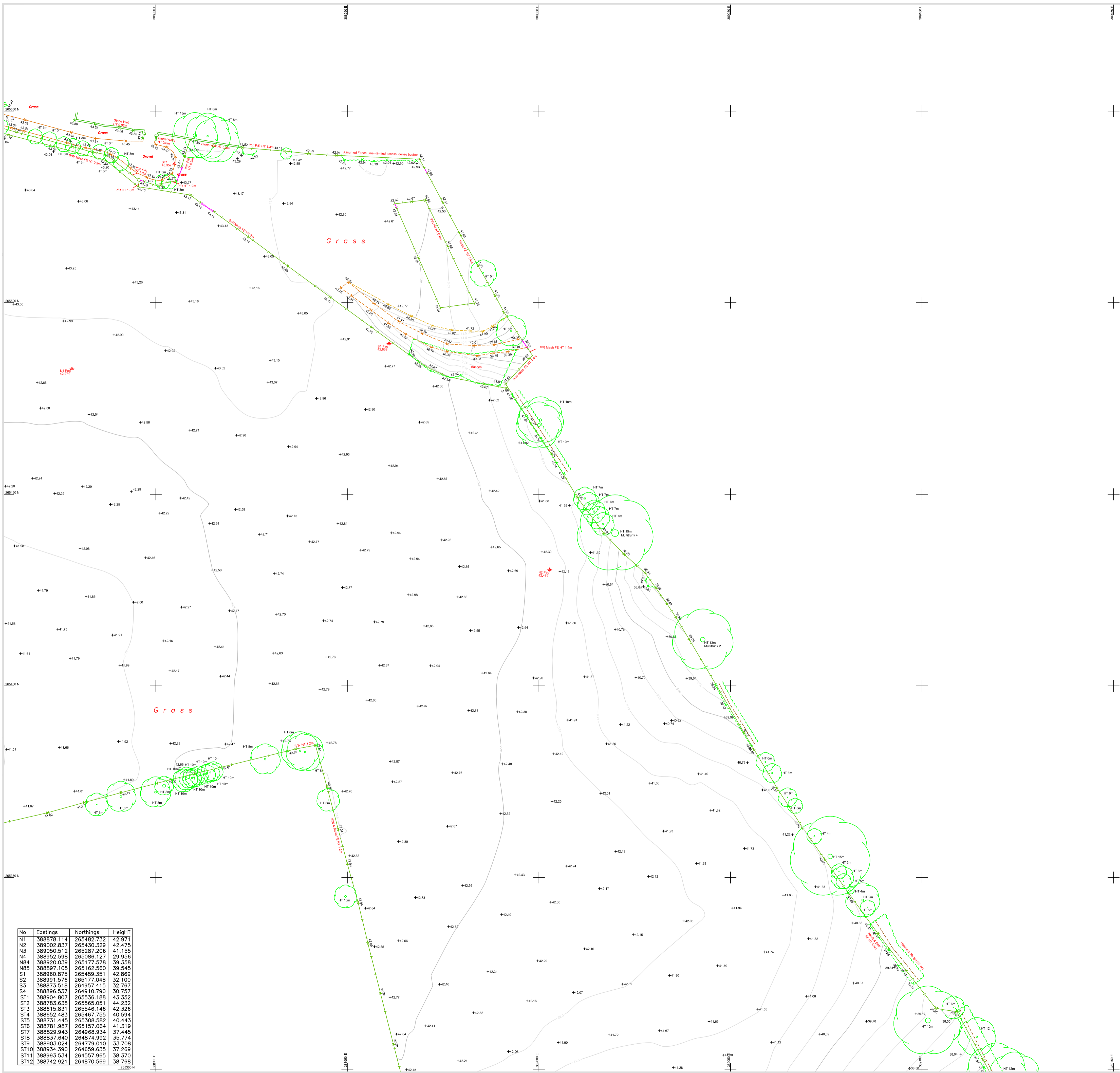
Suite H2 Coventry Place, Blackpole East, Worcester, WR3 8SG

