



## **DRAINAGE & FLOOD RISK STATEMENT**

### **Rockingham Phase 2 and 3 Barnsley**

**Reference**

**4652-2-JPG-XX-XX-RP-D-0620-S2-P01**

**Date**

**December 2019**

**Author**

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## CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

Harworth Group  
Advantage House  
Poplar Way  
ROTHERHAM  
S60 5TR

This report has been prepared for the sole use and reliance of the above named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of JPG (Leeds) Limited. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

## DOCUMENT HISTORY

| Rev | Date       | Revision Details | Status      | Author(s) | Approved |
|-----|------------|------------------|-------------|-----------|----------|
| P01 | 16.12.2019 | First Issue      | Information | JDM       |          |



## 1.0 INTRODUCTION

JPG (Leeds) Limited has been instructed by Harworth Group to carry out a Drainage and Flood Risk Assessment for a proposed commercial development on land immediately to the north and south of Dearne Valley Parkway.

The report will review the drainage and flood risk issues associated with the proposed development and recommend any mitigation which should take place as part of the development.

This document is prepared in accordance with the requirements of and in response to the Planning Practice Guidance & National Planning Policy Framework (NPPF) which states that those proposing particular developments are responsible for:

- Providing an assessment of whether any proposed development is likely to be affected by flooding and whether it will increase the flood risk elsewhere and of the measures proposed to deal with these effects and risks; and
- Satisfying the local planning authority that any flood risk to the development or additional risk arising from the proposal will be successfully managed with the minimum environmental effect, to ensure that the site can be developed and occupied safely.

NPPF defines flood zones as follows:

- Zone 1 – Low Probability – less than 1 in 1000 annual probability (< 0.1%) of river or sea flooding in any year.
- Zone 2 – Medium Probability – between a 1 in 100 and 1 in 1000 annual probability (1% - 0.1%) of river flooding or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.
- Zone 3a – High Probability – 1 in 100 or greater annual probability (> 1%) of river flooding or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Zone 3b – Functional Floodplain – 1 in 20 or greater annual probability (5%) of river flooding in any year. This is land on which water has to flow or be stored in times of flood.

A Flood Risk Assessment is required for all sites in excess of 1ha within Zone 1 and all sites within Zones 2 and 3.



## 2.0 THE SITE

The site is located to the north east of Junction 36 of the M1 motorway, on both the north and south side of Dearne Valley Parkway, approximately 1.75km northwest of Hoyland town centre. The approximate centre of the site is located at NGR E435470, N401042.

### Phase 2

The site is located to the south of Dearne Valley Parkway and is an irregular shape covering an area of approximately 28.037ha.

The site is bounded by Dearne Valley Parkway to the north, a bridle track running from the east around the southern boundary and beyond this is open fields.

To the west is a watercourse/ditch running from south to north including a small pond in the north west corner. Further over to the west is future development land.

The site comprises of restored former opencast working and currently is a mixture of fields interspaced with woodland areas.

The site generally falls from south to north in the order of 36.5m.

### Phase 3

The site is located to the north of Dearne Valley Parkway and is an irregular shape covering an area of approximately 9.72ha.

The site is bounded by Dearne Valley Parkway to the south, open agricultural land to the north, an existing business park to the east and to the west is a watercourse/ditch, pond and further over an existing business park.

The site comprises of restored former opencast working and currently is a mixture of fields and interspaced with woodland areas.

The site generally falls from south to north in the order of 21.0m.

A Site Location Plan is located in Appendix A and topographic survey in Appendix B.



### 3.0 EXISTING DRAINAGE AND SEWER NETWORK

A Yorkshire Water public sewer plan is provided in Appendix C, this indicates the following public sewers in close proximity to the site:

- There is a 150 mm diameter public foul water sewer recorded to the north located within the phase 3 development land.

An open watercourse and pond exist running adjacent to the west of phase 2 which flows in a south to north direction.

This passes beneath Dearne Valley Parkway in a culvert and becomes open watercourse again with a further pond located to the west of Phase 3 development land.

This watercourse is understood to be a tributary of the downstream watercourse known as Short Wood Dike which is located to the north of the phase 3.



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## 4.0 DEVELOPMENT PROPOSALS

It is proposed to develop both phase 2 and phase 3 sites for commercial development.

Proposed development area for phase 2 is approximately 28.00 Ha.  
Impermeable area for Phase 2 is approximately 15.00 Ha.

Proposed development area for phase 3 is approximately 10.00 Ha.  
Impermeable area for Phase 3 is approximately 6.500 Ha.

A proposed site plan is provided in Appendix D.



## 5.0 FLOOD RISK ASSESSMENT

Publicly available information on flooding obtained from the Environment Agency (EA) website database is provided in Appendix E.

The site is indicated to fall within Flood Zone 1 which comprises land assessed as having a low risk of flooding from watercourse and/or sea with less than a 1:1000 annual probability of river or sea flooding.

NPPF Technical Guidance states all uses of land are appropriate in Flood Zone 1.

As the site area is greater than 1ha other sources of flooding need to be considered.

These include:

- Adjoining land.
- Ground water.
- Flooding from sewers.
- Flooding from reservoirs, canals and other artificial sources.

### 5.1 Flooding from Adjoining Land

#### Phase 2

The site sits in an elevated position above land to the north (Dearne Valley Parkway).

To the south land is of a similar elevation to the site at the boundary.

The ground generally falls away to the south and west outside of the site boundary.

There is an area of higher ground in the south east corner, but this generally falls towards the east. Any overland flows from this area would pass the site to the east.

To the west is the existing watercourse/ditch which is at a considerably lower level than the proposed site. Therefore, overland flooding from this location is considered unlikely.

#### Phase 3

The site sits in an elevated position above the land to the north which is open fields and generally falls in a north east direction.

To the south land is of a similar elevation to the site at the boundary and is public highway (Dearne Valley Parkway).

Any runoff from the public highway would be contained within the confines of the highway and associated drainage system.

Land to both the east and west of the site generally falls from the south to the north and is of similar level to the proposed phase 3 development at the boundary.



Any overland flows from here would generally pass the site in a south to north direction. Therefore, overland flooding from these locations is considered unlikely.

The risk of flooding from adjoining land is considered to be **low**.

