MAGNA PARK
LUTTERWORTH

IDI Gazeley
Brookfield Logistics Properties

IDI Gazeley UK Ltd

Magna Park Extension: Hybrid Application

ES Chapter 8 Hydrology and Flood Risk

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Author/Amended by:	Authorised by	Date:	Version:
Chris Despins	Louise Markose	15th September 2015	1 – Issued for planning

CONTENTS

LIST OF TECHNICAL APPENDICES IN ENVIRONMENTAL STATEMENT: VOLUME 3

8.1 Introduction

8.1.1 This chapter of the Environmental Statement (ES) considers the hydrology, flood risk and surface water drainage issues associated with the Proposed Development.

8.1.2 The development comprises the following uses and maximum quanta:

Zone 1 (outline):

- Distribution warehousing and ancillary office space (Use Classes B8 and B1a): up to 427,350 sq m

  (including 100,844 sq m for DHL Supply Chain that is also the subject of Application Reference 15/00919/FUL that was submitted in June 2015)
- National Centre for Logistics Qualifications (Use Class D1): up to 3,700 sq m together with its campus
- Estate office, with heritage exhibition centre and conference facility (Use Class D1): up to 300 sq m.
- Holovis expansion building (Use Class B1a, B1b): up to 7,000 sq m
- Innovation Centre: up to 2,325 sq m
- Public park and meadowland: c 70 ha
- Access corridor, structural landscaping, SuDS systems
- Demolition of existing buildings on the site

Zone 2 (detailed):

- Railfreight shuttle terminal
- HGV Parking (140 spaces)
- HGV Driver Training Centre
- LPG or GNP Fuel Island and Vehicle washing facility.

8.1.3 The purpose of the chapter is to:

- Set out relevant legislation and planning policies against which to consider the Proposed Development;
- Set out the existing hydrological environment;
- Identify and assess the potential impact of the Development;
- Identify and propose appropriate mitigation strategies for the identified impacts; and
- Assess the significance of any residual and cumulative effects of the Development

8.2 Policy and Guidance

Flood and Water Management Act, 2010

8.2.1 Combined with the Flood Risk Regulations 2009, (which enact the EU Floods Directive in the England and Wales) the Act places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues. The Act and The Regulations together raise the requirements and targets Local Authorities need to meet, including:

- Playing an active role leading Flood Risk Management;
- Development of Local Flood Risk Management Strategies (LFRMS);
- Implementing requirements of Flood and Water Management legislation;
- Development and implementation of drainage and flooding management strategies; and
- Responsibility for approval of Sustainable Drainage Systems (SuDS).

8.2.2 The Flood and Water Management Act also clarifies three key areas that influence development:

- *Sustainable drainage systems (SuDs)* - the Act makes provision for a national standard to be prepared on SuDS, and developers will be required to obtain local authority approval for SuDS in accordance with the standards, likely with conditions. Of note are recent changes to the planning regime that supersede provisions of the Act. On 18th December 2014 the Department for Communities and Local Government and Department for Environment, Food and Rural Affairs issued Written Statement - HCWS161 (also referred to as the 'SuDS consultation response'). This statement announced that SuDS will not be delivered as described Schedule 3 of the Flood and Water Management Act, 2010, but be delivered through the planning system. As part of this announcement the use of SuDS Approval Bodies (SABs) as the primary mechanism for SuDS review, approval and management was dropped. The Flood and Water Management Act has not yet been revised to reflect these changes, however they should be noted when considering implementation of SuDS on the Proposed Development.

Flood risk management structures - the Act enables the Environment Agency and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent.

Permitted flooding of third party land - In exceptional circumstances, the EA and local authorities have the power to carry out work which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people's enjoyment of the environment or of cultural heritage.

National Planning Policy Framework (NPPF), March 2012

8.2.3 In determining an approach for the assessment of flood risk for the proposal there is a need to review the policy context. Government Guidance requires that consideration be

given to flood risk in the planning process. The National Planning Policy Framework was issued in March 2012 and outlines the national policy on development and flood risk assessment.

8.2.4 The Framework states that in appropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

8.2.5 The essence of NPPF is that:

- Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards.
- Polices in development plans should outline the consideration, which will be given to flood issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change.
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Use opportunities offered by new developments to reduce the causes and impacts of flooding;
- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains;
- The concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the “Exception Test”.

Planning Practice Guidance Flood Risk and Coastal Change, April 2015

8.2.6 The Planning Policy Guidance (PPG) for Flood Risk and Coastal Change sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

8.2.7 The National Planning Practice Guidance document provides guidance on how the local planning authorities should:

- Assess flood risk;
- Avoid flood risk; and
- Manage and Mitigate flood risk and coastal change.

8.2.8 There is also information on the requirements to consult the Environment Agency, on the role of lead local flood authorities and on flood risk in relation to minor developments.

8.2.9 The April 2015 update to the practice guidance provides additional guidance on SuDS, including:

- The importance of SuDS;
- When SuDS should be considered;
- The SuDS discharge hierarchy;
- Factors a local authority will address when considering SuDS as part of a planning application;
- When SuDS are inappropriate and relevant flood risk consultees;
- Applicability of Defra's Non-statutory Technical Standards for Sustainable Drainage Systems;
- Design and construction cost considerations;
- Operation and maintenance considerations; and
- Where to go for further SuDS advice.

8.2.10 As part of the April 2015 update, the practice guidance provides details on the parties responsible for assessing the suitability of SuDS practices. As per paragraph 084 from the practice guidance:

The decision on whether a sustainable drainage system would be inappropriate in relation to a particular development proposal is a matter of judgement for the local planning authority. In making this judgement the local planning authority will seek advice from the relevant flood risk management bodies, principally the lead local flood authority, including on what sort of sustainable drainage system they would consider to be reasonably practicable.

Water Framework Directive, 2000

8.2.11 The aim of the Water Framework Directive (WFD) is to protect and improve all European Union water bodies. It ensures that all water bodies are assessed to determine the 'ecological status' and 'chemical status' of its water and where a 'good status' is not achieved, it seeks to ensure that measures are implemented to improve the water body.

Harborough District Core Strategy, Adopted 14 November 2011

8.2.12 The Core Strategy is a strategic document setting out the vision and spatial planning framework for the district. It contains core strategic policies that provide for the development needs of the district. The adoption of the Core Strategy replaced a large number of policies set out with the Harborough District Local Plan.

8.2.13 The Core Strategy includes Policy CS10 which includes the provisions reproduced below:

a) New development will be directed towards areas at the lowest risk of flooding within the District; with priority given to land within Flood Zone 1.
b) The use of Flood Zones 2 and 3a for recreation, amenity and environmental purposes will be supported where an effective means of flood risk management is evident, and considerable green space is provided.
c) Land within Flood Zone 3b will be safeguarded, to ensure that the functional floodplain is protected from development. The Council will also support proposals which reinstate the functional floodplain, where possible.
d) All new development will be expected to ensure that it does not increase the level of flooding experienced in other areas of the District.
e) Surface water run-off in all developments should be managed, to minimise the net increase in the amount of surface water discharged into the local public sewer system.
f) The following settlements are particularly sensitive to any net increase in surface water discharge into the local surface water sewer network:
    Market Harborough
    Lutterworth
    Great Glen
    Kibworth
    Scraptoft/Thurnby/Bushby.
g) The use of Sustainable Drainage Systems (SuDS) will be expected; and design and layout schemes which enhance natural forms of on site drainage will be encouraged.
h) The Environment Agency will be closely consulted in the management of flood risk at a local level. This will ensure that development is directed away from areas which are at risk of flooding from either fluvial overflow or surface water run-off. Local management of flood risk will also take into account any future updates relating to climate change modelling information.

8.2.14 It should be noted that given the release date of the Core Strategy that the document references the Environment Agency as the primary consultee in the management of flood risk. Changes to the planning regime following publication of the Core Strategy mean that the Lead Local Flood Authority is to be the consultee on the management of flood risk from flooding from local sources, namely Ordinary Watercourses, surface water and groundwater.

Harborough District Council Level 1 Strategic Flood Risk Assessment, April 2009

8.2.15 The Harborough District Council Level 1 Strategic Flood Risk Assessment (SFRA) was completed in April 2009. The objective of the Harborough SFRA is to provide an overview of all sources of flooding within the administrative area of the Harborough District Council (HDC) and to set out a number of approaches to avoid, reduce and manage this risk as part of a wider objective to ensure a sustainable environment.

8.2.16 Less than 10% of the administrative area of HDC falls within Flood Zone 3. A recommendation of the SFRA is that the outputs from the assessment be used as an evidence base from which to direct new development to areas of low flood risk (Flood Zone 1). Where development cannot be located in Flood Zone 1, HDC should use the flood maps to apply the Sequential Test to their remaining land use allocations.

River Trent Catchment Flood Management Plan, December 2010

8.2.17 The role of a Catchment Flood Management Plan (CFMP) is to establish flood risk management policies that deliver sustainable flood risk management for the long term.

8.2.18 The Proposed Development is located in the Rural Leicestershire sub area in the River Trent CFMP. Overall, current flood risk in this area is deemed to be low with only 30 properties at risk during a 1 in 100 year return period event (a 1% annual exceedance probability) flood event. The Plan states that it does not anticipate the flood risk for the catchment area to increase in the future.

8.2.19 The Proposed Development falls under Policy Option 6:

> *areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.*

8.2.20 The long term vision for this sub area is to set a framework to deliver a sustainable approach to flood risk management that considers the natural function of the River Trent and reduces long term dependence on raised flood defences. This includes identifying opportunities to better utilise areas of natural floodplain to store floodwaters and to attenuate rainwater that will reduce flood risk within the sub area and downstream.

Leicestershire Preliminary Flood Risk Assessment (PFRA), June 2011

8.2.21 The PFRA provides a high level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding. The scope of the PFRA is to consider flooding from the following sources: surface runoff, groundwater and ordinary watercourses and any interaction these have with main rivers and the sea.

8.2.22 A review of historical flooding records across the county council did not find any records of surface water flooding, ordinary watercourse flooding, groundwater flooding or sewer flooding at or near the Proposed Development site.

Leicestershire Local Flood Risk Management Strategy (LFRMS) – Draft for Consultation, October 2014

8.2.23 The Leicestershire Local Flood Risk Management Strategy was developed to understand and manage flood risk within the county. The strategy provides a framework that will enable the Lead Local Flood Authority (Leicestershire County Council) to lead and co-ordinate flood risk management across Leicestershire. The strategy acts as the focal point for integrating all flood risk management functions in the county in alignment with the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy.

8.2.24 The consultation period on the draft LFRMS has now closed and Lecicestershire County Council has indicated that they are in the process of reviewing the comments received alongside the strategy with a view to publishing the final document in 2015.

8.3 Assessment Method

Baseline Data Collection

8.3.1 The methodology involved the initial review of baseline conditions relating to the hydrological environment of the site. Baseline data was collected by identifying and collating readily available data through a desktop assessment, consulting with key stakeholders, including the Environment Agency, and by obtaining technical reports / assessments undertaken at the site and surrounding area.

8.3.2 Baseline data collected and reviewed included:

- Relevant national, regional and local development / water management and flood risk policy;
- Environment Agency indicative mapping: Flood Map for Planning (Rivers and Sea), Risk of Flooding from Surface Water, Risk of Flooding from Reservoirs and Historic River Quality;
- Environment Agency Product 4 flood risk map;
- Masterplan (Drawing No. 3657-33-06);
- Parameter Plan (Drawing No. 3657-34-06);
- Topographic survey (Drawing No. 20799 OGL);
- Ordinance Survey mapping;
- British Geological Survey: surface and bedrock geology, borehole scan (Record BGS Reference: SP58NW32); and
- Ground Investigation Factual Report 06 March 2015.

8.3.3 The Environment Agency were consulted (December, 2014) regarding the status of watercourses within the proposed development, and to obtain flood risk information and requirements.

8.3.4 The LLFA, Leicestershire County Council, was also consulted on 28th August 2015 to obtain further details regarding the ordinary watercourses and any hydrology and flood risk information / requirements.

8.3.5 The second phase of the assessment considers the potential effect of the construction, and operational impacts of the Development. The effects discussed in this chapter exclusively relate to the potential for degradation or improvement to the hydrological environment and any changes in the flood risk situation and the floodplain. Mitigation measures have been identified to ameliorate any significant potential adverse effects of the Development, as discussed later in the chapter and in the accompanying Flood Risk Assessment (FRA).

8.3.6 The magnitude of the identified effects have been assessed, as set out below. Where mitigation measures are required, these are also discussed. The assessment of residual effects then assumes these measures have been implemented.

8.3.7 The assessment follows, where appropriate, the method described by Mustow et al. (2005)[1]. This method is preferred because it provides a transparent way of defining the quality of the water environment, the magnitude of the effect predicted and the significance of that effect. The method is based on earlier Department of Transport methods for assessing the effect of highways schemes on the environment and in particular draws on the NATA and GOMMMS methodologies. Relevant water features, attributes and indicators of quality are presented in Table 8.3.1 below.

Table 8.3.1 Relevant water features, attributes and indicators of quality (based on Table 1 of Mustow et al., 2005).

Feature	Attribute	Indicator of Quality	Measure	Grading	Importance
River/Drain	Water Supply	Chemical Water	EA's Chemical Grade Quality Assessment (GQA)	A B C-D	Very High High Medium
		Industrial/Agricultural Water Quality	Location & Volume of Abstraction	All abstractions within 2km downstream: >1000m^3/day 500 – 1000 m^3/day 50 – 499 m^3/day <50 m^3/day	 Very High High Medium Low
		Drinking Water Supply	Classification defined within The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996 No. 3001	Classification: DW1 or DW2 within critical travel time for pollution downstream DW3 within critical travel time downstream Not designated	Very High High Medium – Low
	Biodiversity	Biodiversity	EA's Biological GQA	A B C-D E-F	Very High High Medium Low
		Fisheries Quality	Fisheries Status as defined within The Freshwater Fish Directive 78/659/EEC	Designated salmonid fishery Designated cyprinid fishery	Very High - High High – Medium

[1] Mustow, S.E., Burgess, P.F. & Walker, N. (2005) Practical Methodology for Determining the Significance of Impacts on the Water Environment. Water and Environment Journal. 19 (2). P100-108.

Feature	Attribute	Indicator of Quality	Measure	Grading	Importance
				Undesignated fishery	Medium – Low
				Not a fishery	Low
	Transport & Dilution of Waste Products	Surface Water/Effluent Discharges	Type of discharges with reference to The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives)	All discharges within 2km up or downstream:	
				List I discharge	Very High - High
				List II discharge	Medium
				Other discharge/no discharge	Low
	Amenity, Recreation and Heritage	Riverside Access	Presence/absence of route and importance	National Trail/Cycleway	Very High
				Regional Trail	High
				Definitive footpath/ bridleway/other route	Medium
				No route	Low
		Presence of Clubs/Recreation use	Presence/ Absence	Club/Recreation use present	Very High – High –Medium
				No Club/Recreation use	Low
		Presence of Downstream Heritage Features	Presence/absence and importance	Grade I	Very High-High
				Grade II*	High- Medium
				Grade II	Medium
				Scheduled Ancient Monument	Medium
				Registered Historic Parks and Gardens	Low
	Conveyance of Flow and Material	Presence of Watercourses	Size of Watercourse	Main River >10m wide	V High - High
				Main River <10m wide	Medium
				Ordinary Watercourse > 5m wide	Medium
				Other	Low
				Active Floodplain	High –Medium
				Existing defended area	Medium
				Does not flood	Low
		Flood Risk	Return Period	> (i.e. more frequent than) 1 in 25 years	V. High
				< 1 in 25 years	High
				< 1 in 100 years (urban)	Medium
				< 1 in 50 years (rural)	Medium
				< 1in 200 years	Low

8.3.8 After the importance of an attribute is established the magnitude of an effect is then defined. Specifying the magnitude of a potential effect is the most subjective aspect of

any environmental assessment and it is based on the effect of the Development. Where mitigation measures have been identified, a subsequent assessment is undertaken assuming these measures will be implemented as an intrinsic part of the Development proposals. Table 8.3.2 below, presents the criteria for determining the magnitude of an effect on hydrology and drainage.

Table 8.3.2 Criteria for determining effect magnitude (based on Table 2 of Mustow et al., 2005)

Magnitude	Criteria	Example
Major	Results in loss of attribute	Loss of existing watercourse Change in GQA Grade Pollution of potable source of abstraction
Moderate	Results in effect on integrity of attribute or loss of part of attribute	Culverting of watercourse Contribution of a significant proportion of the effluent
Minor	Results in minor effect on attribute	Measurable change to attribute but of limited size and/or proportion
Negligible	Result in an effect on attribute but of insufficient magnitude to affect the use/integrity	Discharge to watercourse but no significant loss in quality, fishery productivity or biodiversity

8.3.9 The significance of the identified effects of the Proposed Development has been assessed with reference to Table 8.3.3. The system for determining significance is matrix based and uses the magnitude and importance of the identified effect to ascertain the significance.

Table 8.3.3 Criteria for estimating the significance of potential effects (based on Table 3 of Mustow et al., 2005)

Magnitude of Potential Effect	Importance of Attribute			
	Very High	**High**	**Medium**	**Low**
Major	Very Significant	Highly Significant	Significant	Low Significance
Moderate	Highly Significant	Significant	Low Significance	Insignificant
Minor	Significant	Low Significance	Insignificant	Insignificant
Negligible	Low Significance	Insignificant	Insignificant	Insignificant

Effects

8.3.10 Where appropriate the effects of construction, operation and residual effects of the Proposed Development are discussed in this Technical Chapter. The following terms are used to describe these effects:

- Positive Effects - Effects that have a beneficial influence on the environment.
- Adverse Effects - Effects that have an adverse influence on the environment.
- Direct Effects - Effects that are caused by activities which are an integral part of the project.
- Indirect Effects - Effects that are due to activities that are not part of the project, e.g. some of the regeneration benefits attributable to the project.