T: 01905 622495 F: 01905 700029

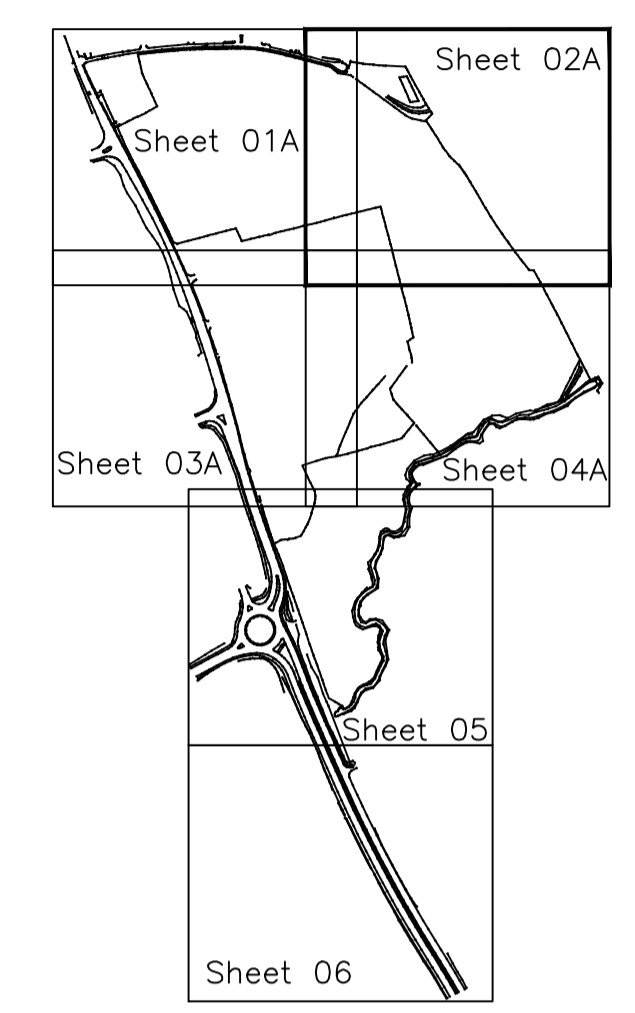
surveys@buryassociates.co.uk

www.buryassociates.co.uk

<b>CLIENT</b>	<b>Malcolm Scott Consultants</b>	Grove House 1 Lovess Grove Worcester WR1 3BU
<b>PROJECT</b>	<b>Land North West of Droitwich Spa</b>	
<b>DRAWING TITLE</b>	<b>Topographical Survey</b>	
<b>SCALE</b>	1:500	<b>SHEET SIZE</b> A1
<b>DRAWING NO.</b>	<b>BA19201014_01A</b>	<b>DATE</b> 29/10/2014
		<b>SURVEYOR</b> NH, JR
		<b>DRAWN BY</b> NH, JR



- NOTES**
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  2. Grid : Ordnance Survey National Grid based on GPS Observations.
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A	Adjacent Roads Added	JR	07/11/14
REVISION	COMMENTS	DRAWN BY	DATE

**KEY**

<b>INTERNAL FEATURES</b>	<b>EXTERNAL FEATURES</b>
B BEAM HEIGHT	C SLOPING CEILING (ARROW POINTS UP)
C CEILING HEIGHT	(IH) IMMERSION HEATER
D DOOR HEIGHT	(B) BOILER
P PIPE HEIGHT	(R) RADIATOR
FL FLOOR LEVEL	TELEPHONE SOCKET
H HEAD HEIGHT	SP SPRING HEIGHT
S SILL HEIGHT	● FIRE ALARM
● ELECTRICAL SOCKET	▲ TV SOCKET
★ LIGHT	