## 5.2 Flooding from Groundwater

The proposed sites will be in an elevated position in relation to the nearest watercourses, thus it is unlikely there will be an issue with groundwater effecting the site.

The risk of flooding from ground water is considered to be **low**.

## 5.3 Flooding from Sewers

The sewers in proximity to the site are public sewers owned by Yorkshire Water and will be subject to regular maintenance and inspection, therefore blockage of these sewers is unlikely.

The risk of flooding from sewers is considered to be **low**.

## 5.4 Flooding from Reservoirs, Canals and Other Artificial Sources

A surface water balancing pond is located to the west of the phase 3 site. This feature is understood to be a facility associated with the adjacent public highway (Dearne Valley Parkway), which is owned/maintained by the highway authority and will be subject to regular maintenance and inspection therefore blockage/overtopping of this facility unlikely.

There are no other known reservoirs, canals or artificial sources within the vicinity of the site. The site is therefore not at risk from such sources.

The risk of flooding from sewers is considered to be **low**.



## 6.0 SURFACE AND FOUL WATER DRAINAGE

The proposed site drainage will comprise of a separate surface and foul water drainage system.

The proposed drainage will be designed in accordance with current Building Regulations, SFA and industry best practice as required.

The following summarises the requirements for the discharge of surface and foul water from the site.

### 6.1 Sustainable Urban Drainage Systems (SUDS)

Initial investigations indicate the sites are underlain by significant depths of made ground/fill due to former mine workings in the area, therefore the disposal of surface water by infiltration methods is not deemed feasible.

Given the underlying ground strata the use of infiltration methods for the discharge of surface water is deemed unsuitable due to potential settlement issues associated with the made ground becoming inundated with surface water.

Sustainable Urban Drainage System (SUDS) may be used in conjunction with conventional drainage systems to improve water quality as well as manage surface water discharge.

The following audit has been carried out relating to suitability of SUD's systems.

| Drainage Method                      | Description/Suitability                                     | Proposal/Feasibility |
|--------------------------------------|-------------------------------------------------------------|----------------------|
| 1. Infiltration.                     | Methods not deemed suitable due to underlying ground strata | Not applicable.      |
| 2. Ponds and wetlands.               | May be suitable if land is allocated                        | Applicable.          |
| 3. Infiltration Basins.              | Methods not deemed suitable due to underlying ground strata | Not applicable.      |
| 4. Detention Basins.                 | May be suitable if land is allocated.                       | Applicable.          |
| 5. Swale.                            | May be utilised convey water.                               | Applicable.          |
| 6. French/Filter drain.              | May be utilised convey water.                               | Applicable.          |
| 7. Pervious/Permeable Pavement.      | Methods not deemed suitable due to underlying ground strata | Not applicable.      |
| 8. Geocellular Systems/Tank systems. | May be used as surface water attenuation.                   | Applicable.          |
| 9. Oversized pipes.                  | May be used as surface water attenuation.                   | Applicable.          |
| 10. Box culverts.                    | May be used as surface water attenuation.                   | Applicable.          |
| 11. Purpose designed tanks.          | May be used as surface water attenuation.                   | Applicable.          |

### 6.2 Surface Water Drainage

The disposal of surface water shall be in accordance with the Requirement H3 of Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway/infiltration system, watercourse and public sewer in that priority order.

As noted in Section 6.1 the discharge of surface water drainage via infiltration methods is not feasible, therefore the second consideration should be discharge to watercourse.



The nearest watercourse is a tributary of the downstream watercourse known as Short Wood Dike. Short Wood Dike is located within land to the north of phase 3.

The tributary which passes adjacent to both phases of the development is located to the west and runs in a south to north direction passing beneath Dearne Valley Parkway.

This is the proposed location for discharge of surface water from both phases. Surface water discharge from the both sites would be restricted to agreed rates with the LLFA (Barnsley).

In previous consultation with Barnsley MDC land drainage department as part of the Hoyland Master Plan Strategy which cover phase 2 of the development. BMDC confirmed a greenfield discharge rate of 4.4 litres/second/hectare is applicable for the area which covers phase 2.

Based on the above figure the greenfield run off for the two phases would be as follows:

- Phase 2 impermeable area approximately 15.00Ha x 4.4l/s/ha = 66.0 l/s.
- Phase 3 impermeable area approximately 6.50Ha x 4.4l/s/ha = 28.6 l/s.

In addition, greenfield run-off calculations have also been prepared using Windes Micro Drainage software and results are located in Appendix F.

Greenfield run off based on the Micro Drainage calculations would be as follows:

- Phase 2 impermeable area approximately 15.00Ha (QBAR) = 62.2 l/s.
- Phase 3 impermeable area approximately 6.50Ha (QBAR) = 26.9 l/s.

The lower of the above figures will be used to calculate preliminary attenuation volumes.

### **Phase 2 Attenuation Volumes**

Given the restricted surface water discharge rate on-plot surface water attenuation will be required, it is proposed this will be provided in a detention basin to the west of the site.

The following provides a brief calculation of the approximate volumes of attenuation using the 'Quick Storage Estimate' element of Windes Microdrainage:

### **Storage Design Parameters**

- Restricted discharge rate = 62.2 litres/second.
- Site area to be developed = 28.00Ha.
- Proposed Impermeable area = 15.00 Ha. (53.5% impermeable).
- M5-60 = 19.0.
- Ratio R = 0.363



- 1:2 Year Return Period = 2089-3366 m<sup>3</sup>.
- 1:30 Year Return Period = between 4736-6916 m<sup>3</sup>.
- 1:100 Year Return Period (+30% cc) = between 9280-12909 m<sup>3</sup>.

The proposed onsite drainage system shall be designed in accordance with the requirements of Building Regulations and Sewers for Adoption and shall demonstrate that:

- No surcharge of pipes occurs in the 1 in 2-year rainfall event.
- No surface flooding occurs in 1 in 30-year rainfall event.
- No flooding to buildings and adjacent properties occurs in 1 in 100-year rainfall event (including an allowance of 30% for the effects of future climate change), as defined in NPPF Technical Guidance.

### **Phase 3 Attenuation Volumes**

Given the restricted surface water discharge rate on-plot surface water attenuation will be required, it is proposed this will be provided in a detention basin to the north of the site.