- Primary Effects - The first effect of a project activity e.g. alteration to a watercourse.

Secondary Effects - Effects that are a consequence of a primary effect, e.g. changes to aquatic fauna as a result of altering a watercourse.

8.4 Baseline Conditions

Introduction

8.4.1 This section identifies the features and attributes of the water environment within the influence of the Proposed Development and identifies the current quality of these attributes and their importance and sensitivity. This information is used in the summary table at the end of this section (Table 8.4.1).

8.4.2 The Proposed Development comprises approximately 227 ha of land in two zones. The site boundary plans are presented the Parameter Plan (Drawing No. 3657-34-06) in Appendix A.

8.4.3 Zone 1, is a c 220 ha triangular parcel of predominantly agricultural land to the north and north west of Magna Park, Lutterworth. Zone 1 is the site of the outline proposals for distribution warehousing, the Logistics Academy and its campus, the small business space and the new estate office, together with the related access, SuDS, country park and service facilities.

8.4.4 Zone 2, situated approximately 1.0 km to the south east of Zone 1, is a 6.7 ha rectilinear parcel of agricultural land to the rear of the George headquarters building on the A4303 near the junction with the A5 Watling Street trunk road, and close to the main access point to Magna Park. Zone 2 is the site of the detailed proposals for the dedicated Magna Park railfreight shuttle terminal and HGV parking facility.

Catchment Details

8.4.5 The catchment of the River Soar covers an area of approximately 1,380km^2, covering much of the county of Leicestershire, together with small areas of south Nottinghamshire and north east Warwickshire. The River Soar is a significant tributary of the River Trent. From its source, south east of Hinckley near Grid Reference SP 41908 90924, the river follows a northerly course towards its confluence with the River Trent near Ratcliffe on Soar, south west of Nottingham at Grid Reference SK 49365 30901.

8.4.6 The Ordinary Watercourses and ditches that convey surface water flows from Zone 1 within the Proposed Development discharge into the River Soar approximately 5.3km north of the site at Grid Reference SP 48519 91688.

8.4.7 There is an Ordinary Watercourse located along the southern border of Zone 2 that discharges into the River Swift south east of the site at Grid Reference SP 52657 82618.

Site Topography

8.4.8 A topographic survey was carried out by Greenhatch Group in October 2014 for Zone 1. The Topographic Survey (Drawing no. 20799 OGL) can be viewed in Appendix E.1.

8.4.9 In general the topography of the land in Zone 1 is such that water drains to the watercourses and ditches running through the site. The majority of the site eventually

slopes towards the larger secondary watercourse which runs through the middle of the site from south to north eventually joining the River Soar.

8.4.10 Areas in the north west corner of the site to drain in an easterly direction towards the aforementioned tributary via two tertiary watercourses. The tertiary watercourses on site all drain to the larger secondary watercourse that runs through the middle of the site.

8.4.11 Areas in the southern corner of the site are directed north/north west towards/along the ditches and watercourses which run from the south western boundary the site in a north easterly direction eventually draining to the tributary of the River Soar.

8.4.12 Areas in the eastern corner of the site are directed in a south westerly direction along a watercourse which eventually joins another watercourse near Bittesby Cottages which eventually drain to the larger tributary of the River Soar.

8.4.13 The variation in ground levels is worth noting with high points of 119 – 123 mAOD surveyed in the south eastern extremities of the site. This is in contrast to the lower lying areas through the centre of the site with ground levels ranging from approximately 105 to 109 mAOD.

8.4.14 In Zone 2, ground levels slope from north west to south east, from an approximate high of 130 mAOD in the north western corner of the site to 120 mAOD in the south eastern corner.

Ditches and Watercourses

8.4.15 A number of small ditches and unnamed watercourses, tributaries of the River Soar, are located within the site boundary of Zone 1 of the Proposed Development. Consultation with the Environment Agency on December 2014 has confirmed that watercourses within Zone 1 of the Proposed Development are Ordinary Watercourses, and not Main Rivers. Refer to Appendix E.2 for Environment Agency correspondence.

8.4.16 A GroundSure EnviroInsight report (dated 22 September 2014) indicates that the majority of the Ordinary Watercourses at the site are classed as tertiary rivers which feed a larger river (classed as a secondary river). There are also some sections of watercourse that are identified on the OS Map as being culverted. The watercourse classifications are based on the Ordnance Surveys delineation of watercourses which only serves to differentiate between the relative sizes of the waterbodies within the site.

8.4.17 Site investigations were conducted at the Zone 1 site to verify watercourse location and type. Following this review, two classifications have been established to describe the observed conditions at the site:

Ditch – ditches primarily conveyed highways runoff through the site, with limited contributions of overland flow from the site itself. Ditches were observed with little or no flow during site inspections.

Watercourse – watercourses were observed conveying flows from outside the red line boundary through the site and / or conveying surface water flows through the site to the outlet point.

8.4.18 Details regarding the watercourses identified within Zone 1 of the Proposed Development are provided in Figure 8.4.1 and Table 8.4.1 below. For further details refer to the Flood Risk Assessment and the Catchment Areas Plan (Drawing No. 074680-CA-0-GF-DR-S-016-P00) in the Drainage Strategy for further details.

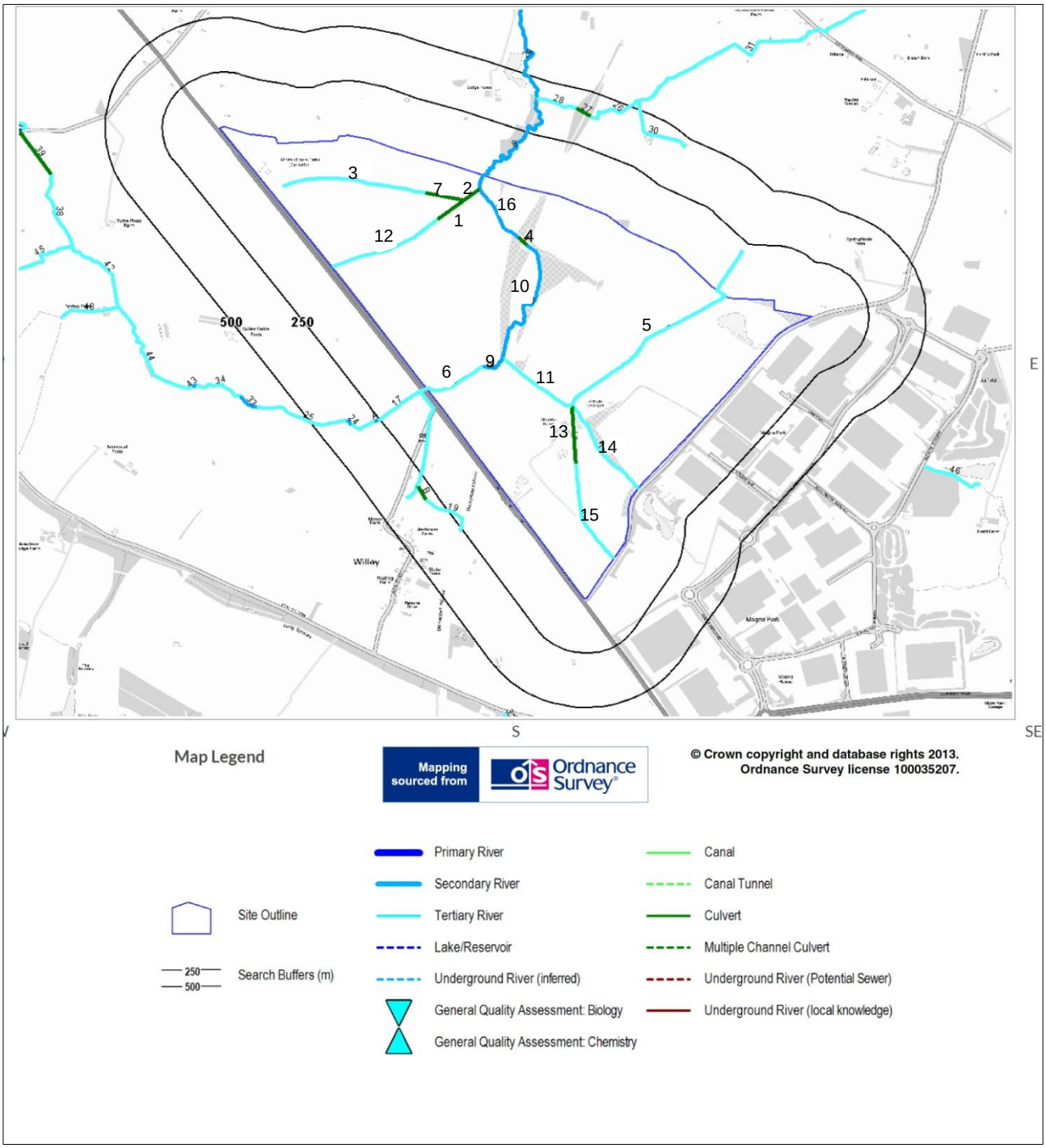

Figure 8.4.1: Baseline conditions of watercourses within Zone 1 of the Proposed Development[2]

[2] GroundSure EnviroInsight Report (dated 22 September 2014) in Appendix E.3.

Table 8.4.1: Baseline conditions of watercourses within Zone 1 of the Proposed Development

OS Map Watercourse Number[3]	OS Map Watercourse Classification[4]	OS Map Flow Direction and Location	OS Map Details and Location with Respect to Proposed Development Parcels[5]	Observed Conditions Watercourse Number[6]	Observed Conditions Watercourse Classification	Observed Conditions Details
5	Tertiary River	South Westerly *[Origin - SP 50975 86013, Terminus - SP 50321 85533]*	OS Map indicates this watercourse originates outside of the red line boundary and terminates at a confluence with watercourses 13 and 14, which then flows into watercourse 11. It is located within Parcel A1 of Proposed Development.	3	Watercourse	Site observations have verified the presence of a watercourse (hence referred to as 'Watercourse 3') is located in Parcel A1.
13	Culverted watercourse	South to North *[Origin - SP 50324 85243, Terminus - SP 50321 85533]*	OS Map indicates this watercourse terminates at a confluence with watercourses 14 and 5, which then flows into watercourse 11. It is located within (culverted under) Parcel H.	N/A	N/A	Site observations were unable to verify presence of culvert as indicated by OS Mapping. Ditch C terminates within Parcel H forming localised wetland.
14	Tertiary River	South to North *[Origin - SP 50611 85137, Terminus - SP 50321 85533]*	OS Map indicates this watercourse terminates at a confluence with watercourses 13 and 5, which then flows into watercourse 11. It is located within Parcels A1 and B.	2	Watercourse	Site observations have verified the presence of a watercourse ('Watercourse 2') is located within Parcels A1 and C.
15	Tertiary River	South to North	OS Map indicates this watercourse flows into a	C	Ditch	Site observations indicate that

[3] Refer to Figure 8.4.1 to view the location of the watercourses on an OS Map of the Proposed Development and surrounding area.
[4] Refer to Figure 8.4.1 to view the watercourse classifications assigned on the OS Map of the Proposed Development and surrounding area.
[5] Refer to the Parameter Plan (Drawing No. 3657-34-06) to view the location of proposed development parcels.
[6] Refer to the Catchment Areas Plan (Drawing No. 074680-CA-0-GF-DR-S-016-P00) in the Drainage Strategy for further details.

OS Map Watercourse Number[3]	OS Map Watercourse Classification[4]	OS Map Flow Direction and Location	OS Map Details and Location with Respect to Proposed Development Parcels[5]	Observed Conditions Watercourse Number[6]	Observed Conditions Watercourse Classification	Observed Conditions Details
		[Origin - SP 50490 84798, Terminus - SP 50321 85533]	culverted section (watercourse 13). It flows through Parcels M2 and H.			this is a small ditch primarily accepting highways runoff from Mere Lane and a small amount of surface water runoff from surrounding field. Ditch C terminates within Parcel H forming localised wetland.
11	Tertiary River	South Westerly *[Origin - SP 50321 85533, Terminus - SP 50013 85701]*	OS Map indicates this watercourse flows into the large Secondary River within the heart of the proposed development (watercourse 9 /10). It is located within Parcels A1 and C.	2	Watercourse	Site observations have verified that this watercourse ('Watercourse 2') is located within Parcels A1 and C.
6	Tertiary River	North Easterly *[Origin - SP 49696 85575, Terminus - SP 49954 85687]*	OS Map indicates this watercourse originates outside of the red line boundary. It terminates at watercourse 9, a Secondary River. It is located within Parcel B.	2	Watercourse	Site observations have verified that this watercourse ('Watercourse 2') is located within Parcels B and C.
9	Secondary River	West to East [Origin - SP 49954 85687, Terminus - SP 50013 85701]	OS Map indicates this short section of watercourse terminates at a confluence with watercourse 11, which then flows into watercourse 10. Located within Parcel C.	2	Watercourse	Site observations have verified that this watercourse ('Watercourse 2') is located within Parcels B and C.
10	Secondary River	South to North [Origin - SP 50013 85701, Terminus - SP 50109 86280]	OS Map indicates this watercourse flows through the Medieval Village of Bitesby, the heart of the Proposed Development. This watercourse flows into a culverted section (watercourse 4). Located within Parcel C.	1	Watercourse	Site observations have verified that this watercourse ('Watercourse 1') is located within Parcel C.
4	Culverted Watercourse	North Westerly [Origin - SP 50109	OS Map indicates this culverted section conveys surface water under the existing track,	1	Watercourse	Site observations have confirmed the presence of a

OS Map Watercourse Number[3]	OS Map Watercourse Classification[4]	OS Map Flow Direction and Location	OS Map Details and Location with Respect to Proposed Development Parcels[5]	Observed Conditions Watercourse Number[6]	Observed Conditions Watercourse Classification	Observed Conditions Details
		86280, Terminus - SP 50074 86278]	discharging flows into watercourse 16 which is open channel. Located within (culverted under track) in Parcel C.			railway culvert within Parcel C.
16	Secondary Watercourse	North Westerly [Origin - SP 50074 86278, Terminus - SP 49918 86571]	OS Map indicates this watercourse flows through the Medieval Village of Bitesby, the heart of the Proposed Development. The watercourse receives flows from a culverted watercourse (watercourse 2), and then exits the red line boundary of the site, eventually discharging into the River Soar. Located within Parcel C.	1	Watercourse	Site observations have verified that this watercourse ('Watercourse 1') is located within Parcel C.
2	Culverted Watercourse	North Easterly [Origin - SP 49849 86477, Terminus - SP 49922 86493]	OS Map indicates this culverted section conveys surface water under an existing field discharging flows into watercourse 16 which is open channel. Located within (culverted under field) in Parcel C.	N/A	N/A	Site observations indicate that Ditch B (upstream) terminates adjacent to existing track, forming a localised wetland and no watercourse was present.
1	Culverted Watercourse	North Easterly [Origin - SP 49728 86367, Terminus - SP 49849 86477]	OS Map indicates this watercourse terminates at a confluence with watercourse 7, which then flows into watercourse 2. Located within (culverted under field) in Parcel C.	N/A	N/A	Site observations indicate that Ditch B (upstream) terminates adjacent to existing track, forming a localised wetland and no watercourse was present.
12	Tertiary Watercourse	North Easterly [Origin - SP 49278 86154, Terminus -	OS Map indicates this watercourse flows into a culverted section (watercourse 1). Flows through Parcel K.	B	Ditch	Site observations indicate that this is a small ditch primarily accepting highways runoff

OS Map Watercourse Number[3]	OS Map Watercourse Classification[4]	OS Map Flow Direction and Location	OS Map Details and Location with Respect to Proposed Development Parcels[5]	Observed Conditions Watercourse Number[6]	Observed Conditions Watercourse Classification	Observed Conditions Details
		SP 49728 86367]				from Watling Street (A5) and a small amount of surface water runoff from the surrounding field. Ditch B terminates adjacent to existing track, forming a localised wetland.
7	Culverted Watercourse	West to East [Origin - SP 49671 86492, Terminus - SP 49849 86477]	OS Map indicates this watercourse terminates at a confluence with watercourse 1, which then flows into watercourse 2. Located within (culverted under field) in Parcel C.	N/A	N/A	Site observations indicate that Ditch A (upstream) terminates adjacent to existing track, forming a localised wetland and no watercourse was present.
3	Tertiary Watercourse	West to East [Origin - SP 49042 86522, Terminus - SP 49671 86492]	OS Map indicates this watercourse flows into a culverted section (watercourse 7). Watercourse flows through Parcels L and M3.	A	Ditch	Site observations indicate that this is a small ditch ('Ditch A') primarily accepting highways runoff from Watling Street (A5) and a small amount of surface water runoff from the surrounding field. Ditch A terminates adjacent to existing track, forming a localised wetland.

8.4.19 A review of the Parameter Plan (Drawing No. 3657-34-06) indicates that there is an Ordinary Watercourses within Zone 2 of the Proposed Development. This is to be diverted along the eastern boundary of that site to accommodate the proposed HGV park.

8.4.20 Set back distances from Ordinary Watercourses need to be determined in consultation with the Lead Local Flood Authority - Leicestershire County Council. As the LLFA, Leicestershire County Council has the responsibility for consenting works on ordinary watercourses (not main rivers) which are outside the administrative boundary of an internal drainage board. For more information on this refer to the Flood Risk Assessment.

Water Bodies

8.4.21 There are a number of water bodies, both naturally occurring and artificial, located within the site boundary of Zone 1 of the Proposed Development.

8.4.22 A pond is located to the north of the Emmanuel Cottages, centred at Grid Reference SP 50090 85162. This pond is located at a localised topographic high, with a surveyed water level of 123.47 m AOD. As the topography surrounding the pond slopes downward, it is possible that this pond is fed by groundwater. This pond is located in Parcel I of Zone 1.