**TOPOGRAPHICAL FEATURES**

AV AIR VALVE	LT LIGHT
BA BARRIER	MH MANHOLE COVER
BB BELISHA BEACON	MK MARKER
BH BORE HOLE	MKE ELECTRIC MARKER
BKW BRICK WALL	MKF FIRE HYDRANT MARKER
BL BOLLARD	MKG GAS MARKER
Bed BED LEVEL OF STREAM	MKT TELEPHONE MARKER
BS BUS STOP	MT MULTI TRUNK
BT BRITISH TELECOM COVER	NB NOTICE BOARD
B/W BARBED WIRE FENCE	NP NAME PLATE
CB CONTROL BOX	PB POST BOX
C/B CLOSE BOARDED FENCE	PP PETROL PUMP
CCTV CCTV CAMERA	P/R POST & RAIL FENCE
CL COVER LEVEL	PT POST
CL CHAIN LINK FENCE	P/W POST & WIRE FENCE
CP CATCH PIT	RE RODDING EYE
CPS CONCRETE PAVING SLABS	RP REFLECTOR POST
CTV CABLE TELEVISION COVER	RS ROAD SIGN
CW CONCRETE WALL	RW RETAINING WALL
DP DOWN PIPE	SC STOP COCK
EIC ELECTRIC INSPECTION COVER	SIG RAILWAY SIGNAL
EP ELECTRIC POLE	SP SIGN POST
ER EARTH ROD	ST STONE WALL
FE FENCE	SV STOP VALVE
FH FIRE HYDRANT	SW SURFACE WATER
FL FLOOR LEVEL	SY STAY
FP FLAG POLE	TAC TACTILE PAVING
FW FOUL WATER	TBM TEMPORARY BENCH MARK
GULLY	TCS TELEPHONE CALL BOX
GP GATEPOST	TL TRAFFIC LIGHT
GV GAS VALVE	TM TICKET MACHINE
HR HAND RAIL	TP TELEPHONE POLE
HT HEIGHT	TRP TRIAL PIT
IC INSPECTION COVER	UTL UNABLE TO LIFT
IL INVERT LEVEL	VT VENT
IR IRON RAILING FENCE	WM WATER METER
KO KERB OUTLET	WO WASH OUT
L/L LARCH LAP FENCE	▲ S8 SURVEY STATION
LP LAMP POST	▲ 47.044

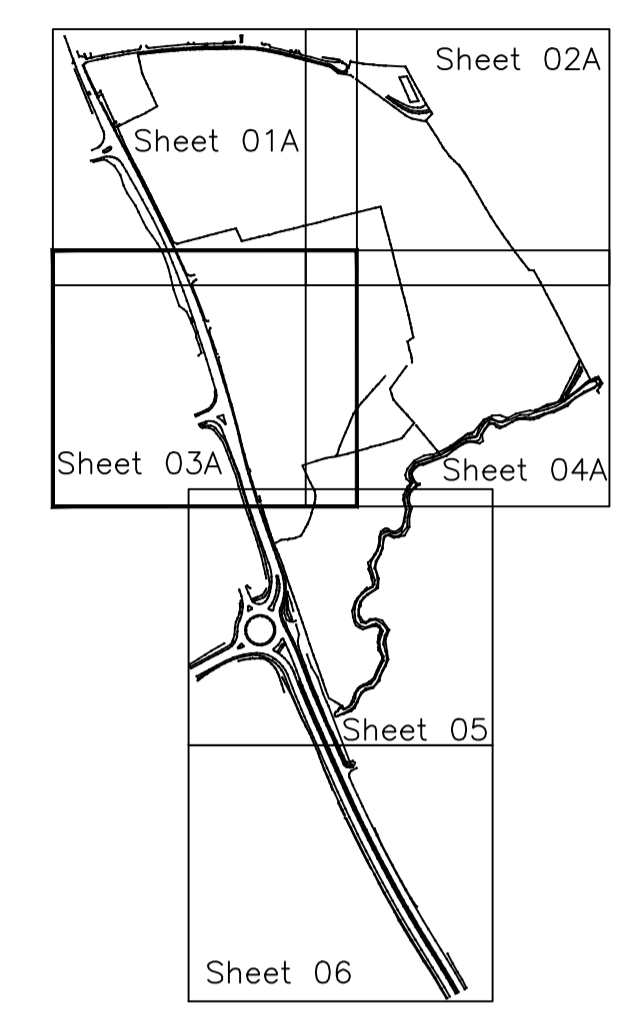
No	Eastings	Northings	Height
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N2	389002.837	265430.329	42.475
N3	389050.512	265287.206	41.156
N4	388952.598	265086.127	29.956
N84	388920.039	265177.578	39.358
N85	388937.105	265162.560	39.545
S1	388960.875	265489.351	42.869
S2	388991.576	265177.048	32.100
S3	388873.518	264957.415	32.767
S4	388896.537	264910.790	30.757
ST1	388904.807	265536.189	43.352
ST2	388783.638	265565.051	44.232
ST3	388615.831	265546.146	42.326
ST4	388652.483	265467.755	40.594
ST5	388731.445	265308.582	40.443
ST6	388781.987	265157.064	41.319
ST7	388829.943	264968.934	37.445
ST8	388837.640	264974.992	35.774
ST9	388903.024	264779.010	33.708
ST10	388934.390	264659.635	37.269
ST11	388993.534	264557.965	38.370
ST12	388742.921	264870.569	38.768