The following provides a brief calculation of the approximate volumes of attenuation using the 'Quick Storage Estimate' element of Windes Microdrainage:

### **Storage Design Parameters**

- Restricted discharge rate = 28.6 litres/second.
- Site area to be developed = 10.00Ha.
- Proposed Impermeable area = 6.50 Ha. (65.0% impermeable).
- M5-60 = 19.0.
- Ratio R = 0.363
- 1:2 Year Return Period = 884-1420 m<sup>3</sup>.
- 1:30 Year Return Period = between 2010-2939 m<sup>3</sup>.
- 1:100 Year Return Period (+30% cc) = between 3953-5511 m<sup>3</sup>.

The proposed onsite drainage system shall be designed in accordance with the requirements of Building Regulations and Sewers for Adoption and shall demonstrate that:

- No surcharge of pipes occurs in the 1 in 2-year rainfall event.
- No surface flooding occurs in 1 in 30-year rainfall event.
- No flooding to buildings and adjacent properties occurs in 1 in 100-year rainfall event (including an allowance of 30% for the effects of future climate change), as defined in NPPF Technical Guidance.



### 6.3 Foul Water Drainage

The proposed foul water discharge has been calculated for both phases and is detailed below:

- Phase 2 foul water discharge – 16.80 l/s (design flow 6xDWF+10%).
- Phase 3 foul water discharge – 6.00 l/s (design flow 6xDWF+10%).

Calculation have been carried out using the method as detailed in SFA.

Foul Water drainage calculations are in Appendix G.

Discharge from both sites is proposed to drain into the existing 150 diameter public foul water sewer located in phase 3 land.

Discharge from Phase 3 will be directly into the public sewer at a convenient location to suit the proposed development.

Discharge from Phase 2 would be via a new section of sewer/drain to be constructed from the south to the north of Dearne Valley Parkway.

The pipe would pass beneath Dearne Valley Parkway via a method to be agreed with BMBC Highways. Possibly directional drilling.

This sewer/drain is to be sized to take Phase 2 along with foul water discharge from the Waddington and Gregory developments to the west.

The drain is been designed and precured by Waddingtons as their development will come on line first. Details are to be finalised by Waddingtons.

The proposed drain will be designed to SFA and Yorkshire Water Requirement and have sufficient capacity to serve all three developments.

The drain will be put forward for adoption at such a time that the criteria for adoption is met.

At the time of writing the drainage and flood risk assessment correspondence from YW had not been received. The report will be reviewed and updated as necessary once correspondence has been received from YW who are the local Sewerage/Water Company.



## **7.0 DRAINAGE MAINTENANCE AND MANAGEMENT**

The proposed foul and surface water drainage systems including the detention basin will remain private in the short term.

The following maintenance and management guidance is provided.

### **7.1 Introduction**

Pipe sizes and gradients are designed to be self-cleansing albeit regular maintenance and inspections are required to ensure the long-term efficiency of the systems.

All works should be undertaken by suitably qualified personnel and waste should be treated and removed by an appropriately registered company.

### **7.2 Drains/Sewers**

The main objective of maintenance guidance is to establish procedures to ensure the sewer system functions appropriately in the long term within an environment of fiscal control.

Maintenance includes:

- Local repair or local replacement of damaged pipes or other structures in order to maintain the functioning of the sewer.
- Cleaning and removal of sediments, obstructions etc. to restore hydraulic capacity.
- Jetting/vacuum of sewers to be undertaken as often as necessary to remove silts and/or ordinary debris.
- In the event that any extraordinary issues are encountered during an inspection, further information may be required such as a CCTV survey report.
- Maintenance to be undertaken on a six monthly schedule.

To avoid damaging the pipe, PSI pressures need to be verified before jetting of plastic twin wall sewers. Cleaning of drainage systems may require the temporary sealing of the system and careful collection of the effluent for disposal off site.



## 7.3 Detention Basin

Regular inspection and maintenance is important for the effective operation of the detention basin. CIRIA's SUDS manual C753 Table 23.1 recommends the following maintenance regime for detention basins:

| Maintenance schedule          | Required action                                                                                                                                                                                                                                     | Typical Frequency                                                                        |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Regular Maintenance</b>    | Remove litter and debris.                                                                                                                                                                                                                           | Monthly (or as required).                                                                |
|                               | Cut the grass – public areas.                                                                                                                                                                                                                       | Monthly (during growing season).                                                         |
|                               | Cut the meadow grass.                                                                                                                                                                                                                               | Half yearly (spring, before nesting season, and autumn).                                 |
|                               | Inspect marginal and bankside vegetation and remove nuisance plants (first 3 years).                                                                                                                                                                | Monthly (at start, then as required).                                                    |
|                               | Inspect inlets, outlets, bankside, structures, pipework, etc. for evidence of blockage and/or physical damage.                                                                                                                                      | Monthly.                                                                                 |
|                               | Inspect water body for signs of poor water quality.                                                                                                                                                                                                 | Monthly (May – October).                                                                 |
|                               | Inspect silt accumulation rates in any dry weather channel and in main body of the basin and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options. | Half yearly.                                                                             |
|                               | Check any mechanical devices, e.g. flow controls.                                                                                                                                                                                                   | Half yearly.                                                                             |
|                               | Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above basin base; include 25% of basin surface).                                                                                                                                 | Annually.                                                                                |
|                               | Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level.                                                                                                                                                               | Annually.                                                                                |
|                               | Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)                                                                                             | Annually.                                                                                |
|                               | Remove sediment from any dry weather channel.                                                                                                                                                                                                       | Every 1-5 years, or as required.                                                         |
|                               | Remove sediment and planting from one quadrant of the main body of basins.                                                                                                                                                                          | Every 5 years, or as required.                                                           |
| <b>Occasional maintenance</b> | Remove sediment from the main body of big basins when pool volume is reduced by 20%.                                                                                                                                                                | With effective pre- treatment this will only be required rarely, e.g. every 25-50 years. |
| <b>Remedial actions</b>       | Repair erosion or other damage.                                                                                                                                                                                                                     | As required.                                                                             |
|                               | Replant, where necessary.                                                                                                                                                                                                                           | As required.                                                                             |
|                               | Repair/rehabilitation of inlets, outlets and overflows.                                                                                                                                                                                             | As required.                                                                             |

This regime can be tailored to suit the detention basin dependant on final landscaping details and many of the maintenance activities may be undertaken as landscaping maintenance.