8.4.23 Another pond is located to the south of Bittesby House, centred at Grid Reference SP 50268 85292. This pond is located within a topographic low. Shallow depths were observed within this pond, and it is assumed that this pond collects small volumes of surface water from the surrounding landscape. This pond is located in Parcel I of the Zone 1.

8.4.24 Near the north eastern boundary of Zone 1 of the Proposed Development there is the Mere Lane Lagoon, centred at Grid Reference SP 51018 85895. The Mere Lane Lagoon is an artificial water body that attenuates water draining from Magna Park and feeds the watercourse in the eastern portion of the site (Watercourse 2). This pond is adjacent to the north eastern border of Parcel G.

8.4.25 There are no known water bodies within Zone 2 of the proposed development.

Water Quality

8.4.26 There is no water quality data available from the Environment Agency's Historic River Quality map for any of the watercourses or ditches within the site. The nearest data that can be used as a comparison is located at Claybrook Magna approximately 3.5km north west of the site[7]. Water quality samples were collected downstream of the

[7] Environment Agency. http://maps.environment-agency.gov.uk/wiyby/queryController?topic=riverquality&x=448700.0&y=291900.0&ep=2ndtierquery&lang=_e&layerGroups=2&extraClause=STRETCH_CODE~%27028010072004%27&textonly=off&extraClause=YEAR~2009&latestValue=2009&latestField=YEAR. Accessed 27 January 2015.

Proposed Development from the River Soar, into which the ditches and Ordinary Watercourses from the Proposed Development discharge into.

8.4.27 Chemical water quality is available for 1990-2009. The 4km stretch of water is currently graded A (very good). The biology has been Graded B (Grade A is very good and Grade F is very bad).

8.4.28 The Magna Park Management Company currently monitors surface water quality of the effluent discharging from the extant foul water treatment works east of Mere Lane. This data is provided to the EA to assist with its evaluation of effluent waters reaching the local watercourses. A copy of the latest results (dated August 2015) is provided in Appendix E.5 for reference.

Local Geology

8.4.29 A baseline environmental desk study of the site, including an assessment of site geology, has been provided as part of the GroundSure EnviroInsight report (dated 22 September 2014). The EnviroInsight report found that the geology of the site consists of largely impermeable soils within the superficial ground and drift geology. Table 8.4.2 below presents the results of the geological inspection carried out.

Table 8.4.2: Superficial ground and drift geology present within Zone 1 of the Proposed Development site

Lex Code	Description	Rock Type
ODT-DMTN	OADBY Member	Diamicton
ALV-CSSG	Alluvium	Clay, Silt, Sand and Gravel
DMG-SAGR	Dunsmore Gravel	Sand and Gravel
PEAT-P	Peat	Peat
WOC-CLSI	Wolston Clay	Clay and Silt
WOSG-SAGR	Wolston Sand and Gravel	Sand and Gravel

8.4.30 The ground investigation found that these superficial deposits were underlain by bedrock and solid geology consisting of Penarth and Mercia Murcia Mudstone group mudstone as well as Blue Liam Formation mudstone and limestone.

8.4.31 It is also noted that the ground investigation found area within the site of made ground consisting of artificial deposits.

8.4.32 The EnviroInsight report found that within the superficial deposits areas following the tributary of the River Soar and other tertiary watercourses to the east of the site were designated as Secondary (A) Aquifers. All other areas of the site are designated as being unproductive.

8.4.33 The bedrock underlying the site was found to consist of Secondary (B) Aquifers to the west of the site, with undifferentiated Secondary Aquifer layers located within the centre of the site and Secondary (A) Aquifers located to the east of the site. This suggests that the more permeable areas of the site are located in the east. It is also noted from the ground investigation that a groundwater abstraction license is in place at a point 500m north of the site, although, the site is not located within a ground water source protection zone.

8.4.34 Secondary aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types[8]:

- Secondary A – permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
- Secondary B – 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. These are generally the water-bearing parts of the former non-aquifers.
- Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

8.4.35 The site is not situated in a groundwater Source Protection Zone, and the EnviroInsight report indicates that there are no Source Protection Zones within a 500m radius surrounding the Zone 1 site.

8.4.36 A ground investigation was carried out on the 10th and 11th February 2015 within one of the development parcels (Parcel G). Seventeen trial pits were excavated within the boundary of Parcel G with the intention of forming an indicative view of the near surface soil conditions for Parcel G. This investigation was conducted to support an Environmental Impact Assessment submitted for this parcel (Magna Park Extension – DHL Supply Chain). A copy of the report, titled Ground Investigation Factual Report, is included in Appendix E.4.

8.4.37 The general findings of the trial pits in Parcel G are as follows:

- Grass or crops overly a 0.20 to 0.40 m thick layer of topsoil which was recorded across the whole site and comprised soft brown silt and clay, with some sand and occasional round flint gravel.
- Below the topsoil is a layer of soft to firm yellowish brown slightly sandy clay with occasional chalk and flint gravels. This corresponds with the poorly sorted glacial

[8] Environment Agency. http://apps.environment-agency.gov.uk/wiyby/117020.aspx

diamicton of the Oadby Member with the gravel fraction variously comprising limestone, sandstone, chert and chalk.

- Bands of gravelly sand and sandy gravel are present up to 0.50 m thick and were locally present in the top 2.00 mbgl.
- Below 1.50 to 2.00 mbgl the Oadby Member graded to stiff grey clay, again with entrained clasts of limestone, chert and sandstone throughout.

8.4.38 Additional trial pits were dug across the Zone 1 site on 3rd – 9th September 2015. For details regarding the location of the trial pits refer to the Exploratory Hole Location Plan (Drawing Number 074680-CA-0-GF-DR-S-501-P02) in Appendix E.4. In general, from the trial pits:

- The site is underlain by a 0.25 m to 0.40 m thick layer of topsoil (average 0.30 m) consisting of soft brown silt/clay with some sand and rounded flint/chert gravel.
- This is underlain by firm orange and yellowish brown gravelly clay, corresponding with the mapped Oadby Member glacial diamicton. The gravel fraction variously comprises poorly sorted limestone, red/yellow sandstone, chert, and chalk. Bands and lenses of gravelly sand and sandy gravel up to 0.50 m thick are locally present within the top 2.0 m with occasional cobbles and boulder clasts. Below 1.50 m to 2.0 m the Oadby Member grades to stiff grey clay, again with poorly sorted entrained clasts of limestone, sandstone and chert throughout.
- The superficial drift deposits of the Oadby Member show low permeability and are thus considered an unproductive stratum. The underlying geology of the Blue Lias Formation is described as a Secondary A aquifer with permeable layers.

Groundwater

8.4.39 In the Environment Agency's consultation response they confirmed that they have no groundwater observation boreholes in the vicinity of the Zone 1 site, and as such were unable to provide any groundwater level data.

8.4.40 The nearest borehole record available from the British Geological Survey was south east of Zone 1 of the Proposed Development, on the southern side of Mere Lane (grid reference SP 51490 85870). The record (BGS Reference: SP58NW32) was taken on 26 June 1986 to a base of 15 m below ground. Water was struck at 10m (121.0m AOD) and rose to 7.0m[9].

8.4.41 The ground investigation undertaken on the 10th and 11th February 2015 within Parcel G of Zone 1 encountered groundwater at much shallower depths than the BGS borehole data from outside the site. Groundwater was observed during the ground investigation as slow seepages in most of the trial pits, at depths of between about

[9] British Geological Survey. http://scans.bgs.ac.uk/sobi_scans/boreholes/339176/images/10640428.html. Accessed 27 January 2015.

1.00 and 2.50 mbgl. These mostly corresponded with bands of granular (sand and gravel) soil.

8.4.42 Across the majority of the site groundwater was not encountered during the 3rd – 9th September 2015 trial pitting investigation (pits extending to about 3.5 m below ground level). However groundwater was observed as very slow seepages in a small quantity of trial pits, at depths of between about 1.0 m and 2.0 m. These water ingresses predominantly corresponded with thin isolated bands of granular (sand and gravel) soil. Refer to Appendix E.4 for groundwater level details for each of the trial pits.

8.4.43 In the Environment Agency's consultation response they confirmed that there are springs located within Zone 1 of the Proposed Development.

8.4.44 A spring is identified on the OS Mapping supplied by the EA as part of their consultation response (see ApDNL-9455.Flood risk map in Appendix E.2 for details). This spring is located to the south of Bittesby House, centred at Grid Reference SP 50322 85173. This spring has been identified within Parcel H of the proposed development.

8.4.45 Another spring is identified on OS Mapping from the EA, and identified on the Proposed Development Parameter Plan (Drawing No. 3657-34-06) to the east of the Medieval Village of Bittesby (centred at Grid Reference SP 50420 86069). It is assumed that, if present, this spring feeds Watercourse 1 flowing from south to north through the centre of Zone 1 of the Proposed Development. This spring has been identified within Parcel A1 (between Parcels C and D).

8.4.46 Further details regarding characteristics of the springs was not available at the time of writing this Chapter.

Surface Water

8.4.47 A review of the existing site topography indicates that surface water flows are most likely being managed on an informal basis in both Zones within the Proposed Development and that surface water flows ultimately drain to a network of ditches and watercoursesat each site.

Flood Risk

Historical Flooding

8.4.48 A review of Information in the Harborough District Council Level 1 Strategic Flood Risk Assessment indicates there are no Historical Flooding Incidents at the site.

8.4.49 The Environment Agency have confirmed in their consultation response, dated 5 December 2014, that they have no records of historic fluvial flooding at the Proposed Development.

Fluvial and Tidal Flood Risk

8.4.50 A review of Environment Agency Flood Zone Maps shows that a large majority of the area within the Zone 1 site boundary falls within Flood Zone 1, which is described within NPPF Table 1 as having a "Low Probability" of flooding. Flood Zone 1 is defined

as “land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%)”.

8.4.51 A portion of the site is classified as Flood Zone 3, which the NPPF describes as having a “High Probability” of flooding. Flood Zone 3 is defined as “land assessed as having a chance of flooding of greater than 1 in 30 (3.3%).” Areas classified as Flood Zone 3 generally follow the western branch of Watercourse 2 and Watercourse 1 that run from south to north through the centre of the site (as shown in the Catchment Areas Plan (Drawing No. 074680-CA-0-GF-DR-S-016-P00) in the Drainage Strategy). The extent of land classed as Flood Zone 3 is shown in the flood risk maps in Appendix E.2.

8.4.52 Zone 1 includes a number of development parcels, each with varying levels of flood risk vulnerability. Details regarding the flood risk vulnerability classification of these development parcels is summarised in Table 8.4.3 overleaf.

Table 8.4.3: Proposed uses and associated flood risk vulnerability classification

Development Parcel[10]	Proposed Use[11]	Flood Risk Vulnerability Classification[12]
A1	Structural landscape corridors and open space	Water-Compatible Development
A2	Structural landscape corridors and open space	Water-Compatible Development
A3	Structural landscape corridors and open space	Water-Compatible Development
B	Principal access corridor	Essential Infrastructure
C - The Park	Repositioned public routes / bridleway, watercourses, wetlands, strategic attenuation basins and Medieval Village of Bittesby.	Water-Compatible Development
D - The Meadowland	Existing permissive public bridleway	Water-Compatible Development
E - The 'Heart' Development Zone	D1 Academy + Estate Office	More Vulnerable
F - Small business innovation space	B1 (a) & (b)	Less Vulnerable
G	B8 Storage & Distribution	Less Vulnerable
H	B8 Storage & Distribution	Less Vulnerable
I	B8 Storage & Distribution	Less Vulnerable
J	B8 Storage & Distribution	Less Vulnerable
K	B8 Storage & Distribution	Less Vulnerable
L	B8 Storage & Distribution	Less Vulnerable
M2	Services Farm	Less Vulnerable
M3	Services Farm	Less Vulnerable

8.4.53 In Zone 2, a Railfreight shuttle terminal, HGV Parking, HGV Driver Training Centre and LPG or GNP Fuel Island and Vehicle washing facility are proposed. All of these uses are classified as 'Less Vulnerable.'

[10] Adapted from Parameter Plan (Drawing No. 3657-34-06)

[11] Adapted from Parameter Plan (Drawing No. 3657-34-06)

[12] From Table 2: Flood Risk Vulnerability Classification of Planning Practice Guidance to the National Planning Policy Framework.

8.4.54 The compatibility for development for each type of flood risk vulnerability classification is provided in Table 8.4.4.

Table 8.4.4: Suitability of development based on flood risk vulnerability

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required †	×	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	×	×	×	✓*

✓- Development is appropriate. × - Development should not be permitted
† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

8.4.55 From Tables 8.4.3 and 8.4.4 it is evident that a large majority of the development types / parcels are compatible for development in accordance with Table 2: Flood Risk Vulnerability Classification and Table 3: Flood Risk Vulnerability and Flood Zone Compatibility in the Planning Practice Guidance for Flood Risk and Coastal Change.

8.4.56 Parcel B – the Principal Access Corridor – is classified as Essential Infrastructure in Table 8.4.3. The EA Risk of Flooding from Rivers & the Sea map (in Appendix E.2) and the Parameter Plan (Drawing No. 3657-34-06) indicate that the Essential Infrastructure is located within Flood Zone 3, and is shown as requiring construction of a road crossing the Flood Zone 3 extent. Given the flood risk and vulnerability classification of development within Parcel B, development will need to take place ensuring that the essential infrastructure is designed and constructed to remain operational and safe in times of flood.

8.4.57 The remaining lands classified as Flood Zone 3 lie within Parcel C – The Park of Zone 1. This land is classified as Water-Compatible Development in Table 8.4.3, and is compatible for development.

8.4.58 As the site is not tidally influenced the risk from tidal flooding is negligible.

Flood Risk from Land, Surface Water and Sewers

8.4.59 A review of the Environment Agency's Risk of Flooding from Surface Water indicates that the Zone 1 and Zone 2 sites have varying levels of risk from surface water, with areas of low and medium risk generally following the paths of the ditches and watercourses at each site.

8.4.60 Flooding can also result when sewers, typically combined foul and surface water, are overwhelmed and surcharge water into the nearby environment. The Harborough District Council SFRA Level 1 states:

The majority of sewers built in the last 30 years are built to the guidelines within "Sewers for Adoption" (WRC, 2006). These sewers have a design standard to contain up to and including the 1 in 30 year rainfall event. Therefore the majority of sewer systems will surcharge during rainstorm events with a return period greater than 1 in 30 years (e.g. 100 years). Many sewers are however much older and date back to the Victorian era and are of an unknown capacity and condition.

8.4.61 The condition and capacity of the foul and surface water sewers at the proposed development site is currently unknown. There are reports of flooding following heavy rainfall in the HDC SFRA where the main factor behind this flooding is believed to be the insufficient capacity of the drainage system, however no records are located at the development site.

Flood Risk from Artificial Sources

8.4.62 Artificial sources of flooding include reservoirs, canals, lakes and mining abstraction.

8.4.63 A review of the Environment Agency Reservoir Maps indicates that the Proposed Development (Zones 1 and 2) is not within an area at risk from reservoir flooding.

Groundwater Flood Risk

8.4.64 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall.

8.4.65 The Harborough District Council SFRA Level 1 cites the DEFRA Strategy for Flood and Coastal Erosion Risk Management study (2004), which did not find any recorded instances of groundwater flooding within the development site. The SFRA recommended that the risk of groundwater flooding should be considered as part of site specific FRA.

8.4.66 The Local Flood Risk Management Strategy concluded that the majority of Leicestershire is sited on strata that is at low risk of flooding. This is supported by the bedrock geology identified in Leicestershire generally considered to have an aquifer classification of non-productive or Secondary B.

8.4.67 As springs may be present within Zone 1 of the Proposed Development, and a water body has been identified that may be fed by groundwater sources, the risk of groundwater flooding is considered to be moderate to high.

Amenity, Recreation and Heritage

8.4.68 Claybrooke Mill, a Grade 1 listed building, is located approximately 2.5 km north west of the Proposed Development at Frolesworth Lane, Claybrooke Magna LE17 5DB (Grid Reference SP 49909 89120). The Mill is adjacent to the River Soar, which receives flows from the ditches and watercourses from Zone 1 of the Proposed Development.

8.4.69 A Scheduled Monument (the Medieval Village of Bittesby) is located within the Zone 1 site, centred at the approximate Grid Reference of SP 50073 85895. The Village is located adjacent to the western bank of Watercourse 1 within Parcel C, land set aside as park / open space. See the Parameter Plan (Drawing No. 3657-34-06) to view the location of the Medieval Village within Parcel C of the Proposed Development.

Summary

8.4.70 Table 8.4.1 summarises the baseline water environment. It indicates that the current water quality is likely to be very good, and is therefore of High Importance. The Proposed Development will discharge surface water into Ordinary Watercourses both upstream and downstream of the Medieval Village of Bittesby (a Scheduled Monument) and upstream of the Claybrooke Mill (a Grade I Listed Building). The importance of effects to these heritage features are considered to be Medium and High, respectively. A large majority of the site lies within Flood Zone 1 and is considered at low risk for fluvial flooding. A portion of the site, following the course of Watercourse 1 and the western branch of Watercourse 2 lies within land classified as Flood Zone 3 and is considered to be at high risk for fluvial flooding.

Table 8.4.5 Baseline summary of water environment

Feature	Attribute	Indicator of Quality	Measure	Development Parcel	Grading	Importance
River	Water Supply	Chemical Water Quality	EA's Chemical GQA	Entire Site (Zone 1 / 2)	A	Very High
		Biological Water Quality	EA's Biological GQA	Entire Site (Zone 1 / 2)	B	High
		Industrial/Agricultural Water Quality	Location & Volume of Abstraction	Entire Site (Zone 1 / 2)	No Surface Water Abstraction Licences within 2000m of the study site[13]	Medium
		Industrial/Agricultural Water Quality	Location and Volume of Discharge	Entire Site (Zone 1 / 2)	Multiple licensed Discharge Consents have been granted by the EA for Magna Park upstream of the Proposed Development.[14]	Medium
	Amenity, Recreation and Heritage	Presence of Grade I Listed Building	Present, Downstream (2.5 km from site)	Zone 1 site	Proposed Development is upstream of Grade I Listed Building	High
		Presence of a Scheduled Monument	Present, within Parcel C of the Proposed Development (approximately centred at SP 50073 85895)	Parcel C	Proposed Development has surface water discharges upstream of Scheduled Monument	High
		Riverside Access	Presence/absence of	Parcels A1, A2,	Definitive	Medium

[13] GroundSure EnviroInsight (dated 22 September 2014) in Appendix E.3.