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CLIENT	Malcolm Scott Consultants	Grove House 1 Loves Grove Worcester WR1 3BU
PROJECT	Land North West of Droitwich Spa	
DRAWING TITLE	Topographical Survey	
SCALE	1:500	SHEET SIZE A1
DATE	29/10/2014	
DRAWING NO.	BA19201014_02A	SURVEYOR NH, JR
		DRAWN BY NH, JR

No	Eastings	Northings	Height
N1	38878.114	265482.732	42.971
N2	38902.837	265430.329	42.475
N3	389050.512	265287.206	41.155
N4	388952.598	265086.127	29.956
N84	388920.039	265177.578	39.358
N85	388897.105	265162.560	39.545
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S2	388991.576	265177.048	32.100
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ST12	388742.921	264870.569	38.768

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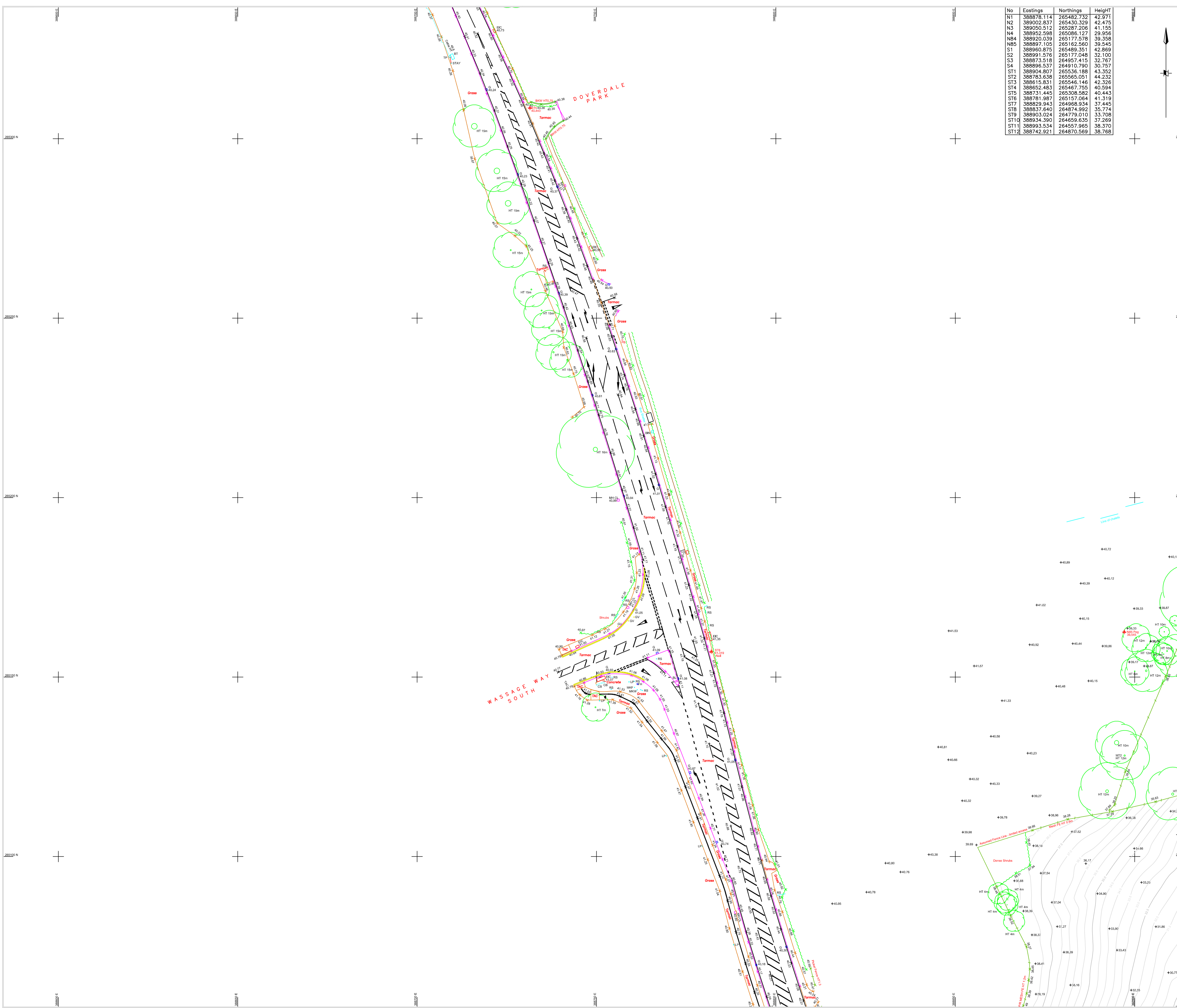
A	Adjacent Roads Added	JR	07/11/14
REVISION	COMMENTS	DRAWN BY	DATE