## 7.4 Flow Control Chamber

The surface water drainage network has a discharge restriction imposed by Barnsley MBC; this is controlled by a flow control device.



Regular inspections of the flow control chamber should be carried out to ensure that debris that may obstruct the inlet to the flow control is not present. The frequency of inspection will depend on the location of the unit, it is recommended initial inspections should be on a three-month basis for the first year of operation followed by a six-monthly basis thereafter.

In the event that the inlet to the control unit becomes blocked, the pivoting bypass door may be operated by pulling the wire rope attached upwards to drain down the chamber and provide access for maintenance.

## **7.5 Manholes/Access Chambers**

All manhole covers should be lifted, and the manholes visually inspected for silt, debris and signs of blockages within the drainage system. Check manhole covers and frames for damage and ensure correctly bolted together. This should be undertaken on a six monthly basis.

Should any debris or blockages be detected, the manholes should be cleaned along with associated pipe runs which should be high pressure jetted and CCTV surveyed to verify/identify that no further remedial works are required.



## 8.0 CONCLUSIONS

This assessment has looked at the drainage and flood risk issues to support a proposed commercial development on land adjacent to Dearne Valley Parkway.

The site lies within Flood Zone 1 and is therefore at low risk of flooding from river or sea. NPPF Technical Guidance states all uses of land are appropriate in Flood Zone 1.

Other sources of flooding have been assessed and the risk of flooding from these sources is considered to be low.

Surface water shall discharge to tributary of the downstream watercourse known as Short Wood Dike which passes through the west of the site.

Discharge from both phases will be restricted to greenfield run off rate as detailed in the report.

Surface water attenuation will be provided in a detention basin located to the west of the phase 2 development and to the north of the phase 3 development.

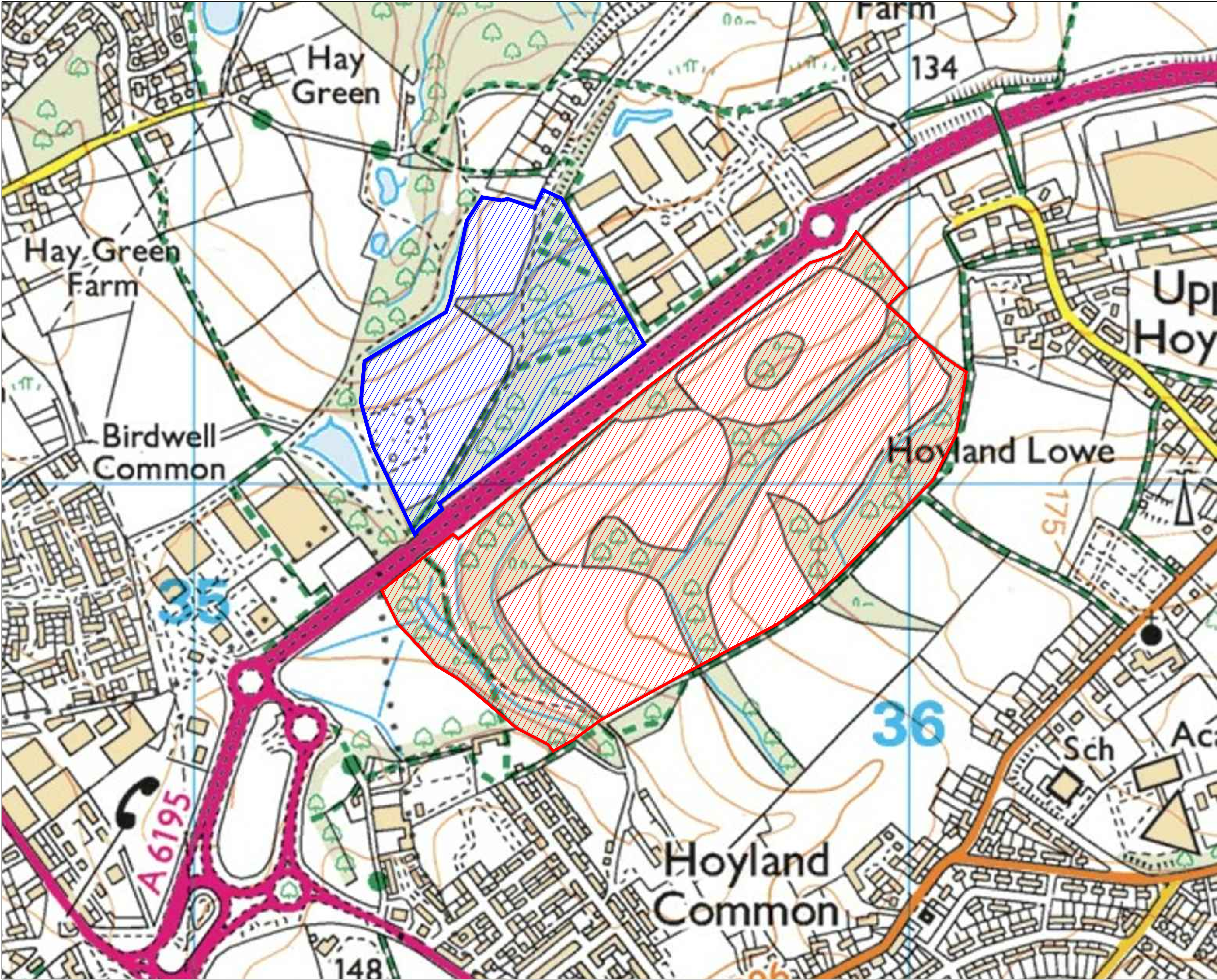
Foul water drainage will discharge to the existing 150 diameter public foul water sewer located in phase 3 land subject to agreement by YW.

**Jonathan Millar**  
For and behalf of JPG (Leeds) Limited

December 2019



## **Appendix A   Site Location Plan**



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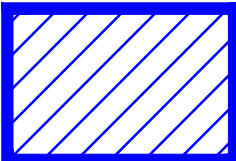
DO NOT SCALE

NOTES

GENERAL NOTES

- ALL MATERIALS AND WORKMANSHIP IS TO COMPLY WITH JPG CONSULTANTS STANDARD SPECIFICATION & ALL RELEVANT BRITISH & EUROPEAN STANDARDS.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, M & E CONSULTANTS AND JPG CONSULTANTS DRAWINGS.
- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO COMMENCEMENT OF WORKS.