[14] GroundSure EnviroInsight (dated 22 September 2014) in Appendix E.3.

Feature	Attribute	Indicator of Quality	Measure	Development Parcel	Grading	Importance
			route and importance	A3, C, and D	footpath/bridleway/ other route	
				Remaining parcels and Zone 2 site	No direct access	Low
	Conveyance of flow and materials (surface water)	Presence of Watercourse	Size of Ordinary Watercourse	Parcels A1, A2, A3, B	Ordinary Watercourse >5m	Medium
				Parcel C	Active Floodplain	High
				Remaining parcels and Zone 2 site	Other	Low
		Flood Risk	Return Period	Parcels B, C	< 1 in 50 years (rural)	Medium
				Remaining parcels and Zone 2 site	< 1in 200 years	Low

8.5 Construction Effects and Mitigation

Construction Activities

8.5.1 For a complete description of construction activities at the Proposed Development site, please refer to the Construction Methodology and Programme and the Construction Environmental Management Plan (CEMP) that forms part of this Environmental Statement. In summary, construction activities will include:

- Pre-construction - Prior to construction commencing, a full review of the Development and all background information will be undertaken, including dialogue with relevant key stakeholders. From this review an outline method statement for the construction phase(s) of the Development will be produced and will form the basis of the on-going discussions with the various parties. This will be incorporated into the CEMP. In addition, prior to the commencement of construction all ecological licences will be applied for and any habitat removal will be completed during the correct time of year.
- Enabling Works - For the majority of the site the preparation works will include the removal of topsoil and other vegetation as the vast majority of the site is free of built development. This will be followed by an earth moving exercise to achieve required levels adopting a 'cut and fill balance' approach thus mitigating the need to remove site won materials off site. Drainage works will also be undertaken during this phase. Across the Site as a whole, this will involve implementing a range of sustainable urban drainage measures (SUDS), comprising a combination of pipes, swales/ditches and balancing ponds, and redirection of ditches in preparation to receive surface water runoff.
- Highways – The routes taken by construction traffic on the local highway network will be the subject of discussions between the developer, planning and highway authorities, and will also be subject to the existing physical and legal restrictions on movements of large vehicles.
- Construction Traffic Access and Off-Site Construction Routing - Access to the Zone 1 development plot is envisaged to be off Mere Lane under a Traffic Regulation Order. It is assumed that construction traffic access to Zone 2 will be via Coventry Road. Provision will be made, wherever possible, to ensure that vehicle unloading can be carried out on-site rather than on the adjacent highway. Should this become problematic during certain phases or elements of the construction process, such arrangement will be reviewed with appropriate authorities nearer the time. All construction traffic entering and leaving the Site will be closely controlled. Vehicles making deliveries to the Site or removing spoil or other material will travel via designated routes.
- Foundations - Based on the proposed earthworks strategy it is expected that pad foundations founding on the existing ground formations will be used. Material associated with the earthworks will be retained for re-use on site wherever possible, whilst material which proves unsuitable for re-use will be disposed of offsite in accordance with a Materials Management Plan.

- Superstructure – Where applicable, construction of superstructures within each development parcel will commence following the sufficient progression of the substructures. Many of the development parcels will primarily be comprised of a steel frame construction, though details for each parcel remain to be confirmed.
- External Works and Landscaping - Preparation for new/enhanced landscaping, including the placing of topsoil, will be carried out using large and small excavators and dump trucks to transport materials. Planting will be carried out manually with the plants being transported to their locations either directly from the rear of the delivery vehicles or on pallets by adapted excavating machines.

8.5.2 Specific construction activities pertaining to drainage and flood risk mitigation at the Proposed Development include:

- Construction / Alteration of Ditches, Watercourses and Culverts - These activities will likely take place during the Enabling Works and Highways construction phases. Refer to the following sections for details regarding these works.
- Construction of drainage infrastructure and SuDS - Construction of drainage infrastructure will take place in accordance with the drainage scheme for the site. These activities will likely take place during the Enabling Works, Highways and External Works and Landscaping construction phases.
- Works adjacent to a watercourse – Construction of access roads, highways improvements and drainage infrastructure will likely all require works adjacent to one or more of the Ordinary Watercourses at the site. These activities will likely take place during the Enabling Works and Highways construction phases. Any works near an Ordinary Watercourse require an Ordinary Watercourse Consent from the LLFA (Leicestershire County Council) in addition to any planning permission being sought.

Construction Effects

Sources of pollution and effects on water environment

8.5.3 This section identifies the likely significant effects of the scheme during the time of construction. The anticipated sources of pollution and effect on the water environment are considered to be:

- Suspended sediments – Coarse and fine sediment generated during the construction process and the exposure of soils on site;
- Hydrocarbons and chemicals – Spillage and leakage of oils and fuels associated with plant on the site and also any stored chemicals required as part of the construction process;
- Earth moving / creation of stockpiles – The exposure of soils on site as a result of temporary soil storage bunds;
- Construction Traffic Access and Off-Site Construction Routing – reduction in permeable area, increased runoff rates and creation of potential preferential flow paths;

- Construction / Alteration of Ditches, Watercourses and Culverts – construction or alteration of ditches, watercourses and / or culverts can cause potential damage to the profile of the channel, and changes to the flow velocities and volumes which could affect the ecology and fish as well as restrict movement along the watercourse;
- Construction or alteration of existing water bodies – removal of existing water bodies may affect ecology and fish habitat, affect existing overland flow paths as well as affect existing storage and flowpaths from groundwater emergence / springs; and
- Flood risk – potential for site inundation during an extreme rainfall event.

Sediment transport

8.5.4 Sediment can become entrained in surface water runoff. These suspended sediments can enter a surface watercourse. These suspended sediments can have adverse primary and secondary effects.

8.5.5 The sediment can have the primary effect of increasing turbidity and therefore having the secondary impact on the normal functioning of flora and fauna in addition to reducing light levels within the watercourse and affecting habitats, which can have secondary effects on growth and activity. The sediment may also contain contaminants that could have a primary effect on the chemical and biological water quality of a receiving watercourse and which may also have longer-term cumulative effects through accumulation followed by later disturbance and release.

8.5.6 Where no mitigation measures are implemented during the construction of the Proposed Development, the amount of sediment entering the nearby watercourses is likely to increase. This could lead to an adverse effect on the plants and species in the watercourses and result in a potential decrease in the GQA grade and effect WFD targets. The effect on the watercourses would be adverse and of a Major magnitude in the short term and therefore would result in a highly significant effect on a water environment of High importance (Significant effect). There would be the potential for medium to long-term disturbance of sediments, for example from flood events, resulting in continuing Minor to Moderate magnitude effects locally and downstream (Significant effect).

Hydrocarbons and Chemicals

8.5.7 Hydrocarbons are toxic in small quantities to flora and fauna, particularly fish and invertebrates, and as well as reducing the water quality through interactions with other chemicals can cause an oily sheen to be present on the surface of a water body. Where water with an oily content is turbulent it can result in foams and other unsightly features.

8.5.8 Construction activities and particularly the presence of plant and heavy vehicles can result in spillages and leakages of diesel, oils and other fuels, which, in addition to impacting on groundwater resources can result in contamination of surface waters on site and ultimately receiving waters via surface water runoff. Hydrocarbons and some chemicals are a List I substance and therefore its release, accidental or otherwise, can be considered to be a prosecutable offence under UK legislation. During times of flood or heavy rain, contaminated sediment has the potential to be deposited in areas adjacent to flow paths

and within the channels and has the potential to accumulate over time with longer term effects.

8.5.9 Where no construction practices are utilised to manage the use, storage and release of hydrocarbons and chemicals, over time it may to lead to a build up of contaminants in soils and ultimately in the channel from surface waters. In a worst case this could lead to a decrease in the GQA grade for both chemistry and biology. The effect on the watercourse would be of Major magnitude which would result in a Significant to Highly Significant effect on a water environment of High importance (Significant effect). Such effects could vary between short and longer term depending upon the mechanism by which the pollutants enter the water environment. It should be noted that the effect on the watercourses would differ in magnitude depending on the size of the spillage.

Construction / Alteration of Ditches, Watercourses and Culverts

8.5.10 The construction of new culverts can result in a temporary change to the existing profile of the channel. In addition, any changes to the flow regime could impact on the existing flora and fauna as well as restrict movement along the watercourse. During construction bunding may be required which could change water levels upstream (increase) and downstream (decrease) of the bund.

8.5.11 A summary of the proposed alterations to the baseline existing ditches, watercourses and culverts, as well as details regarding new culverts is provided in Table 8.5.1 below.

Table 8.5.1: Proposed alteration / construction of ditches, watercourses and culverts within Zone 1 of the Proposed Development

Observed Conditions Watercourse Number[15]	Observed Conditions Watercourse Classification	Proposed Alteration / Construction Activity
A	Ditch	It is proposed that this ditch be redirected along the northern borders of Parcels L and M3, rather than flow through these parcels. The ditch will now discharge directly into Watercourse 1 instead of terminating adjacent to the existing track in Parcel C.
B	Ditch	It is proposed that this ditch be redirected to along the southern and western border of Parcel K, rather than flow through this parcel. The ditch will now discharge directly into Watercourse 1 instead of instead of terminating adjacent to the existing track in Parcel C.
C	Ditch	It is proposed that this ditch be redirected to flow north of Parcels M2 and H, rather than through these parcels. The ditch will now discharge into Watercourse 2 instead of terminating in a wetland in Parcel H.
1	Watercourse	No substantive changes are proposed to the route of this watercourse. Highway access (as part of the principal access corridor) will be necessary via culvert or bridge structures, details of which are subject to agreement with the EA. Strategically formed outfall headwall structures are also proposed as part of the surface water drainage strategy.
2	Watercourse	No substantive changes are proposed to the route of this watercourse. Highway access (as part of the principal access corridor) will be necessary via culvert or bridge structures, details of which are subject to agreement with the EA. Strategically formed outfall headwall structures are also proposed as part of the surface water drainage strategy.
3	Watercourse	No changes are proposed for this watercourse.

[15] Refer to the Catchment Areas Plan (Drawing No. 074680-CA-0-GF-DR-S-016-P00) in the Drainage Strategy for further details.

8.5.12 The Parameter Plan (Drawing No. 3657-34-06) does not indicate any changes to the existing Ordinary Watercourse along the southern boundary of Zone 2.

8.5.13 Construction activities taking place on or near a watercourse can impact the existing profile of the channel which could temporarily alter the conveyance of flow and materials. It is understood that works taking place on or near an Ordinary Watercourse in the Zone 1 site is the construction of a culvert in Parcel B. These works will require an Ordinary Watercourse Consent from the LLFA (Leicestershire County Council) in addition to any planning permission being sought.

8.5.14 Any further Any works that are proposed to take place on or adjacent to Ordinary Watercourses would also require an Ordinary Watercourse Consent in addition to any planning permission being sought. Temporary consent may be required for works within the byelaw distance and for works to facilitate new structures whilst permanent consent is required for any new structures such as culverts for road crossings.

8.5.15 In the event that Ordinary Watercourse Consent is not gained from the LLFA prior to works commencing there is potential for damage the overall water environment. This is likely to be a long term effect of moderate magnitude which would result in a Significant effect on a water environment of High Importance (Significant effect). Failure to get consent would contravene the Land Drainage Act 1991, as amended by the Flood and Water Management Act (2010), and could result in a fine or legal prosecution.

Construction / Alteration of Water Bodies and Springs

8.5.16 Construction or alteration of existing water bodies may affect ecology and fish habitat, existing surface water attenuation and / or overland flow paths. The proposed alterations to the baseline existing water bodies and springs, and construction of new water bodies is summarised below.

8.5.17 It is proposed that the pond located in Parcel I in Zone 1 of the Proposed Development (located to the north of the Emmanuel Cottages, centred at Grid Reference SP 50090 85162) be removed. This pond is located at a localised topographic high under baseline conditions, with a surveyed water level of 123.47 m AOD. As the topography surrounding the pond slopes downward, it is possible that this pond is fed by groundwater. Prior to removal of this pond, ground investigations should be conducted to verify the source(s) of water feeding the pond.

8.5.18 Development plans indicate that another pond, located in Parcel I (south of Bittesby House, centred at Grid Reference SP 50268 85292), is proposed to be removed. This pond is located within a topographic low and is assumed to collect small volumes of surface water from the surrounding landscape under baseline conditions.

8.5.19 A spring may be located to the south of Bittesby House, centred at Grid Reference SP 50322 85173. This spring has been identified within Parcel H of Zone 1 of the Proposed Development. It is unknown whether any development is proposed on or within the vicinity of the spring, however prior to any development, the spring should be investigated as part of ground investigations for the site.

8.5.20 Another spring is identified on OS Mapping from the EA, and identified on the Proposed Development Parameter Plan (Drawing No. 3657-34-06) to the east of the Medieval Village of Bittesby (centred at Grid Reference SP 50420 86069). It is assumed that, if present, this spring feeds Watercourse 1. This spring has been identified within Parcel A1 (between Parcels C and D). It is assumed that no development is planned on or within the vicinity of the spring and that any overland flows from the spring will be permitted to flow to Watercourse 1 as per baseline conditions.

8.5.21 The construction of artificial water bodies, specifically attenuation basins, is planned to manage surface water runoff generated from the development parcels under post-developed (operational) conditions. It is understood that attenuation basins will be located within the development parcels to the greatest extent possible to maximise management of surface water at its source. Where construction of attenuation basins within a Parcel is not possible, it is understood that the construction of strategic attenuation basins is proposed. Parcel C has also been targeted for construction of strategic attenuation basins.

8.5.22 Where no mitigation measures are implemented during the construction / alteration of water bodies and springs within the Proposed Development, overland flow paths may change, and groundwater emergence and potential groundwater flooding may take place. Ecology and fish habitat could also be negatively impacted. This could lead to lead to an adverse effect on the biodiversity within the Proposed Development. The effect on the Proposed Development would be adverse and of a Major magnitude in the short term and therefore would result in a highly significant effect on a water environment of High Importance (Significant effect).

Surface Water Runoff Rates, Volumes and Flow Paths

8.5.23 There is likely to be increased surface water runoff and changes to the flow regime during construction of the Proposed Development, though it is not possible to accurately quantify these changes at the time of writing this Chapter. The use of heavy plant machinery has the potential to result in the compaction of the ground surface and this will reduce the marginal overall reduction in the permeability of the site, potentially increasing the volume of the runoff.

8.5.24 The result of these effects could be increased wetness and potentially saturation in those places that received diverted flow, which could increase the loss of soil during very wet periods of the year and during heavy rainfall. Those areas in which water is diverted away by works could experience marginal drying. In any areas that experience a change in wetness, either wetting or drying, there is the potential to locally influence vegetation composition depending upon the degree of change and the sensitivity of the species concerned. The overall direction of overland flow and the quantum of water entering the ditches and watercourses either on site or off site is unlikely to change significantly as a result of any works.

8.5.25 Temporary changes to the flow regime, either an increase or decrease in flows may have an adverse impact upon Claybrooke Mill. The Mill is a Grade 1 listed building located approximately 2.5 km north west of the Proposed Development. The Medieval Village of

Bittesby (Scheduled Monument) is located within Parcel C of Zone 1 of the Proposed Development.

8.5.26 The Claybrooke Mill, in particular, relies upon flows from the River Soar, into which the ditches and watercourses from Zone 1 of the Proposed Development are tributaries. Changes to the flow regime during construction is considered to have an effect of major magnitude on an attribute of High Importance (Significant effect).

Flood Risk

8.5.27 A large majority of the Proposed Development is located within land classified as Flood Zone 1, and as such, fluvial flood risk in these areas is considered to be low. A portion of the Zone 1 site is classified as Flood Zone 3. Areas classified as Flood Zone 3 generally follow Watercourse 1 and the western branch of Watercourse 2 from south to north through the centre of the Zone 1 site. Refer to Appendix E.2 to view the predicted flood extent in Zone 1 of the Proposed Development.

8.5.28 During construction there is the potential (predicted to be greater than 1 in 30 (3.3%) for fluvial flooding to take place within the lands classified as Flood Zone 3. If stockpiles or plant equipment are stored within the predicted flood extent, this can reduce the baseline floodplain storage, increasing flood risk to properties downstream. The effect on properties downstream of the Proposed Development would be adverse and of a Major magnitude in the short term and therefore would result in a highly significant effect on a water environment of High Importance (Significant effect).

8.5.29 During the construction phase there is the potential for surface water flooding localised around the ditches and watercourses at each site. The probability of surface water flooding occurring during the construction phase is very low due to the short duration of the construction phase and the overall probability of fluvial flooding occurring at any one time. Reference should be made to the operational and residual risk sections for discussion on appropriate mitigation.

Summary

8.5.30 Table 8.5.1 below summarise the effects from the construction phase of the Proposed Development when mitigation measures are not implemented.