- KEY**
- INTERNAL FEATURES**
- B BEAM HEIGHT
  - C CEILING HEIGHT (ARROW POINTS UP)
  - D DOOR HEIGHT
  - P PIPE HEIGHT
  - FL FLOOR LEVEL
  - H HEAD HEIGHT
  - S SILL HEIGHT
  - SP SPRING HEIGHT
  - LS LIGHT SWITCH
  - ES ELECTRICAL SOCKET
  - C SLOPING CEILING (ARROW POINTS UP)
  - IH IMMERSION HEATER
  - B BOILER
  - R RADIATOR
  - TE TELEPHONE SOCKET
  - FA FIRE ALARM
  - TS TV SOCKET
  - L LIGHT
- TOPOGRAPHICAL FEATURES**
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  - TRP TRIAL PIT
  - UTL UNABLE TO LIFT
  - VT VENT
  - WM WATER METER
  - WO WASH OUT
  - S28 SURVEY STATION
  - 47.044

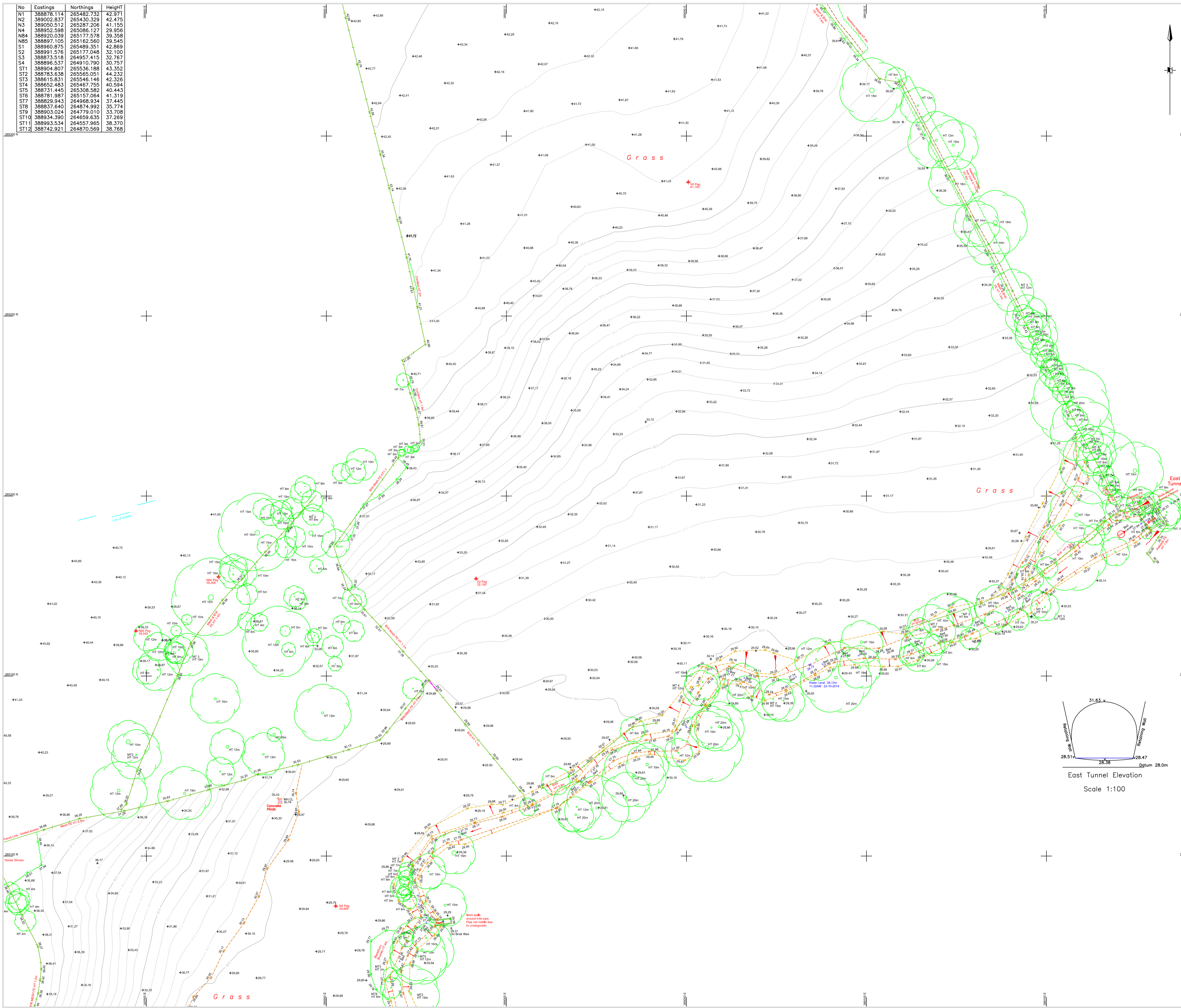
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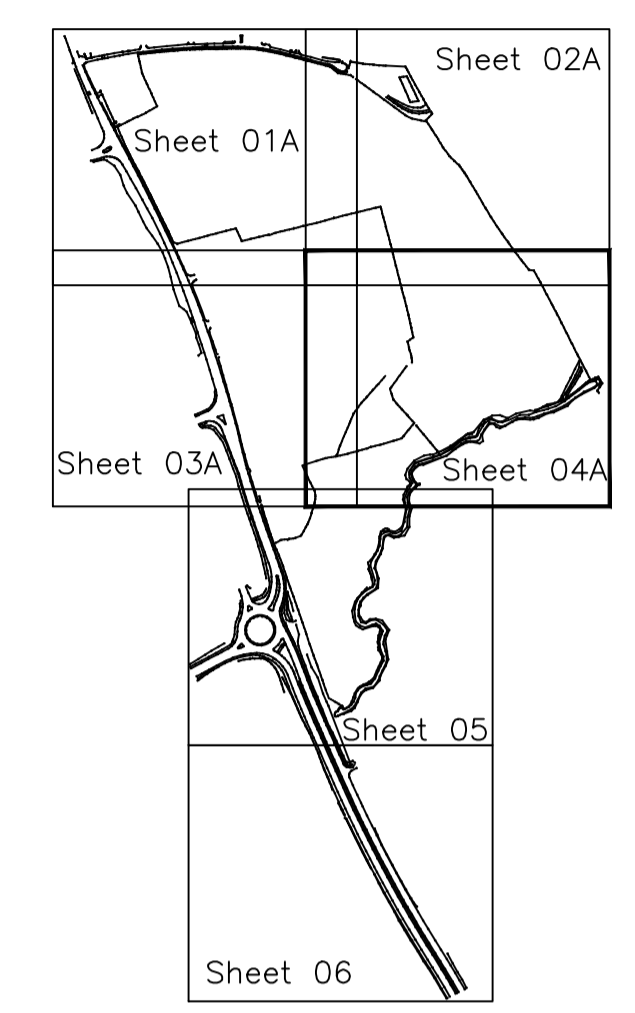
CLIENT	Malcolm Scott Consultants	Grove House 1 Lovess Grove Worcester WR1 3BU
PROJECT	Land North West of Droitwich Spa	
DRAWING TITLE	Topographical Survey	
SCALE	1:500	DATE 29/10/2014
DRAWING NO.	BA19201014_03A	SURVEYOR NH, JR DRAWN BY NH, JR
		SHEET SIZE A1