**SITE INFORMATION**  
SITE ADDRESS  
ADDRESS - DEARNE VALLEY PARKWAY  
NEAREST POSTCODE - S74 9LH  
OS SHEET/TILE - SE354010  
OS CO-ORDINATES - E435470, N401042



SITE LOCATION PHASE 2

SITE LOCATION PHASE 3

| REV                                  | DESCRIPTION | DATE | BY |
|--------------------------------------|-------------|------|----|
| Project<br>ROCKINGHAM PHASES 2 AND 3 |             |      |    |

Drawing Title  
LOCATION PLAN

INFORMATION ISSUE

Architect  
THE HARRIS PARTNERSHIP

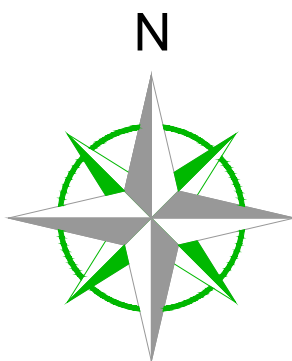


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| JPG Project Ref | Scale at A1 | Date     | Checked | Drawn |
|-----------------|-------------|----------|---------|-------|
| 4652-2          | 1:2500      | DEC 2019 | JDM     | JDM   |



# Appendix B   Topographic Survey



Station Information:

| Station | Easting (m) | Northing (m) | Level (m) |
|---------|-------------|--------------|-----------|
| J3      | 435882.1325 | 401329.6624  | 137.5958  |
| J9      | 435461.1431 | 401030.8561  | 133.7290  |
| J10     | 435379.0995 | 400966.2000  | 133.1627  |
| J11     | 435297.9100 | 400902.7972  | 132.5586  |
| J101    | 435584.3756 | 401567.5944  | 115.8042  |
| J102    | 435740.2869 | 401523.5149  | 125.2937  |
| J103    | 435810.8799 | 401448.4666  | 131.4481  |
| R1      | 435197.5609 | 400844.8155  | 132.8223  |
| GH1     | 435043.1610 | 400723.1770  | 134.9460  |
| GH2     | 435031.6440 | 400619.6290  | 137.2870  |
| GH3     | 435120.3913 | 400749.6597  | 134.5070  |

**OS Note:**  
Some services may have been omitted due to parked vehicles.  
The Ordnance Survey file is to be used as a guide only.

**OS Buildings** Surveyed Buildings

This survey has been orientated to the Ordnance Survey (O.S.) National Grid (OSGB36) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).  
A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN02 & OSGM02 transformation models.  
The survey has been correlated to this point and a further one or more OSGB36 points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.  
Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

|                                                                                       |          |                                                                                       |                |                                                                                       |       |                                                                                       |                    |                                                                                       |      |
|---------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------|------|
|    | Boundary |    | Overhead Cable |    | IC    |    | Inundation channel |    | Road |
|    | Pipe     |    | Flow           |    | Inlet |    | Barrage            |    | Dam  |
|    | Flow     |    | Flow           |    | Flow  |    | Flow               |    | Flow |
|    | Flow     |    | Flow           |    | Flow  |    | Flow               |  | Flow |
|  | Flow     |  | Flow           |  | Flow  |  | Flow               |  | Flow |
|  | Flow     |  | Flow           |  | Flow  |  | Flow               |  | Flow |
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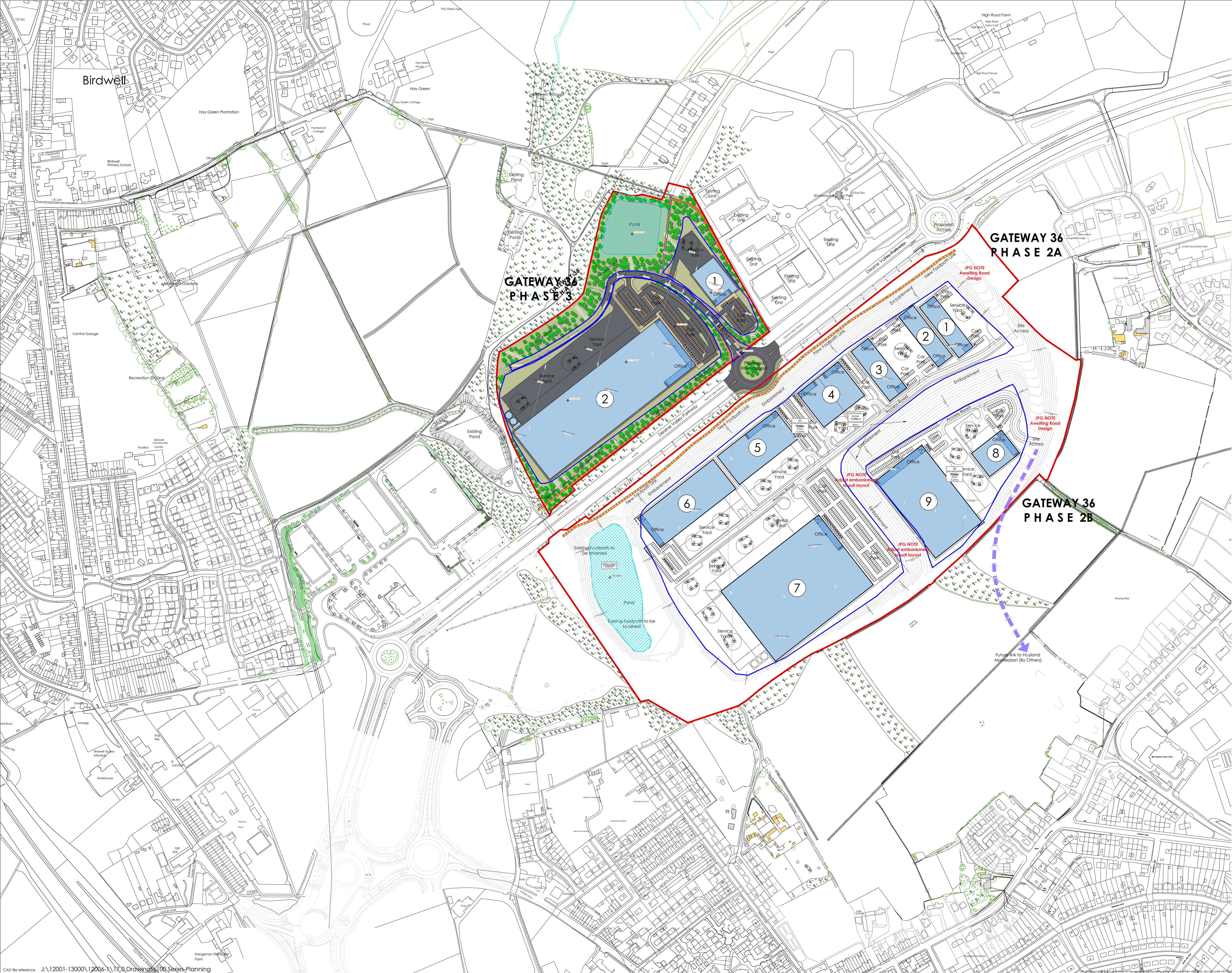