Table 8.5.2: Summary of Effect Assessment (construction)

Feature	Attribute	Importance Level	Magnitude of Effect	Beneficial/ Adverse	Development Parcel	Significance of Effect	Significance in EIA terms
River/drain	Water Quality	High	Major*	Adverse	Entire site (Zone 1 / 2)	Highly Significant	Significant
	Biodiversity	High	Major	Adverse	Entire site (Zone 1 / 2)	Highly Significant	Significant
	Conveyance of flow and materials (surface water)	Medium	Moderate	Adverse	Entire site (Zone 1 / 2)	Low significance	Not Significant

Feature	Attribute	Importance Level	Magnitude of Effect	Beneficial/ Adverse	Development Parcel	Significance of Effect	Significance in EIA terms
	Active Floodplain	High	Moderate	Adverse	Parcel C, and downstream properties	Significant	Significant
	Recreation, Amenity and Heritage	High-Medium	Major	Adverse	Entire site (Zone 1 / 2)	Highly Significant	Significant

* Residual risk in the event of major accidental spillage

Proposed Mitigation

Suspended sediment

8.5.31 Standard construction practices should be utilised to manage the generation and release of sediments. These should include:

- Phasing of construction operations and organisation of the site to minimise the areas of exposed sediments within a development at all times;
- Provision of a drainage system that provides facilities to trap sediments before it can be entrained in runoff or washed from the site. This should be adopted in the temporary works compound as well as when working in the vicinity of ditches and watercourses.
- Facilities to remove trapped sediments from site runoff prior to discharging into ditches and watercourses. Note that silty water cannot be discharged directly into ditches or watercourses. Facilities should be designed to cope with an event of approximately 1 in 10 years; and
- All soil stockpiles should be placed in bunds or within geotextile fencing, to reduce the transfer of sediment from the stockpiles into ditches and watercourses.

8.5.32 The implementation of the above measures should significantly reduce the availability of sediment on the site, reduce and manage the pathways for sediment to enter the ditches or watercourses or as surface water runoff and therefore ultimately reduce the amount of sediment reaching the local watercourse and its associated primary and secondary effects.

8.5.33 The implementation of such measures should result in an effect of Minor magnitude, which would therefore result in an Insignificant effect on a water environment of high importance (Not Significant effect).

8.5.34 The above measures should be regularly and pro-actively maintained and monitored as part of the daily site activities with repairs carried out as necessary. They should also form part of the CEMP to be agreed prior to the start of work on site.

Hydrocarbons and chemicals

8.5.35 Standard construction practices should be utilised to manage the use, storage and release of hydrocarbons and chemicals. These should include:

- Storage of hydrocarbons and chemicals will be away strategically, located away from surface water sources in appropriately designated and (minimum 110% capacity) bunded locations and with strict procedures to manage the operation of such facilities. Such materials will be stored within secure compound areas with access gained by competent authorised personnel only. The Control of Pollution (Oil Storage) Regulations 2001 indicate what is required for the storage of oil in the UK with further information provided in the Environment Agency's Pollution Prevention Guideline 02 – Above Ground Oil Storage Tanks;
- Leakage of oils and chemicals can be avoided through regular checks and maintenance of storage and other facilities; and
- Plant should be provided with drip trays to prevent direct effects to groundwater and indirect effects to surface waters. Drip trays should be checked and emptied regularly using appropriately licensed waste operators.

8.5.36 The implementation of the above measures should significantly reduce the opportunities for oils and chemicals to be spilt or leaked on the site, should reduce and manage the pathways for oils and chemicals to enter ditches and watercourses and therefore ultimately reduce the effect that it has amount on the local watercourses.

8.5.37 The implementation of such measures under normal circumstances should result in an effect of Negligible magnitude, which would therefore result in an Insignificant effect on a water environment of high importance (Not Significant effect).

8.5.38 There will always remain a residual risk of spillage and planning for such circumstances should take place. Measures for the control of spillages should be available on site along with details of the EA's Emergency Hotline (Tel: 0800 80 70 60), who should be called in the event of any spillage. The implementation of such measures should result in an effect of no more than Moderate magnitude on a water environment of high importance, which would result in a Significant effect should it take place (Significant effect).

8.5.39 The above measures should be regularly and pro-actively maintained and monitored as part of the daily site activities with repairs carried out as necessary. They should form part of the CEMP to be agreed prior to the start of work on site.

Construction / Alteration of Ditches, Watercourses and New Culverts

8.5.40 Works associated with the construction or alteration of a ditch, watercourse and / or culvert should take place in accordance with relevant legislation and consultation with the LLFA, Leicestershire County Council, to ensure that no work is done in such a manner to cause damage to flora and fauna. Practical considerations for works associated with the construction or alteration of a ditch, watercourse and / or culvert include, but are not limited to the following:

- Construction works should include a bespoke temporary outfall structure to allow runoff to discharge downstream, therefore minimising any effects to the hydrological regime downstream.
- Construction workers should investigate any areas of ponding and relocate any trapped fauna (e.g. fish).

8.5.41 The implementation of such measures and adherence to the requirements of the Ordinary Watercourse Consent should result in a temporary effect no higher than Minor magnitude, which would therefore result in an effect of Low significance on a water environment of High importance (Not significant effect).

8.5.42 If an Ordinary Watercourse Consent is required from the LLFA, the following are the key considerations for the Development:

- It should be ensured that necessary measures for the adequate discharge of flood waters and for continued operation of all land drainage systems in the area are maintained;
- Approval should be sought from the LLFA if temporary diversions or piping of the watercourses during construction or temporary obstruction of the floodplain by temporary soil bunds are proposed;
- No material should be placed within the channel or floodplain during the construction of the temporary works; and
- The structural integrity of fluvial, or flow control structures should not be damaged.

8.5.43 The implementation of the above measures and adherence to the requirements of the Ordinary Watercourse Consent should significantly reduce the effect on the watercourses. It should be noted that these consents emphasise mitigating impacts to water quality. Therefore the CEMP should also detail how the effect on water quality during the removal and construction works will be limited. Methods such as those described in relation to suspended sediment, hydrocarbons and chemicals and cement and concrete will be sufficient.

8.5.44 The implementation of such measures should result in a temporary effect no higher than Minor magnitude, which would therefore result in an effect of Low significance on a water environment of High importance (Not significant effect).

Construction / Alteration of Water Bodies and Springs

8.5.45 Prior to the alteration / removal of any water bodies within the Proposed Development ground investigations should be undertaken to verify whether the water bodies are fed by a groundwater source. If ground investigations confirm a groundwater supply to water body(ies) then mitigation measures will need to be implemented as part of alteration works to ensure that sufficient means are provided to collect and convey flows to a suitable location, such as a nearby watercourse. Any alteration and / or development on or near a spring will also require mitigation measures to be implemented during construction to appropriately collect and convey flows.

8.5.46 Furthermore, prior to the alteration / removal of water bodies or springs, an investigation should be undertaken to identify fauna and other species located within the ponds, and to relocate identifies fauna / species to an appropriate location within the Proposed Development.

8.5.47 The implementation of such measures should result in a temporary effect no higher than Minor magnitude, which would therefore result in an effect of Low significance on a water environment of High importance (Not significant effect).

Surface Water Runoff Rates, Volumes and Flow Paths

8.5.48 The implementation of measures identified for the previous sections – works adjacent to the watercourse and alteration / construction of new watercourses and culverts – should result in a reduced probability of variable surface water volumes discharged from the Proposed Development during construction. This should result in an effect of moderate magnitude, which would therefore result in an Insignificant effect on a water environment of high importance (Not Significant effect).

Summary

8.5.49 Table 8.5.2 below summarise the effects from the construction phase of the Proposed Development when mitigation measures are implemented.

Table 8.5.3: Summary of Effect Assessment (Construction with Mitigation)

Feature	Attribute	Importance Level	Magnitude of Effect	Beneficial/ Adverse	Development Parcel	Significance of Effect	Significance in EIA terms
River/drain	Water Quality	High	Moderate	Adverse	Entire site (Zone 1 / 2)	Significant*	Significant
	Biodiversity	High	Moderate	Adverse	Entire site (Zone 1 / 2)	Significant*	Significant
	Conveyance of flow and materials (surface water)	Medium	Moderate	Adverse	Entire site (Zone 1 / 2)	Low Significance	Not Significant
	Active Floodplain	Medium	Moderate	Adverse	Parcel C, and downstream properties	Low Significance	Not Significant
	Recreation, Amenity and Heritage	High-Medium	Minor	Adverse	Entire site (Zone 1 / 2)	Low Significance	Not Significant

8.6 Operational Effects and Mitigation

Operational Effects

8.6.1 Operation of the Proposed Development shall involve the daily transport of goods to and from the proposed distribution warehousing facilities located within Zone 1. Goods (cargo) shall primarily be transported by means of transport trailers. The site shall also be accessed daily by workers at the distribution warehousing as well as offices, Estate Office and the Logistics Institute. Operation of Zone 2 will also involve the transport and storage of LPG or or GNP for a vehicle refuling island, as well as vehicle washing facilities. Public use is anticipated through access to the Estate Office conference facility and public heritage facility in Zone 1, as well as access through existing and redirected public footpaths and bridleways. It is anticipated that these operating conditions will remain in effect throughout the life time of the Proposed Development. The following potential effects during the operational phase are detailed below.

Hydrocarbons and chemicals

8.6.2 The Proposed Development will provide on-site vehicle fuelling and vehicle washing facilities. As such, petrol, oil, cleaning agents and other hydrocarbons/chemicals will be stored on site. If no mitigation practices were to be utilised to manage the storage of hydrocarbons/chemicals, over time it may to lead to a build up of contaminants in soils and ultimately in the watercourses from surface waters. In a worst-case this could lead to a decrease in the GQA grade for both chemistry and biology. It is expected that changes to the surface water regime will be of an ongoing effect (due to ongoing vehicle refuelling and washing operations) of moderate magnitude which would result in a Significant effect on a water environment of High Importance if there was a direct overland pathway to a receiving watercourse (Significant effect).

Surface water

8.6.3 The drainage strategy for the Proposed Development will ensure that any increase in surface water runoff is managed by attenuation and restrict discharges to the Greenfield runoff rate. SuDS practices are planned to be implemented as feasible, based on the suitability of site ground conditions.

8.6.4 If surface water runoff was not restricted the increase in impervious surfaces would likely generate additional surface water runoff. This would increase peak flows in the site's watercourses and watercourses downstream of the Proposed Development. It is expected that changes to the conveyance of flows would be of moderate magnitude to an Ordinary Watercourse of Medium importance which would result in result of Low Significance (Not Significant effect).

8.6.5 If site soil and geology are not suited for the implementation of SuDS practices, there is the potential for the Proposed Development to reduce net infiltration of rainwater into the soil due to the increase of impermeable surfaces. This could have the secondary effect of reducing baseflows in the Ordinary Watercourses and river network downstream. A review of available data from the Ground Investigation Factual Report 06 March 2015, the 3rd – 9th September trial pits assessment and British Geological Survey and boreholes near the

Proposed Development indicate that the underlying soils and geology are clay and as such infiltration under existing conditions is minimal.

8.6.6 It is expected that if changes to the conveyance of flows were to occur as a result of reduced infiltration, these would be of moderate magnitude to a watercourse of Medium importance which would result in result of Low Significance (Not Significant effect). If an assessment finds that existing infiltration rates are low, then it is expected that the effects of increased impermeable surfaces shall have negligible impact on baseflows. A detailed assessment of site infiltration rate is required in order to assess existing infiltration and surface water runoff rates from the site.

Water Bodies and Springs

8.6.7 The drainage strategy for the Proposed Development will ensure that any water bodies or springs that have been removed to facilitate development will be provided with adequate drainage to intercept groundwater flows before emergence onto finished ground levels and / or within any buildings car parks or other structures. If drainage infrastructure was not provided this could have the effect of increasing groundwater flood risk within the Proposed Development, particularly locations where groundwater fed water bodies and springs may be located.

Flood risk

8.6.8 A large majority of the Proposed Development is located within lands classified as Flood Zone 1, and as such, fluvial flood risk in these areas is considered to be low. A portion of the Zone 1 site is classified as Flood Zone 3. Areas classified as Flood Zone 3 generally follow Watercourse 1 and the western branch of Watercourse 2 running from south to north through the centre of the Zone 1 site. Refer to Appendix E.2 to view the predicted flood extent in the Proposed Development.

8.6.9 Parcel B – the Principal Access Corridor – is classified as Essential Infrastructure and the proposed Parameter Plan (Drawing No. 3657-34-06) indicates that the development parcel will include a road with a crossing over the Flood Zone 3 predicted flood extent. It is assumed that this crossing will be designed and constructed in order to ensure that this crossing remain operation and safe in times of flood. If the crossing is not designed and constructed to ensure safe passage along the principal access corridor, then this may affect safe egress from the site in the event of a flood.

8.6.10 A large proportion of Zone 1 of the Proposed Development – Parcel C: The Park – has been set aside as park and open space. This development is classified as Water-Compatible Development by the Planning Practice Guidance to the National Planning Policy Framework. Setting aside land for open space in Parcel C will ensure that no development will take place within the existing floodplain and that surrounding development is set back sufficiently to mitigate flood risk. If development was proposed within Parcel C, particularly within the extent of Flood Zone 3, this may increase flood risk for site users and may increase flood risk for properties downstream. This will result in an effect of moderate magnitude which would result in a Low Significance on a floodplain of Medium Importance (Not Significant effect).

8.6.11 Based upon a review of indicative soil and geology data at the site and surrounding area, groundwater flood risk is considered moderate to high.

8.6.12 If surface water flows from the development are not restricted to the Greenfield runoff rate, then increased surface water flows may affect properties downstream. In Zone 1, affected properties could include Parcel C, which contains the Medieval Village of Bittesby and further properties downstream like the Claybrooke Mill. This would result in an effect of moderate magnitude which would result in a Low Significance on a floodplain of Medium Importance (Not Significant effect).

Construction / Alteration of Ditches, Watercourses and New Culverts

8.6.13 It is understood that the new culvert and redirected ditches will be designed for hydrological conditions during the detailed design phase; therefore the existing flow regime will be maintained with only a minor loss of vegetation at the culvert locations. The effect of the redirected ditches and new culverts during the operation of the Proposed Development will have a minor magnitude which would result in a Low significant effect on a water environment of High Importance (Not significant effect).

Summary

8.6.14 Table 8.6.1 below summarise the effects from the operation phase of the Proposed Development when mitigation measures are not implemented.

Table 8.6.1: Summary of Effect Assessment (Operation)

Feature	Attribute	Importance Level	Magnitude of Effect	Beneficial/ Adverse	Development Parcel	Significance of Effect	Significance in EIA terms
River/drain	Water Quality	High	Moderate to Major*	Adverse	Entire site (Zone 1 / 2)	Significant	Significant
	Conveyance of flow and materials (surface water)	High	Moderate	Adverse	Entire site (Zone 1 / 2)	Significant	Significant
	Recreation, Amenity and Heritage	High-Medium	Moderate	Adverse	Entire site (Zone 1 / 2)	Significant	Significant

Proposed Mitigation

Hydrocarbons and chemicals

8.6.15 Storage of hydrocarbons and chemicals should be away from surface water sources in appropriately designated locations and with strict procedures to manage the operation of such facilities.

8.6.16 SuDS and other forms of surface water treatment practices should be implemented as part of the drainage strategy for the Proposed Development to mitigate water quality impacts from operation of Zones 1 and 2.

Surface Water

8.6.17 Restricting runoff to the Greenfield runoff rate shall ensure that there is no increase in surface water flood risk either on site or off site. As a result, the probability of surface water flooding is considered to be low for this site. The implementation of the suitable drainage strategy within the Proposed Development at the detailed design stage would represent a permanent, local effect of moderate beneficial significance (Significant beneficial effect).

8.6.18 It is recommended that any permanent SuDS practices constructed on site are incorporated into the maintenance regime and that a management plan is included within the detailed drainage design strategy for the site. Typical maintenance activities include, mowing (as required), inspection for erosion, rubbish removal and avoidance of using heavy machinery near infiltrating SuDS practices as this may lead to reduction of the infiltration capacity due to soil compaction.

Water Bodies and Springs

8.6.19 Surface water treatment / attenuation ponds will need to be incorporated into the maintenance regime and a management plan should be included with the detailed drainage strategy for the site.

8.6.20 Any sub-surface drainage system incorporated to mitigate groundwater flooding from removed water bodies or springs will need to be incorporated into the maintenance regime and a management plan should be included with the detailed drainage strategy for the site.

Construction / Alteration of Ditches, Watercourses and New Culverts

8.6.21 Redirected ditches, existing watercourses and culverts (new and existing) will need to be incorporated into the maintenance regime and a management plan should be included with the detailed drainage strategy for the site.

Flood risk

8.6.22 Restricting the surface water runoff from the Proposed Development to the Greenfield runoff rate will ensure that the Proposed Development will not increase flood risk to properties downstream. This will result in an effect of minor magnitude which would result in a Low Significance on a floodplain of Medium Importance (Not significant effect).

8.6.23 A Flood Evacuation Plan will need to be created that provides directions for safe egress from the Proposed Development site in the event of a flood event. The Flood Evacuation Plan should include directions to avoid the crossing of Watercourse 2 in Parcel B [located in Flood Zone 3], prioritising the use of access roundabouts to the north west and south west.

Summary

8.6.24 Table 8.6.2 summarise the effects from the operation phase of the Proposed Development when mitigation measures are implemented.

Table 8.6.2: Summary of Effect Assessment (Operation with Mitigation)

Feature	Attribute	Importance Level	Magnitude of Effect	Beneficial/ Adverse	Development Parcel	Significance of Effect	Significance in EIA terms
River/drain	Water Quality	Medium	Moderate	Adverse	Entire site (Zone 1 / 2)	Low significance*	Not significant
	Conveyance of flow and materials (surface water)	High	Negligible	Beneficial	Entire site (Zone 1 / 2)	Insignificant	Not significant
	Recreation, Amenity and Heritage	High-Medium	Minor	Adverse	Entire site (Zone 1 / 2)	Low Significance	Not Significant

* Residual risk in the event of major accidental spillage.

8.7 Residual Effects

Construction

8.7.1 The only potentially significant residual effect of the Proposed Development during construction arises from the risk to water quality in the ditches and watercourses from (severe) spillages. There is little opportunity to implement further mitigation measures (to those outlined above) to reduce the effects of accidental spillages other than undertaking risk and site specific emergency planning such that the effects of major spillages can be managed with as little impact on the water environment. The likelihood of such a severe spillage is low and is not considered a constraining factor to the Proposed Development.