No	Eastings	Northings	Height
N1	38876.114	26542.732	42.971
N2	38902.837	26543.329	42.475
N3	38905.512	26528.206	41.155
N4	38892.598	26508.127	29.956
N84	38892.039	26517.578	39.358
N85	38887.105	26516.560	39.545
S1	38896.875	26489.351	42.869
S2	38891.576	26517.048	32.100
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S4	38896.537	26491.790	30.757
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A	Adjacent Roads Added	JR	07/11/14
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REVISION	COMMENTS	DRAWN BY	DATE
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KEY	
<b>INTERNAL FEATURES</b>	<b>TOPOGRAPHICAL FEATURES</b>
B BEAM HEIGHT	LT LIGHT
C CEILING HEIGHT (ARROW POINTS UP)	MH MANHOLE COVER
D DOOR HEIGHT	MK MARKER
P PIPE HEIGHT	MKE ELECTRIC MARKER
FL FLOOR LEVEL	MKF FIRE HYDRANT MARKER
H HEAD HEIGHT	MKG GAS MARKER
S SILL HEIGHT	Bed Bed LEVEL OF STREAM
SP SPRING HEIGHT	BS BUS STOP
ES ELECTRICAL SOCKET	BT BRITISH TELECOM COVER
	B/W BARBED WIRE FENCE
	CB CONTROL BOX
	C/B CLOSE BOARDED FENCE
	CCTV CCTV CAMERA
	CL COVER LEVEL
	CL CHAIN LINK FENCE
	CP CATCH PIT
	CPS CONCRETE PAVING SLABS
	CTV CABLE TELEVISION COVER
	CW CONCRETE WALL
	DP DOWN PIPE
	EIC ELECTRIC INSPECTION COVER
	EP ELECTRIC POST
	ER EARTH ROD
	FE FENCE
	FH FIRE HYDRANT
	FL FLOOR LEVEL
	FP FLAG POLE
	FW FOUL WATER
	G GULLY
	GP GATEPOST
	GV GAS VALVE
	HR HAND RAIL
	HT HEIGHT
	IC INSPECTION COVER
	IL INVERT LEVEL
	IR IRON RAILING FENCE
	KO KERB OUTLET
	LP LAMP POST
	RE SLOPING CEILING (ARROW POINTS UP)
	IH IMMERSION HEATER
	B BOILER
	R RADIATOR
	TS TELEPHONE SOCKET
	FA FIRE ALARM
	TS TV SOCKET
	L LIGHT
	AV AIR VALVE
	BA BARRIER
	BB BELISHA BEACON
	BH BORE HOLE
	BKW BRICK WALL
	BL BOLLARD
	Bed Bed LEVEL OF STREAM
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