# Appendix C   Yorkshire Water Sewer Records





## **Appendix D   Proposed Development Plan**



Schedule of Accommodation

|         |         |          |
|---------|---------|----------|
| Phase 2 |         |          |
| Unit 1  | 26,000  | 2,415.5  |
| Unit 2  | 26,000  | 2,415.5  |
| Unit 3  | 30,000  | 2,787.1  |
| Unit 4  | 50,000  | 4,645.2  |
| Unit 5  | 60,000  | 5,574.2  |
| Unit 6  | 80,000  | 7,432.3  |
| Unit 7  | 250,000 | 23,225.8 |
| Unit 8  | 25,000  | 2,322.6  |
| Unit 9  | 130,000 | 12,077.4 |

|         |         |          |
|---------|---------|----------|
| Phase 3 |         |          |
| Unit 1  | 25,000  | 2,322.6  |
| Unit 2  | 250,000 | 23,225.8 |

Total 952,000 ft² 88,443.8 m²

Office content (10% of upper levels)  
95,200 ft² 8,844.4 m²

Development Total (inc Office content)  
1,047,200 ft² 97,288.2 m²

**Note:**  
Information is based on OS map and received information and is subject to full topographical and building survey.  
Assumed site boundary and site constraints subject to confirmation.  
All Legal easements and extent of existing underground services locations are subject to confirmation.

0 25 50 75 100 125 m  
SCALE 1:2500

DRAFT

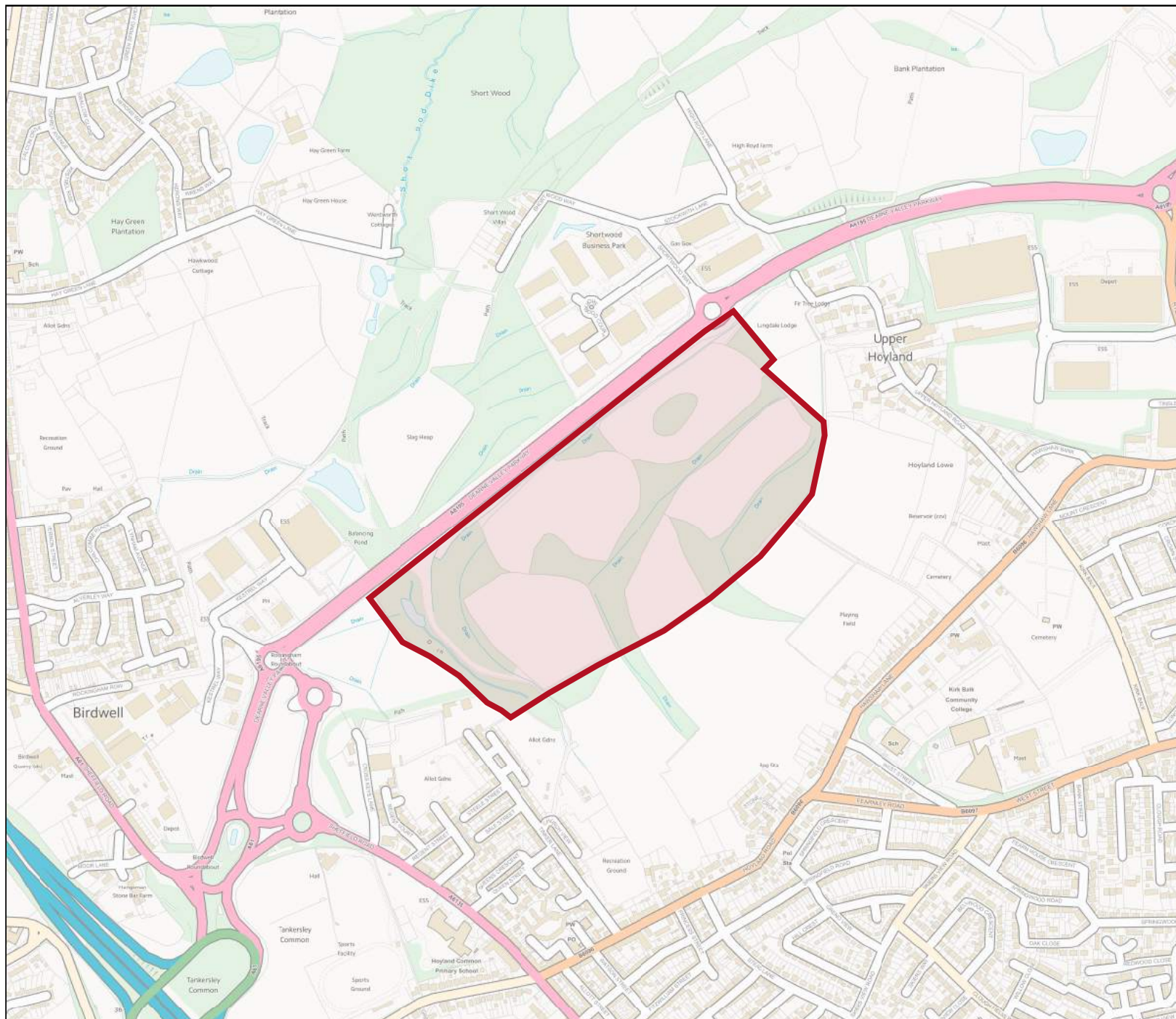
|                                                 |         |             |              |         |     |
|-------------------------------------------------|---------|-------------|--------------|---------|-----|
| Rev                                             | Date    | Description | Rev          | Chkd    | By  |
| Project Title                                   |         |             |              |         |     |
| PROPOSED INDUSTRIAL DEVELOPMENT                 |         |             |              |         |     |
| Dearne Valley Parkway<br>Rockingham<br>Barnsley |         |             |              |         |     |
| Client                                          |         |             |              |         |     |
| HARWORTH GROUP                                  |         |             |              |         |     |
| Status                                          |         |             |              |         |     |
| FOR PLANNING                                    |         |             |              |         |     |
| Scale                                           |         | 1:2500      | Drawing Size |         | A1  |
| Date                                            | 11.2019 | Drawn By    | NBB          | Checked | JMR |
| Drawing Title                                   |         |             |              |         |     |
| PROPOSED MASTERPLAN                             |         |             |              |         |     |
| Job/Dwg No                                      |         | 12006-1-110 | Rev          |         | -   |