Operation

8.7.2 Residual risks from spillages also exist during operation of the Proposed Development due to the presence of refuelling and vehicle washing facilities and due to the anticipated volume of traffic into and out of Zones 1 and 2. There is little opportunity to implement further mitigation measures (to those outlined above) to reduce the effects of accidental spillages other than undertaking risk and site specific emergency planning such that the effects of major spillages can be managed with as little impact on the water environment. The likelihood of such a severe spillage is low and is not considered a constraining factor to the Proposed Development.

8.7.3 A large majority of the site is located in Flood Zone 1 and as such is at low risk from fluvial flooding. The site is also at low risk of surface water and artificial sources of flooding. Portions of the site may be at risk for groundwater flooding, and as such groundwater flood risk is considered to be moderate – high across the site. A portion of the Zone 1 site is classified as Flood Zone 3. Areas classified as Flood Zone 3 generally follow the tertiary and secondary watercourses running from south to north through the centre of Zone 1 (watercourse numbers 6, 9, 10, 4 and 16 as shown in Figure 8.4.1). Refer to Appendix E.2 to view the predicted flood extent in the Proposed Development.

8.7.4 Flooding could occur at Proposed Development site, with areas classified as Flood Zone 3 at greatest risk (predicted to be greater than 1 in 30 (3.3%)). A Flood Evacuation Plan should be produced by the site operator which provides direction on actions to take during flood conditions.

8.8 Cumulative Effects

Other Developments Accounted

8.8.1 A number of Other Developments have been proposed in the area surrounding the Proposed Development. Other Developments could potentially have an adverse impact on flood risk, potentially increasing flood risk on the Proposed Development site, or to properties downstream of the Proposed Development.

8.8.2 The Proposed Development, along with Other Developments (such as the Proposed Residential Development in Ullesthorpe, with erection of 45 dwellings) have been identified as a potential concern by the owner of the Claybrooke Mill. Claybrooke Mill, a Grade 1 listed building, is located approximately 2.5 km north west of the Proposed Development (located on Frolesworth Lane, Claybrooke Magna LE17 5DB). The Mill is adjacent to the River Soar, which receives flows from the Ordinary Watercourses from Zone 1 of the Proposed Development.

8.8.3 Other Development includes the Land at Glebe Farm, Coventry Road, Lutterworth (centred at Grid Reference SP 52250 83909). The outline application for this site includes the erection of up to 278,709m^2 of Storage, Distribution buildings (B8) with ancillary B1(a) offices. The area surrounding the Glebe Farm drains into a series of Ordinary Watercourses, which discharge into the River Swift.

Multiple Issues Resulting in Cumulative Effects

Impact of Other Developments on the Proposed Development

8.8.4 As the Proposed Development is located in an upstream part of the River Soar catchment this minimises the potential of it being affected from Other Developments within the catchment. As such, the increase in flood risk to the Proposed Development from Other Developments in the surrounding region is considered negligible.

Impact of Other Developments and the Proposed Development on Others

8.8.5 If the Proposed Development and Other Developments (such as the Proposed Residential Development in Ullesthorpe) resulted in a reduction in permeable surfaces, there is the potential for the primary effect to be a reduction of infiltration into the surrounding soils. This could have the secondary effect of reducing baseflows to tributaries of the River Soar, upon which the Claybrooke Mill operates. These effects could be cumulative in nature.

8.8.6 A review of available data from the Ground Investigation Factual Report 06 March 2015, the additional trial pit ground investigation conducted 3rd – 9th September 2015 and British Geological Survey and boreholes near the Proposed Development indicate that the underlying soils and geology are clay and as such infiltration under existing conditions is minimal. Soil and geology at Other Developments (such as the Proposed Residential Development in Ullesthorpe) are not known. Further site investigations are required to determine existing infiltration rates.

8.8.7 If infiltration rates are found to be high from a detailed assessment of site infiltration rates, then SuDS should be implemented to the greatest extent feasible to maximize infiltration

and maintain baseflow rates. If soil conditions are found to be poor, then surface water can be managed through attenuation in accordance with the proposed drainage strategy. If soil conditions are shown to have low infiltration rates, then it is expected that the effects of increased impermeable surfaces shall have negligible impact on baseflows.

8.8.8 The Land at Glebe Farm drains to the River Swift, which is a tributary of the River Avon. As such, if this development were to take place in addition to the Proposed Development, the cumulative effects are considered to be negligible as only a small proportion of the Proposed Development (the Zone 2 lands) are part of the same catchment. As such cumulative impacts to the water environment and increases to flood risk are considered to be negligible.

8.9 Summary

Introduction

8.9.1 This technical chapter identified the likely significant environmental effects (if any) of the Proposed Development with respect to water resources and flood risk.

Construction Effects

8.9.2 An assessment of construction effects from the Proposed Development identified potential Significant effects to Water Quality, Biodiversity, Recreation, Amenity and Heritage arising from construction activities (where no mitigation measures were implemented).

8.9.3 Following the implementation of mitigation measures, Significant effects remained for Water Quality and Biodiversity. Mitigation measures specified include, but are not limited to:

- Standard construction practices should be utilised to manage the generation and release of sediments;
- Standard construction practices should be utilised to manage the use, storage and release of hydrocarbons and chemicals; and
- If works adjacent to a watercourse take place, then an Ordinary Watercourse Consent will be required from the LLFA.

Operational Effects

8.9.4 An assessment of operation effects from the Proposed Development identified potential Significant effects to Water Quality, Conveyance of flow and materials (surface water) and Recreation, Amenity and Heritage arising from the operation of the Proposed Development (where no mitigation measures were implemented).

8.9.5 Following the implementation of mitigation measures, all effects were considered Not Significant. Mitigation measures specified include, but are not limited to:

- Storage of hydrocarbons and chemicals away from surface water sources in appropriately designated locations and with strict procedures to manage the operation of such facilities;
- Surface water runoff from the property not to exceed the Greenfield runoff rate, and to maximize the use of SuDS to the greatest extent feasible; and
- Redirected ditches and the new culvert should be designed for hydrological conditions during the detailed design phase; to ensure the existing flow regime will be maintained with only a minor loss of vegetation at the culvert locations.

Residual Effects

8.9.6 The significant residual effect of the Proposed Development during construction and operation arises from the risk to water quality in the ditches and watercourses from (severe) spillages and the risk of flooding, particularly in the land classified as Flood Zone 3.

8.9.7 There is little opportunity to implement further mitigation measures (to those outlined above) to reduce the effects of accidental spillages other than undertaking risk and site specific emergency planning such that the effects of major spillages can be managed with as little impact on the water environment. The likelihood of such a sever spillage is low.

8.9.8 A Flood Evacuation Plan should be developed to mitigate the risk of flooding to site users in during a flood event.

Cumulative Effects

8.9.9 As the Proposed Development is located in an upstream part of the River Soar catchment this minimises the potential of it being affected from Other Developments within the catchment. As such, the increase in flood risk to the Proposed Development from Other Developments in the surrounding region is considered negligible.

8.9.10 The development of a surface water management scheme that restricts runoff to the Greenfield runoff rate shall ensure that there is no increase in flood risk on site or to those downstream. SuDS practices should be implemented to the greatest extent possible (depending upon appropriate site soil and geology) to maximize infiltration rates and associated contributions to baseflow.

8.10 References

British Geological Survey. https://www.bgs.ac.uk/geoindex/ Accessed 5 December 2014.

British Geological Survey. http://scans.bgs.ac.uk/sobi_scans/boreholes/339176/images/10640428.html. Accessed 27 January 2015.

Department for Communities & Local Government. National Planning Policy Framework (NPPF), March 2012.

Department for Communities & Local Government. National Planning Practice Guidance, April 2015

Department for Communities & Local Government. Sustainable drainage systems: Written statement - HCWS161. Issued 18 December 2014. http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/

EIA Briefing Pack (Project Ref: 28684/002). Peter Brett Associates LLP. Issued December 2014.

Environment Agency. http://maps.environment-agency.gov.uk/wiyby/queryController?topic=riverquality&x=448700.0&y=291900.0&ep=2ndtierquery&lang=_e&layerGroups=2&extraClause=STRETCH_CODE~%27028010072004%27&textonly=off&extraClause=YEAR~2009&latestValue=2009&latestField=YEAR. Accessed 27 January 2015.

GroundSure EnviroInsight. GroundSure EnviroInsight Report for 1 Lodge Cottages, Bittesby, Bittesby, Lutterworth, LE17 4JH. Reference no. GS-1673446. Report date: 22 Sep 2014.

Harborough District Council. Harborough District Core Strategy. Adopted 14 November 2011. http://www.harborough.gov.uk/download/downloads/id/17/core_strategy_-_adopted_versionpdf. Accessed 5 December 2014.

Harborough District Council. Harborough District Council Level 1 Strategic Flood Risk Assessment, April 2009

Leicestershire County Council. Leicestershire Preliminary Flood Risk Assessment (PFRA), June 2011

Leicestershire County Council. Leicestershire Local Flood Risk Management Strategy (LFRMS) – Draft for Consultation, October 2014

Mustow, S.E., Burgess, P.F. & Walker, N. (2005) Practical Methodology for Determining the Significance of Impacts on the Water Environment. Water and Environment Journal. 19 (2). P100-108.

8.11 Abbreviations

Term	Acronym
National Planning Policy Framework	NPPF
Environment Agency	EA
Lead Local Flood Authority	LLFA
Local Flood Risk Management Strategy	LFRMS
Preliminary Flood Risk Assessment	PFRA
Flood Risk Assessment	FRA
Sustainable Drainage Systems	SuDS
British Geological Survey	BGS
Grade Quality Assessment	GQA
Water Framework Directive	WFD

APPENDIX E.1

Site Plans

APPENDIX E.2

Environment Agency Correspondence

APPENDIX E.3

GroundSure EnviroInsight Report

APPENDIX E.4

Ground Investigation Report

APPENDIX E.5

Water Quality

CAPITA

Magna Park Extension: Hybrid Planning Application

Flood Risk Assessment

22 September 2015

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Quality Management

Job No	CS074680		
Project	Magna Park Extension: Hybrid Planning Application		
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Client	IDI Gazeley		
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-	15/9/15	First issue	PWE	NRB
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Contents

Appendices

1. Introduction

1.1 Appointment

1.1.1 Capita Property and Infrastructure Limited was appointed by IDI Gazeley (the Client) to undertake a Flood Risk Assessment for the site known as Magna Park Extension: hybrid Planning Application in Lutterworth, in the Harborough district of Leicestershire.

1.2 Site Description

1.2.1 The application site (the Site) comprises approximately 227 ha of land in two zones. Together, the two zones form the Site of the hybrid planning application to which this FRA refers. A red line boundary plan is provided in Appendix A.

1.2.2 Development Zone 1 is a c 220 ha triangular parcel of predominantly agricultural land to the north and north-west of Magna Park. It is the site of outline proposals for new distribution warehousing, a 'Logistics Academy' and its campus, small business space and a new estate office. Related access, sustainable drainage infrastructure, a country park and service facilities will also be formed.

1.2.3 Development Zone 2, situated approximately 1.0 km to the south east of Zone 1, is a 6.7 ha rectilinear parcel of agricultural land to the rear of the existing ASDA George headquarters building on the A4303. It is located near the junction with the A5 Watling Street trunk road, and close to the main access point to Magna Park. Development Zone 2 is the site of detailed proposals for a dedicated Magna Park railfreight shuttle terminal and HGV parking facility.

Development Zone 1

1.2.4 Development Zone 1 is linked to and extends the existing Magna Park Industrial Estate. Its boundaries are created by the A5 to the south and west, Mere Lane to the east and the ridgeline hedgerows following the parish boundary to the north. The nearest local settlement is Willey which is 0.85 km away, beyond the A5. To the north are the villages of Ullesthorpe and Claybrooke Parva which are located, at the closest point from the Site, 1.0 km and 1.3 km distant. Bitteswell is located 2.0 km to the east and the market town of Lutterworth is 2.2 km to the east.

1.2.5 Access to Development Zone 1 is currently provided by Mere Lane, which in turn connects to the A5 and the wider strategic highway network. Bittesby Farm, the Brick Barn (occupied by Holovis) and Bittesby House, all located within Development Zone 1, are connected to Mere Lane by two minor access roads.

1.2.6 Development Zone 1 comprises large open arable fields, smaller enclosed fields, some mature hedgerow boundaries and mixed native tree belts. The topography slopes away from the high ground of its boundaries towards the Upper Soar Valley that crosses the centre of the site. The vertical level difference changes by more than 20 m across the site from the highest ground along the eastern Mere Lane and the northern boundary at circa 125m AOD, to the lowest point of 103m AOD in the valley bottom. From this central valley, the ground rises gently again towards White House Farm at the site's north-western corner.

1.2.7 Two tributary streams meet the Upper Soar and run along small valleys to the east of the site. To the west, two small folds in the landscape also carry ditches towards the main valley bottom. Mere Lane Lagoon is situated at the north-eastern end of the site. This is an attenuation pond which stores surface water run-off draining from the existing Magna Park. The lagoon is fed by an inlet pipe which passes below Mere Lane, and it discharges into an open drainage ditch which in turn feeds into a small tributary valley of the River Soar to the northern and western flanks of the site. Further details of surface watercourses are provided in Section 2 below.

1.2.8 The water courses in Development Zone 1 are marked by hedgerows and riparian trees that form field boundaries. Wet woodland tree species and woodland blocks punctuate the valley bottoms whereas broadleaf spinneys and hedgerows mark the ridgelines.

1.2.9 Other landscape features include the wooded embankments of the dismantled Midland Counties railway that follows the Upper Soar valley at the centre of the site and the tree lined avenue of Bittesby House. Other built elements of the original Bittesby Estate include Lodge and Emmanuel cottages on the A5, both non- residential properties in the control of IDI Gazeley.

1.2.10 Public Rights of Way Bridleways and Public Footpaths cross the site connecting the village of Willey to Ullesthorpe and Claybrooke Parva and the Lutterworth Road. These rights of way intersect and connect with the permissible routes that currently allow a variety of walking and riding itineraries around the site.

1.2.11 Included within the application boundary are the Magna Park services farm and its associated amenity pond and reed beds and existing areas of grassland and plantation woodland.

1.2.12 Zone 1 of the Site also contains the Scheduled Monument of Bittesby Deserted Medieval Village (reference 1012563), which is likely to have been established in the late Saxon period. The Scheduled Monument is located at the centre of the site between the railway embankment and Upper Soar tributary. This open access land comprises visible earthworks maintained by sheep grazing. No development is proposed for the Scheduled Monument.

Development Zone 2

1.2.13 Development Zone 2 forms part of the developed southern edge of Magna Park. Immediately to the zone's north is a distribution building occupied by Pearson (Plot 7100) and the George House office building. Development Zone 2 is located approximately 1.6 km from Willey to the north-west; 1.6 km from Lutterworth to the east; and 2.5 km from Cotesbach to the south east. Access is via the southern arm of the roundabout on Coventry Road (the A4303), which to the north also provides the main point of vehicular access to Magna Park.

1.2.14 Development Zone 2 benefits from an extant planning permission for an HGV parking facility which was granted by HDC in November 2012 (reference 12/00851/FUL). IDI Gazeley is in the process of discharging the pre-commencement conditions relating to this scheme and intends to begin the development once the requisite approvals have been secured. The existing arrangements for both the main Magna Park access point and Development Zone 2 access will benefit from improvements and upgrading works associated with the proposed DHL Supply Chain project, currently subject of a planning application (15/00919/FUL) and the extant planning permission for the HGV parking facility.

1.2.15 The site consists of two fields, neither of which are currently in agricultural use. The topography slopes from the north to the south, with an overall fall of some 12 metres. Existing mature trees and hedgerows are located on the northern and southern edges of the zone and there is a hedgerow running through it from north to south. A brook runs adjacent to the southern boundary, with open farmland beyond to the south and east.

1.3 Proposed Development

1.3.1 The proposed development is understood to comprise the following:

Development Zone 1 (outline application)

- Distribution warehousing and ancillary office space (Use Classes B8 and B1a): up to 427,350 sq. m (including 100,844 sq. m for DHL Supply Chain that is also the subject of Application Reference 15/00919/FUL that was submitted in June 2015).
- National Centre for Logistics Qualifications (Use Class D1): up to 3,700 sq. m together with its campus estate office, with heritage exhibition centre and conference facility (Use Class D1): up to 300 sq. m.
- Holovis expansion building (Use Class B1a, B1b): up to 7,000 sq. m.
- Innovation Centre: up to 2,325 sq. m.
- Public park and meadowland: c 70 ha.
- Access corridor, structural landscaping, SUDs systems.
- Demolition of existing buildings on the site.

Development Zone 2 (detailed application)

- Railfreight shuttle terminal.
- HGV Parking (140 spaces).

- HGV Driver Training Centre.
- LPG or GNP Fuel Island and Vehicle washing facility.

1.3.2 Development Zone 2 already benefits from planning consent to provide an area for HGV and car parking.

1.3.3 IDI Gazeley will be seeking planning permission for each parcel and its parameters, the means of access and the details of the railfreight shuttle. The demolition of Bittesby House is required to facilitate the development of the distribution warehousing.

1.3.4 A Parameter Plan covering every part of the site is provided in Appendix B and an Illustrative Masterplan covering the outline application area is provided in Appendix C.

1.4 Report Objectives

1.4.1 The Flood Risk Assessment presented herein has been completed taking cognisance of the National Planning Policy Framework (NPPF) published in March 2012 by the Department for Communities and Local Government (DCLG) and other applicable technical guidance. Its objectives can be defined as:

- Review all sources of flooding which are likely to affect the development site, both now and in the future.
- Consider the merit and practicability of various Sustainable Drainage Systems (SuDS).
- Provide an assessment of whether the site development will increase flood risk elsewhere.
- Establish whether current measures (where they exist) to mitigate such risks are appropriate.