- 2 St. Johns North, Wakefield, WF1 3GA t. 01924 291800
- Carvers Warehouse, 77 Dale Street, Manchester, M1 2HG t. 0161 2386555
- The Old Rectory, 79 High Street, Newport Pagnell, MK16 6AB t. 01908 211577
- 101 London Road, Reading, RG1 5BY t. 0118 9507700
- 10 Goss Court, St Christophers Place, London, W1U 1JJ t. 0207 4091215





# Appendix E   Environment Agency Flood Map



## Flood map for planning

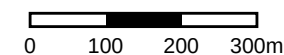
Your reference  
**4652-2-Ph2**

Location (easting/northing)  
**435669/400991**

Scale  
**1:10000**

Created  
**16 Dec 2019 8:32**

-  Selected area
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



## Flood map for planning

Your reference  
**4652-2-Ph3**

Location (easting/northing)  
**435431/401175**

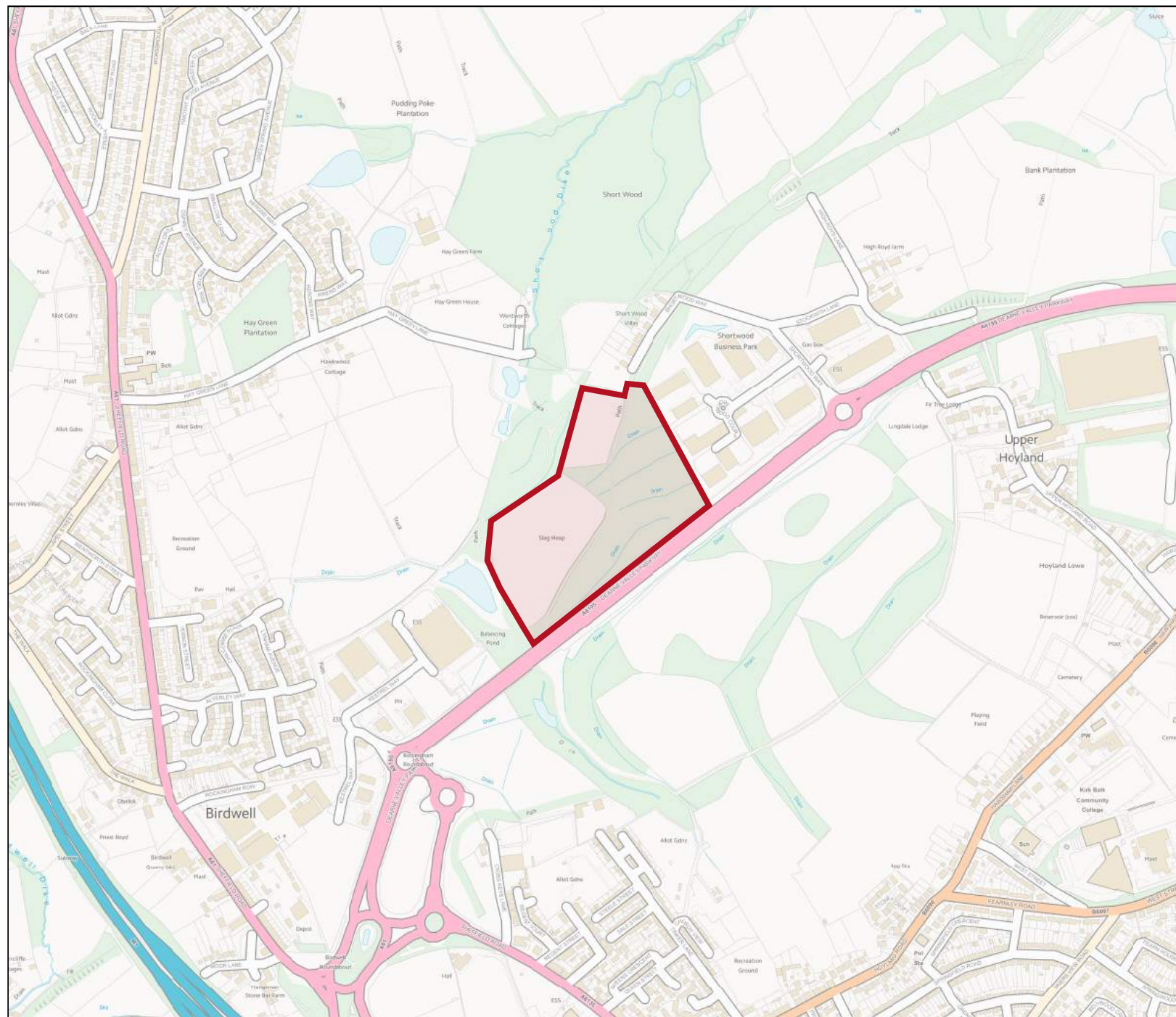
Scale  
**1:10000**

Created  
**16 Dec 2019 8:34**

-  Selected area
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 100 200 300m