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2. Policy and Guidance

2.1 National Planning Policy Framework (March 2012)

2.1.1 In determining an approach for the assessment of flood risk for the development proposal there is a need to review the policy context. Government guidance requires that consideration be given to flood risk in the planning process. The National Planning Policy Framework (NPPF) was issued in March 2012 and outlines the national policy position on development and flood risk assessment.

2.1.2 The Framework states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, it can be permitted provided it is made safe without increasing flood risk elsewhere.

2.1.3 The essence of NPPF is that:

- Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards.
- Polices in development plans should outline the consideration, which will be given to flooding issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change.
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Opportunities offered by new developments should be used to reduce the causes and impacts of flooding;
- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains; and
- The concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the “Exception Test”.

2.2 Flood and Water Management Act 2010

2.2.1 Combined with the Flood Risk Regulations 2009 (‘the Regulations’), (which enact the EU Floods Directive in the England and Wales) the Flood and Water Management Act 2010 (‘the Act’) places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues.

2.2.2 The Act and the Regulations together raise the requirements and targets Local Authorities need to meet, including:

- Playing an active role leading Flood Risk Management;
- Development of Local Flood Risk Management Strategies (LFRMS);
- Implementing requirements of Flood and Water Management legislation;
- Development and implementation of drainage and flooding management strategies;
- Responsibility for first approval, then adopting, management and maintenance of Sustainable Drainage System (SuDS) where they service more than one property.

2.2.3 The Flood and Water Management Act also clarifies three key areas that influence development:

1. ***Sustainable Drainage Systems (SuDS)*** - the Act makes provision for a national standard to be prepared on SuDS, and developers will be required to obtain local authority approval for SuDS in accordance with the standards, likely with conditions. Supporting this, the Act requires local authorities to adopt and maintain SuDS, removing any ongoing responsibility for developers to maintain SuDS if they are designed and constructed robustly.
2. ***Flood risk management structures*** - the Act enables the EA and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent from the relevant authority.
3. ***Permitted flooding of third party land*** **-** The EA and local authorities have the power to carry out work which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people's enjoyment of the environment or of cultural heritage.

2.3 Planning Practice Guidance Flood Risk and Coastal Change, April 2015

2.3.1 The Planning Policy Guidance (PPG) for Flood Risk and Coastal Change sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

2.3.2 The National Planning Practice Guidance document provides guidance on how the local planning authorities should:

- Assess flood risk;
- Avoid flood risk; and

- Manage and Mitigate flood risk and coastal change.

2.3.3 There is also information on the requirements to consult the Environment Agency, on the role of lead local flood authorities and on flood risk in relation to minor developments.

2.3.4 The April 2015 update to the practice guidance provides additional guidance on SuDS, including:

- The importance of SuDS;
- When SuDS should be considered;
- The SuDS discharge hierarchy;
- Factors a local authority will address when considering SuDS as part of a planning application;
- When SuDS are inappropriate and relevant flood risk consultees;
- Applicability of Defra's Non-statutory Technical Standards for Sustainable Drainage Systems;
- Design and construction cost considerations;
- Operation and maintenance considerations; and
- Where to go for further SuDS advice.

2.3.5 As part of the April 2015 update, the practice guidance provides details on the parties responsible for assessing the suitability of SuDS practices. As per paragraph 084 from the practice guidance:

> *The decision on whether a sustainable drainage system would be inappropriate in relation to a particular development proposal is a matter of judgement for the local planning authority. In making this judgement the local planning authority will seek advice from the relevant flood risk management bodies, principally the lead local flood authority, including on what sort of sustainable drainage system they would consider to be reasonably practicable.*

2.4 Water Framework Directive, 2000

2.4.1 The aim of the Water Framework Directive (WFD) is to protect and improve all European Union water bodies. It ensures that all water bodies are assessed to determine the 'ecological status' and 'chemical status' of their water and where a 'good status' is not achieved, it seeks to ensure that measures are implemented to improve the water body.

2.5 Harborough District Core Strategy, Adopted 14 November 2011

2.5.1 The Core Strategy is a strategic document setting out the vision and spatial planning framework for the district. It contains core strategic policies that provide for the development needs of the district. The adoption of the Core Strategy replaced a large number of policies set out with the Harborough District Local Plan.

2.5.2 The Core Strategy includes Policy CS10 which includes the provisions reproduced below:

a) New development will be directed towards areas at the lowest risk of flooding within the District; with priority given to land within Flood Zone 1.

b) The use of Flood Zones 2 and 3a for recreation, amenity and environmental purposes will be supported where an effective means of flood risk management is evident, and considerable green space is provided.

c) Land within Flood Zone 3b will be safeguarded, to ensure that the functional floodplain is protected from development. The Council will also support proposals which reinstate the functional floodplain, where possible.

d) All new development will be expected to ensure that it does not increase the level of flooding experienced in other areas of the District.

e) Surface water run-off in all developments should be managed, to minimise the net increase in the amount of surface water discharged into the local public sewer system.

f) The following settlements are particularly sensitive to any net increase in surface water discharge into the local surface water sewer network:

- Market Harborough
- Lutterworth
- Great Glen
- Kibworth
- Scraptoft/Thurnby/Bushby.

g) The use of Sustainable Drainage Systems (SuDS) will be expected; and design and layout schemes which enhance natural forms of on site drainage will be encouraged.

h) The Environment Agency will be closely consulted in the management of flood risk at a local level. This will ensure that development is directed away from areas which are at risk of flooding from either fluvial overflow or surface water run-off. Local management of flood risk will also take into account any future updates relating to climate change modelling information.

2.5.3 It should be noted that given the release date of the Core Strategy, the document references the Environment Agency as the primary consultee in the management of flood risk. Changes to the planning regime following publication of the Core Strategy mean that the Lead Local Flood Authority is to be the consultee on the management of flood risk from flooding from local sources, namely Ordinary Watercourses, surface water and groundwater.

2.6 Harborough District Council Level 1 Strategic Flood Risk Assessment, April 2009

2.6.1 The Harborough District Council Level 1 Strategic Flood Risk Assessment (SFRA) was completed in April 2009. The objective of the Harborough SFRA is to provide an overview of all sources of flooding within the administrative area of the Harborough District Council (HDC) and to set out a number of approaches to avoid, reduce and manage this risk as part of a wider objective to ensure a sustainable environment.

2.6.2 Less than 10% of the administrative area of HDC falls within Flood Zone 3. A recommendation of the SFRA is that the outputs from the assessment be used as an evidence base from which to direct new development to areas of low flood risk (Flood Zone 1). Where development cannot be located in Flood Zone 1, HDC should use the flood maps to apply the Sequential Test to their remaining land use allocations.

2.7 River Trent Catchment Flood Management Plan, December 2010

2.7.1 The role of Catchment Flood Management Plans (CFMPs) is to establish flood risk management policies which will deliver sustainable flood risk management for the long term.

2.7.2 The proposed development is located in the Rural Leicestershire sub area in the River Trent CFMP. Overall current flood risk in this area is low with only 30 properties at risk during a 1% annual exceedance probability flood event. It is anticipated that there will be no significant increase in the future.

2.7.3 This area falls under Policy Option 6 – areas of low to moderate flood risk where action will be taken with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits. The long term vision for this sub area is to set a framework to deliver a sustainable approach to flood risk management that considers the natural function of the river and reduces long term dependence on raised flood defences. This includes identifying opportunities to better utilise areas of natural floodplain to store floodwaters and to attenuate rainwater that will reduce flood risk within this sub area and downstream.

2.8 Leicestershire Preliminary Flood Risk Assessment (PFRA), June 2011

2.8.1 The PFRA provides a high level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding. The scope of the PFRA is to consider flooding from surface runoff, groundwater and ordinary watercourses and any interaction these have with main rivers and the sea.

2.8.2 A review of historical flooding records across the county council did not find any records of surface water flooding, ordinary watercourse flooding, groundwater flooding or sewer flooding at or near the proposed development site.

2.9 Leicestershire Local Flood Risk Management Strategy (LFRMS) - Draft for Consultation, October 2014

2.9.1 The Leicestershire Local Flood Risk Management Strategy is being developed to understand and manage flood risk within the county. The strategy provides a framework that will enable the Lead Local Flood Authority (Leicestershire County Council) to lead and co-ordinate flood risk management across Leicestershire. The strategy acts as the focal point for integrating all flood risk management functions in the county in alignment with the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy.

2.9.2 Reference to Leicestershire county council website (http://www.leicestershire.gov.uk/index/environment/energy_and_climate_change/flood_management/floodstrategy.htm) accessed 14th September 2015 indicates that public consultation on the draft flood risk management strategy has now closed. The council is in the process of reviewing the comments received alongside the strategy with a view to publishing later this year.

3. Geology and Hydrogeology

3.1 Mapped Geology

3.1.1 The application site is mapped to be underlain by superficial glacial diamicton deposits of the Oadby Member, part of the Pleistocene Wolston Formation. This lithology is typically described as grey, weathering brown clay characterised by Cretaceous and Jurassic rock fragments (chalk and flint), subordinate lenses of sand and gravel, clay and silt.

3.1.2 A small area in the south-west of the site is mapped to be underlain by Dunsmore Sand and Gravel deposits. This lithology is typically described as red, brown and yellow flinty gravel with lenses of coarse sand. The Bosworth Clay Member, Wolston Sand and Gravel, and Alluvium are also indicated to be present, broadly corresponding with the alignment of mapped watercourses.

3.1.3 The underlying bedrock is mapped to comprise either the Blue Lias Formation (thinly interbedded limestone and calcareous mudstone or siltstone); the Penarth Group (grey / black mudstones with limestones and sandstones); or Mercia Mudstone (red mudstones and subordinate siltstones).

3.2 Encountered Geology

3.2.1 Two phases of ground investigation have been undertaken by Capita to assess soil conditions below the application site. The first of these was undertaken in February 2015 comprising seventeen mechanically-excavated trial pits (TP01 to TP17), and was confined to the area of proposed Unit G. A second phase of investigation was carried out in August 2015 comprising nineteen additional trial pits (TP101 to TP119) positioned across the wider outline application site.

3.2.2 A factual report of the investigation, including logs and a trial pits location plan, is provided in Appendix D.

3.2.3 The site was found to be underlain by a 0.25 m to 0.40 m thick layer of topsoil (average 0.30 m) consisting of soft brown silt/clay with some sand and rounded flint/chert gravel. This was underlain by firm orange and yellowish brown gravelly clay, corresponding with the mapped Oadby Member glacial diamicton. The gravel fraction variously comprised poorly sorted limestone, red/yellow sandstone, chert, and chalk. Bands and lenses of gravelly sand and sandy gravel up to 0.50 m thick were locally present within the top 2.0 m with occasional cobbles and boulder clasts. Below 1.50 m to 2.0 m the Oadby Member was found to grade to stiff grey clay, again with poorly sorted entrained clasts of limestone, sandstone and chert throughout.

3.2.4 To the south west of the site below the topsoil, the Dunsmore Sand and Gravel formation was observed in TP111, TP113, TP114 and TP104. This comprised orange-brown and yellow, matrix-supported, clay rich, poorly sorted flinty gravel with lenses of coarse sand.

3.3 Hydrogeology

3.3.1 The Oadby Member is classified by the Environment Agency as a Secondary Undifferentiated aquifer. The Dunsmore Sand and Gravel, Wolston Sand and Gravel and Alluvium together form a Secondary 'A' aquifer.

3.3.2 The underlying bedrock layers are described as follows;

- Secondary (A) Aquifer (permeable layers) – Blue Lias Formation
- Secondary (B) Aquifer (lower permeability layers) – Mercia Mudstone Groups
- Secondary Aquifer (Undifferentiated layers) – Penarth Group

3.3.3 The site is not situated within a groundwater source protection zone.

3.3.4 Groundwater was observed during the first phase of ground investigation as slow seepages in most of the trial pits, at depths of between about 1.00 and 2.50 mbgl. These mostly corresponded with isolated bands of granular (sand and gravel) soil. During the second phase of investigation groundwater was encountered as a slow seepage in trial pit TP113 only (at 2.75m bgl)

3.3.5 The Environment Agency has indicated that two springs may be located within the boundary of the proposed development, however site inspections undertaken by Capita could not verify their existence. If present, the springs are assumed to feed into nearby surface watercourses as illustrated on appended Capita drawing 016 and discussed in Sections 4 and 5 of this report.

4. Site Hydrology

4.1 Introduction

4.1.1 This section identifies the features and attributes of the water environment within the influence of the proposed development.

4.1.2 As discussed in Chapter 1, the development comprises approximately 227 ha of land in two zones. Zone 1 is a c 220 ha triangular parcel of predominantly agricultural land to the north and north-west of the existing Magna Park estate. Zone 2, situated approximately 1.0 km to the south east of Zone 1, is a 6.7 ha rectilinear parcel of agricultural land to the rear of the George headquarters building on the A4303, near the junction with the A5 Watling Street trunk road, and close to the main access point to Magna Park.

4.2 Catchments

4.2.1 The overall catchment of the River Soar covers an area of approximately 1,380km2, covering much of the county of Leicestershire, together with small areas of south Nottinghamshire and north east Warwickshire. The River Soar is a significant tributary of the River Trent. From its source, south east of Hinckley near Grid Reference SP 41908 90924, the Soar follows a northerly course towards its confluence with the River Trent near Ratcliffe on Soar, south west of Nottingham at Grid Reference SK 49365 30901.

4.2.2 The surface watercourses that convey water flows from the proposed Zone 1 development discharge into the River Soar approximately 5.3km north of the site at Grid Reference SP 48519 91688.

4.2.3 There is also a surface watercourse located along the southern border of Zone 2 that discharges into the River Swift south east of the site at Grid Reference SP 52657 82618.

4.3 Site Topography

4.3.1 A topographic survey was carried out by Greenhatch Group in October 2014 (see Appendix E).

4.3.2 In general the topography of the land in the Zone 1 development area is such that water drains to the watercourses and ditches running through the site. The majority of the site eventually slopes towards a watercourse which runs through the middle of the site from south to north eventually joining the River Soar (see further description below).

4.3.3 Ground levels in development Zone 1 vary between high points of 119 – 123 mAOD in the south eastern extremities down to levels ranging from approximately 105 to 109 mAOD in lower lying areas through the central area.

4.3.4 In Zone 2, ground levels slope from north-west to south-east, from an approximate high of 130 mAOD in the north-western corner to 120 mAOD in the south eastern corner.

4.4 Surface Watercourses

4.4.1 As previously noted, a number of small unnamed watercourses, tributaries of the River Soar, are located within the boundary of the proposed Zone 1 development. Consultation with the Environment Agency in December 2014 has confirmed that all of these are Ordinary Watercourses.

4.4.2 The majority are classed as tertiary rivers which feed a larger river (classed as a secondary river). Some sections are indicated on Ordnance Survey mapping to be culverted, however site walkover inspections indicate could not confirm this to be the case.

4.4.3 Details of the watercourses present at the Zone 1 development area are detailed on Appended Capita drawing 016 in Appendix E and are summarised below:

Watercourse 1

4.4.4 Watercourse 1 comprises a stream whose source is within agricultural fields to the west of the A5. It drains approximately from north-west to south-east towards the A5 (Watling Street) to a point approximately 200m north of the junction of Main Street (village of Willey). A series of sluice gates and ponds exist along the stream, which are anticipated to provide on-line attenuation. The stream then passes under the A5 via a 1050mm & 900mm diameter culvert where it enters the proposed development site, reverting back to an open channel for approximately 300m draining from south-west to north-east to a headwall.

4.4.5 At the headwall the stream reverts to a 1500mm diameter culvert approximately 55m long (which passes under the disused railway line embankment from west to east) flowing in an approximate west to east direction. From this location the watercourse reverts back to a short length of open channel (approximately 25m) before reverting back to a second 1500mm diameter culvert approximately 10m long flowing to the north east, before again reverting back to an open channel.

4.4.6 The stream extends a further 600m, roughly south to north, to a headwall where it again passes under the disused railway embankment. It passes under the embankment for a distance of approximately 90m. There is a further open section before it passes under a concrete and steel bridge section of a road/track at the northern boundary of the proposed development site, from where it continues towards the north via a series of meandering sections.

Watercourse 2

4.4.7 Watercourse 2 has its source within the existing Magna Park foul sewage treatment works lagoon south of Mere Lane. It is culverted under Mere Lane and flows from south to north for approximately 480m before its confluence with Watercourse 3 at a location north west of proposed Unit G of the Zone 1 development.

Watercourse 3

4.4.8 Watercourse 3 has its source within agricultural land to the north of the Unit G. It drains from north-east to south-west just beyond the north-western boundary of Unit G, where it joins Watercourse 2. The combined flow of Watercourse 2 and 3 is then directed north-west where it joins Watercourse 1 at a point directly north of Units E1/E2. Within the Unit G site, Watercourse 3 is culverted in three locations as detailed on Capita drawing 003 (Appendix E).

4.5 Existing Ditches

4.5.1 Three surface water ditches are also present at the Zone 1 development site, two of which (referenced A and B) receive run-off from the A5 highway, while the third (Ditch C) receives run-off from Mere Lane. Further details are set out below and are provided on Capita drawing 16.

Ditch A

4.5.2 Ditch A extends west to east in the site's northern sector, taking surface run-off from the A5 eastwards towards an existing gravel track. At the track it appears to peter out and form a localised wetland area. Visual observations by Capita suggest negligible flow within this ditch in August/September 2015.

4.5.3 It is acknowledged that OS mapping suggests this ditch may be culverted under the track and feed in to Watercourse 1, although site inspections were not able to verify this.

Ditch B

4.5.4 Ditch B also extends west to east taking run-off from the A5, approximately 400 m south of but very roughly parallel with Ditch A. Like Ditch A, Ditch B also appears to terminate at the existing track to form a wetland area, but may possibly be culverted under the track.