Page 2 of 2





## **Appendix F    Micro Drainage Greenfield Discharge Calculations**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                           |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|
| JPG (Leeds) Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           | Page 1                                                                              |
| 5 John Charles Way<br>Leeds<br>LS12 6QA                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |  |
| Date 16/12/2019 10:54<br>File 180808-5377-BASIN-01-10...                                                                                                                                                                                                                                                                                                                                                                                                                                                | Designed by jonathan.millar<br>Checked by |                                                                                     |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Source Control 2017.1.2                   |                                                                                     |
| <p style="text-align: center;"><u>ICP SUDS Mean Annual Flood</u></p> <p style="text-align: center;">Input</p> <p>Return Period (years)      1                      Soil      0.450<br/> Area (ha) 15.000                      Urban      0.000<br/> SAAR (mm)      666 Region Number Region 3</p> <p style="text-align: center;"><b>Results      l/s</b></p> <p>QBAR Rural    62.2<br/> QBAR Urban    62.2</p> <p>Q1 year    53.5</p> <p>Q1 year    53.5<br/> Q30 years 109.3<br/> Q100 years 129.3</p> |                                           |                                                                                     |
| ©1982-2017 XP Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |                                                                                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                           |                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|
| JPG (Leeds) Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           | Page 1                                                                              |
| 5 John Charles Way<br>Leeds<br>LS12 6QA                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |  |
| Date 16/12/2019 11:03<br>File 180808-5377-BASIN-01-10...                                                                                                                                                                                                                                                                                                                                                                                                                             | Designed by jonathan.millar<br>Checked by |                                                                                     |
| Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Source Control 2017.1.2                   |                                                                                     |
| <p style="text-align: center;"><u>ICP SUDS Mean Annual Flood</u></p> <p style="text-align: center;">Input</p> <p>Return Period (years)      1                      Soil      0.450<br/> Area (ha) 6.500                      Urban      0.000<br/> SAAR (mm)    666 Region Number Region 3</p> <p style="text-align: center;"><b>Results    1/s</b></p> <p>QBAR Rural 26.9<br/> QBAR Urban 26.9</p> <p>Q1 year 23.2</p> <p>Q1 year 23.2<br/> Q30 years 47.4<br/> Q100 years 56.0</p> |                                           |                                                                                     |
| ©1982-2017 XP Solutions                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                                                                     |



# Appendix G Foul Water Drainage Calculations

|                                                   |            |         |           |     |
|---------------------------------------------------|------------|---------|-----------|-----|
| Project: <b>ROCKINGHAM PHASES 2 AND 3</b>         |            |         |           |     |
| Date:                                             | 09.12.2019 | Job No. | Sheet No. | Rev |
| By:                                               | JDM        | 4652-2  | 1         | A   |
| Checked:                                          |            |         |           |     |
| Title: <b>Preliminary FW Calculations Phase 2</b> |            |         |           |     |



### Residential Developments

*Based on SFA rate of 4000.0 Litres/dwelling/day*

| Use             | L/Day             | No. | Total (L/day) |
|-----------------|-------------------|-----|---------------|
| General Housing | 4000 per dwelling | 0.0 | 0.00          |

Design Flow = Total/86400 Second = **0.000** l/s (6DWF+10%)  
**0.000** l/s (1xDWF)

### Commercial/Industrial Developments

*Based on SFA allow 0.6 litres/second/hectare of developable land for domestic flow*

| Domestic Flow | Area (ha) | Flow l/s |
|---------------|-----------|----------|
| Commercial    | 28.000    | 16.800   |

*Based on SFA allow 0.5 litres/second/hectare of developable land for trade effluent normal process and 1.0 litres/second/hectare of developable land for wet process*

| Trade Effluent | Area (ha) | Flow l/s |
|----------------|-----------|----------|
| Normal         | 0.000     | 0.000    |
| Wet            | 0.000     | 0.000    |

Total flow domestic + trade effluent = **16.800** l/s

*Based on SFA allow 0.7 litres/second/hectare of developable land where proportion of wet industry is not known*

| Domestic +Trade | Area (ha) | Flow l/s |
|-----------------|-----------|----------|
| Commercial      | 0.000     | 0.000    |

Design Assumptions based on HCA drawing  
671.60 (90) 001 & 671.60 (90) 002

|                                            |                |                                                                                     |  |  |             |       |
|--------------------------------------------|----------------|-------------------------------------------------------------------------------------|--|--|-------------|-------|
| Project: <b>ROCKINGHAM PHASES 2 AND 3</b>  |                |  |  |  |             |       |
| Date: 09.12.2019                           | Job No. 4652-2 |                                                                                     |  |  | Sheet No. 1 | Rev A |
| By: JDM                                    |                |                                                                                     |  |  |             |       |
| Checked:                                   |                |                                                                                     |  |  |             |       |
| Title: Preliminary FW Calculations Phase 3 |                |                                                                                     |  |  |             |       |

### Residential Developments

*Based on SFA rate of 4000.0 Litres/dwelling/day*

| Use             | L/Day             | No. | Total (L/day) |
|-----------------|-------------------|-----|---------------|
| General Housing | 4000 per dwelling | 0.0 | 0.00          |

Design Flow = Total/86400 Second = 0.000 l/s (6DWF+10%)  
0.000 l/s (1xDWF)

### Commercial/Industrial Developments

*Based on SFA allow 0.6 litres/second/hectare of developable land for domestic flow*

| Domestic Flow | Area (ha) | Flow l/s |
|---------------|-----------|----------|
| Commercial    | 10.000    | 6.000    |

*Based on SFA allow 0.5 litres/second/hectare of developable land for trade effluent normal process and 1.0 litres/second/hectare of developable land for wet process*

| Trade Effluent | Area (ha) | Flow l/s |
|----------------|-----------|----------|
| Normal         | 0.000     | 0.000    |
| Wet            | 0.000     | 0.000    |

Total flow domestic + trade effluent = 6.000 l/s

*Based on SFA allow 0.7 litres/second/hectare of developable land where proportion of wet industry is not known*

| Domestic +Trade | Area (ha) | Flow l/s |
|-----------------|-----------|----------|
| Commercial      | 0.000     | 0.000    |

Design Assumptions based on HCA drawing  
671.60 (90) 001 & 671.60 (90) 002

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