Ditch C

4.5.5 Ditch C extends north from Mere Lane, approximately 200 m north-east of its junction with the A5. It passes through the existing arable fields in the area of what is proposed to become Units H1 and H2. It is 'fed' by surface water run-off from the Mere Lane highway, and has been observed by Capita (during site inspections undertaken over the period May to September 2015) to contain very small quantities of water with no measurable flow.

4.6 Surface Water Bodies

4.6.1 A pond is located to the north of the Emmanuel cottages, centred at Grid Reference SP 50090 85162. This pond is located at a localised topographic high, with a surveyed water level (October 2014) of 123.47 m AOD.

4.6.2 Another pond is located to the south of Bittesby House, centred at Grid Reference SP 50268 85292. This pond is located within a topographic low (approximately 116.6mAOD) and has been observed to contain only small depths of water.

4.6.3 It is possible that one or both of these ponds are fed by groundwater springs, which OS mapping indicates may be present in the locale.

4.6.4 Mere Lane Lagoon is centred on Grid Reference SP 51018 85895 near the site's north-eastern boundary. This is an artificial water body that attenuates surface water run-off draining from the Magna Park estate and feeds a tertiary watercourse in the eastern portion of the site.

4.7 Surface Water Quality

4.7.1 Magna Park Management Company currently monitors surface water quality of the effluent discharging from the extant foul water treatment works east of Mere Lane. A copy of the latest monitoring data (dated August 2015) is enclosed in Appendix F.

5. Flood Probability and Hazard

5.1 EA Flood Zone Classification

5.1.1 Fluvial flooding occurs when the amount of water exceeds the flow capacity of the channel. Most rivers have a natural floodplain into which the water spills in times of flood.

5.1.2 A review of Environment Agency Flood Zone Maps shows that the majority of the area within the application site boundary falls within Flood Zone 1, which is described within NPPF Table 1 as having a "Low Probability" of flooding. Flood Zone 1 is defined as "land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)".

5.1.3 A small portion of the development Zone 1 area, along the alignment of Watercourse 1 (as referenced on Capita drawing 016), is mapped to fall within Flood Zone 3, which the NPPF describes as having a "High Probability" of flooding. Flood Zone 3 is defined as "land assessed as having a chance of flooding of greater than 1 in 30 (3.3%)." The extent of land mapped to fall within Flood Zone 3 is shown on the flood risk map in Appendix G.

5.1.4 A detailed evaluation of the Watercourse 1 catchment west of the A5 (i.e. immediately upstream of the Flood Zone 3 area within the development site) is detailed in the Surface Water Drainage Strategy in Appendix E. This evaluation indicates that the majority of the watercourses within the proposed development area do provide sufficient capacity for the estimated Greenfield flows when the inlet restriction adjacent to the A5 (described in report section 4.4 above) is taken into account. Based on this, the Environment Agency flood map appears to significantly over-estimate the true extent of any fluvial flooding which could occur in this location.

5.2 Flood Zone Compatibility

5.2.1 The Zone 1 development area includes a number of land parcels with varying levels of flood risk vulnerability. Details regarding the flood risk vulnerability classification of these development parcels is summarised in Table 2 overleaf.

5.2.2 The compatibility for development for each type of flood risk vulnerability classification is provided in Table 1 below:

Table 1: Suitability of development based on flood risk vulnerability

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**	**Water Compatible**
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required †	×	Exception Test Required	✓	✓
Zone 3b	Exception Test	×	×	×	✓

	Required				

✓- Development is appropriate. ✗ - Development should not be permitted

†*: In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.*

Table 2: Proposed uses and associated flood risk vulnerability classification

Development Parcel [#]	**Proposed Use** [##]	**Flood Risk Vulnerability Classification** [###]
A1	Structural landscape corridors and open space	Water-Compatible Development
A2	Structural landscape corridors and open space	Water-Compatible Development
A3	Structural landscape corridors and open space	Water-Compatible Development
B	Principal access corridor	Essential Infrastructure
C - The Park	Repositioned public routes / bridleway, watercourses, wetlands, strategic attenuation basins. Medieval Village of Bittesby (unchanged)	Water-Compatible Development
D - The Meadowland	Existing permissive public bridleway	Water-Compatible Development
E - The 'Heart' Development Zone	D1 Academy + Estate Office	More Vulnerable
F - Small business innovation space	B1 (a) & (b)	Less Vulnerable
G	B8 Storage & Distribution	Less Vulnerable
H	B8 Storage & Distribution	Less Vulnerable
I	B8 Storage & Distribution	Less Vulnerable
J	B8 Storage & Distribution	Less Vulnerable
K	B8 Storage & Distribution	Less Vulnerable
L	B8 Storage & Distribution	Less Vulnerable
M2	Services Farm	Less Vulnerable
M3	Services Farm	Less Vulnerable

[#] Adapted from Parameter Plan (Drawing No. 3657-34-06)

[##] Adapted from Parameter Plan (Drawing No. 3657-34-06)

[###] From Table 2: Flood Risk Vulnerability Classification of Planning Practice Guidance to the National Planning Policy Framework.

5.2.3 The vast majority of the development parcels are compatible for development in accordance with Table 2: Flood Risk Vulnerability Classification and Table 3: Flood Risk Vulnerability and Flood Zone Compatibility in the Planning Practice Guidance for Flood Risk and Coastal Change.

5.2.4 Parcel B – the Principal Access Corridor for development Zone 1 – is classified as Essential Infrastructure. The Parameter Plan (Appendix B) indicates that this corridor requires construction of a road crossing over Watercourse 1 (either via a bridge or by converting the watercourse) and thus passes through the mapped Flood Zone 3 extent. Given the vulnerability classification of development within Parcel B, and notwithstanding the potentially 'exaggerated' extent of the Flood Zone 3 area, this part of the development will need to be designed and constructed to remain operational and safe in times of flood.

5.2.5 The remaining areas classified as Flood Zone 3 lie within Parcel C – The Park. This land is classified as Water-Compatible Development in Table 8.4.3, and is compatible for development.

5.2.6 As the site is not tidally influenced the risk from tidal flooding is negligible.

5.3 Flood Risk from Land, Surface Water and Sewers

5.3.1 Flooding from land occurs when intense, often short duration rainfall is unable to soak into the ground or enter drainage systems. The amount of runoff is a function of geology, topography, climate, rainfall, soil saturation, soil type and vegetation. Flooding from sewers can happen when rainfall exceeds the capacity of formal drainage networks or when there is an infrastructure failure. The impact is usually confined to relatively small localised areas however when it is associated with a blockage or failure of the sewer network, flooding can be rapid and unpredictable.

5.3.2 The Harborough District Council SFRA Level 1 states that the majority of sewers built in the last 30 years are built to the guidelines within "Sewers for Adoption" (WRC, 2006). These sewers have a design standard to contain up to and including the 1 in 30 year rainfall event. Therefore these systems may surcharge during rainstorm events with a return period greater than 1 in 30 years (e.g. 100 years).

5.3.3 There are reports of localised flooding following heavy rainfall in the HDC SFRA where the main factor is believed to be insufficient capacity of the drainage system, however no records are located at the development site.

5.3.4 Notwithstanding that there are no formal historical records of flooding from land at the site, the surface water drainage strategy for the proposed development will be designed to ensure rainfall run-off is adequately managed.

5.4 Flood Risk from Artificial Sources

5.4.1 Artificial sources of flooding include reservoirs, canals, lakes and mining abstraction. A review of the Environment Agency Reservoir Maps indicates that the site is not within an area at risk from reservoir flooding.

5.5 Groundwater Flood Risk

5.5.1 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall.

5.5.2 The Harborough District Council SFRA Level 1 cites the DEFRA Strategy for Flood and Coastal Erosion Risk Management study (2004), which did not find any recorded instances of groundwater flooding within the development site. The SFRA recommended that the risk of groundwater flooding should be considered as part of site specific FRA.

5.5.3 The Local Flood Risk Management Strategy concluded that the majority of Leicestershire is sited on geology that is at low risk of flooding. This is supported by the bedrock geology identified in Leicestershire generally considered to have an aquifer classification of non-productive or Secondary B.

5.5.4 It is recognised that springs are mapped to be present at the site, although field inspections have been unable to verify this. In the event that springs are confirmed, new drainage infrastructure is to be installed to direct the groundwater flow into the new surface water drainage system. Details are provided on Capita drawing 015 in Appendix E.

5.6 Climate Change

5.6.1 Projections of the likely impact of climate change indicate that more frequent short-duration, high intensity rainfall events can be expected in the UK, as well as more frequent prolonged periods of rainfall. The surface water drainage strategy for the proposed development, presented in Chapter 5, takes cognisance of this anticipated change.

6. Drainage Strategy and SuDS

6.1 Introduction

6.1.1 Due to impermeable ground cover, a greater volume of runoff may be generated by a developed site compared to its undeveloped condition, regardless of the magnitude of any given storm event. This can lead to an increase in downstream flood risk so the Environment Agency generally requires runoff from new developments to be restricted as far as possible. Based on the proposed development layout and site constraints, the appropriateness of several Sustainable Drainage Systems (SuDS) has been assessed.

6.2 Basins and Ponds

6.2.1 Construction of retention basins and/or ponds is feasible at the site given the prevailing geological conditions and proposed development type. Consequently the surface water drainage strategies for development Zones 1 and 2 have been designed to include such features, which are of considerable SuDS benefit.

6.3 Infiltration devices

6.3.1 As discussed in Chapter 3, the site is predominantly underlain by at least 3m of firm orange and yellow-brown gravelly clay, corresponding with the Oadby Member. It is a low permeability geological unit with a negligible infiltration coefficient, into which it would not be feasible to install soakaways.

6.4 Green Roofs

6.4.1 The site is proposed to be developed for new steel-framed industrial / commercial units. By their nature such buildings span wide areas and are of lightweight and economic construction. The adoption of green roofs would require significant and costly modifications to the structural design including significantly upgraded foundations and more extensive use of structural steelwork. It has consequently been determined that such an option is not compatible within the proposed development.

6.5 Permeable Paving

6.5.1 The use of permeable paving to provide water quality and pollution prevention benefits is considered feasible in areas of new car parking. Consequently and where appropriate, a degree of such paving and has been incorporated into the proposed drainage strategies.

6.6 Tanked Systems

6.6.1 Underground storage to receive surface run-off would be a suitable and beneficial SuDS option for the proposed development and would be compatible and appropriate within the scheme layout. Attenuation through below ground storage to restrict run-off to a suitable ‘greenfield’ rate could be achieved through oversized pipework and/or underground tanks.

6.7 Rainwater Harvesting

6.7.1 The use of suitably sized rainwater harvesting tanks to provide reclaimed water to the toilets in the new development to reduce both site run-off and potable water demand is recommended.

6.8 Surface Water Drainage Strategy

6.8.1 Full details of the proposed drainage strategy for the Zone 1 development, including drawings illustrating the outline arrangements, are provided in Appendix E.

6.8.2 On the basis of the various options detailed above, SuDS measures comprising attenuation swales / storage ponds, and permeable paving in areas of new car parking, are proposed. All surface water discharge rates and storage systems are based on an allowable Greenfield (Qbar) discharge rate of 4.4 l/sec/ha for all rainfall events up to and including the 1:100 year plus 20% for climate change event.

6.8.3 Critical design storms up to and including the 1 in 100 year return period plus 20% are designed to be contained within the site, within the drainage network, attenuation pipes and attenuation ponds, in accordance with Environment Agency and NPPF requirements.

6.8.4 The proposed drainage design incorporates diversions of Ditches A, B and C (which at present only receive run-off from the existing highways and limited overland flow from within the site) but no changes are proposed to the routes of Watercourses 1, 2 and 3. Highway access will be necessary via culvert or bridge structures at Watercourses 1 and 2, subject to agreement with the EA, and strategically formed outfall headwalls structures will be constructed into these watercourses.

6.8.5 Details of proposed drainage arrangements for the Zone 2 development area are provided in the separate FRA drafted for that part of the application site in 2012, a copy of which is provided in Appendix H. It should be noted that although some details of the Zone 2 development have changed since the strategy was produced, there is no change to the proposed total impermeable area. Consequently there is no change in flood risk and the overall drainage strategy (notwithstanding minor refinement) is also unchanged.

6.9 Heritage

6.9.1 As noted in paragraph 1.2.12, the Medieval Village of Bittesby - a Scheduled Monument - is located within the overall boundaries of the proposed development. The village is adjacent to Watercourse 1 within Parcel C, land set aside as park / open space (see architect's Parameter Plan in Appendix B)

6.9.2 Claybrooke Mill, a Grade 1 listed building, is located approximately 2.5 km north-west of the Proposed Development at Frolesworth Lane, Claybrooke Magna LE17 5DB (Grid Reference SP 49909 89120). The Mill is adjacent to the River Soar, which receives flows from the Ordinary Watercourses from the Proposed Development.

6.9.3 The proposed Zone 1 development will discharge surface water into watercourses both upstream and downstream of the Bittesby and upstream of the Claybrooke Mill. However given that run-off rates are to be attenuated to Greenfield rates through the use of above and below-ground storage systems there will be no change to the overland flow rates reaching these heritage features. In particular, there will be no change to the flow in the River Soar at Claybrook Mill, as all of the present day catchment draining into this watercourse will continue to be directed into it, at Greenfield rates via Watercourse 1, post development.

6.10 Foul Water Drainage Strategy

6.10.1 The foul water drainage from proposed Units G, H and I at development Zone 1 will be designed to connect into the existing Magna Park sewage works east of Mere Lane, which will be extended and upgraded to accommodate the proposed increase in flows.

6.10.2 A new sewage treatment plant and tertiary treatment wetland area will be provided in the north-west area for the remainder of the development.

6.10.3 Further details are provided in Appendix E.

6.10.4 For development Zone 2, foul water is proposed to comprise a gravity system discharging into on site pumping stations which will then pump the effluent to a manhole located in Hunter Boulevard, north of the existing Asda George building. The effluent will then flow by gravity and discharge into the existing Magna Park sewage works. An emergency storage tank with capacity to store 24 hours of foul waste is to be incorporated, to be utilised in the event of pump failure. Further details are provided in Appendix H.

7. Summary and Conclusions

7.1 Capita Property and Infrastructure Limited was appointed by IDI Gazeley (the Client) to undertake a Flood Risk Assessment for the proposed Magna Park Extension: Hybrid Planning Application development in Lutterworth.

7.2 The application site comprises approximately 227 ha of land in two zones. Development Zone 1 is a c 220 ha triangular parcel of predominantly agricultural land to the north and north-west of Magna Park. It is the site of outline proposals for new distribution warehousing, a 'Logistics Academy' and its campus, small business space and a new estate office. Related access, sustainable drainage infrastructure, a country park and service facilities will also be formed. Development Zone 2, situated approximately 1.0 km to the south east of Zone 1, is a 6.7 ha rectilinear parcel of agricultural land to the rear of the existing Asda George building on the A4303. Development Zone 2 is the site of detailed proposals for a dedicated Magna Park railfreight shuttle terminal and HGV parking facility.

7.3 The majority of the application site is located in Flood Zone 1 and is at low probability of flooding from fluvial or tidal sources. A small portion of the site, following the alignment of Watercourse 1 (as referenced on Capita drawing 16), is mapped by the Environment Agency to fall within Flood Zone 3, which the NPPF describes as having a "High Probability" of flooding. However it is concluded that Environment Agency mapping significantly over-estimates the true extent of any fluvial flooding which could occur in this location, due to a restriction on the upstream inlet from the catchment to the west.

7.4 Furthermore, the only built element of the proposed development to pass through the mapped Flood Zone 3 area is an access corridor to the north-west of proposed Units E1/E2. The design of the corridor in this location (expected to comprise either a bridge or a new culvert) will be subject to agreement with the EA and LLFA.

7.5 Flood risk, both on and off-site, from site-generated runoff has been addressed via surface water drainage strategies. The strategy for the Zone 1 development is proposed to comprise attenuated above ground storage utilising new swales / storage ponds and below ground storage devices. Off site discharge will be restricted to a Greenfield rate of 4.4l/s/ha and be directed into existing surface water courses. Following the development there is expected to be no change to the amount of run-off entering these water courses compared with the present day pre-development condition, and as such there is not expected to be any material change to the local and surrounding hydrological environment.

7.6 For the Zone 2 development the drainage strategy incorporates permeable paving, filter drains and detention basins, with off-site discharge directed into the existing stream network and restricted to a Greenfield run off rate.

7.7 This FRA has been produced to demonstrate that appropriate attenuation measures and SuDS techniques can be incorporated into the proposed Magna Park Expansion. The surface water strategies have been designed to accommodate the critical 1 in 100 year +20% climate change storm event whilst preventing off-site flooding. The site is therefore considered to be at low risk from flooding and is not considered to increase flood risk to others.

Appendix A – Red Line Boundary Plan

ZONE 1

ZONE 2

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.

Subject to statutory approvals and survey.

AREAS
Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.

N

PLANNING RED LINE	
ZONE 1	232.10 Ha / 573.53 acres
ZONE 2	6.74 Ha / 16.64 acres
TOTAL	**238.84 Ha / 590.17 acres**

revisions			
04	Red line revised. Area updated accordingly.	19.08.15	mb
03	Red line revised. Area updated accordingly.	28.07.15	mb
02	Drawing amended to Red Line Drawing.	08.07.15	mb
01	Road network amended according to URS Infrastructure changes, Unit A, C & D repositioned.	15.08.14	RS

PROPOSAL

chetwoods®
architects
32 Frederick street, Birmingham B1 3HH
T: +44 (0) 121 234 7500 F: +44 (0) 121 234 7501

Project Job Number 3657

MAGNA PARK EXTENSION:
HYBRID PLANNING APPLICATION

IDI Gazeley
Brookfield Logistics Properties

Drawing Title Drawing Size A1

RED LINE BOUNDARY PLAN

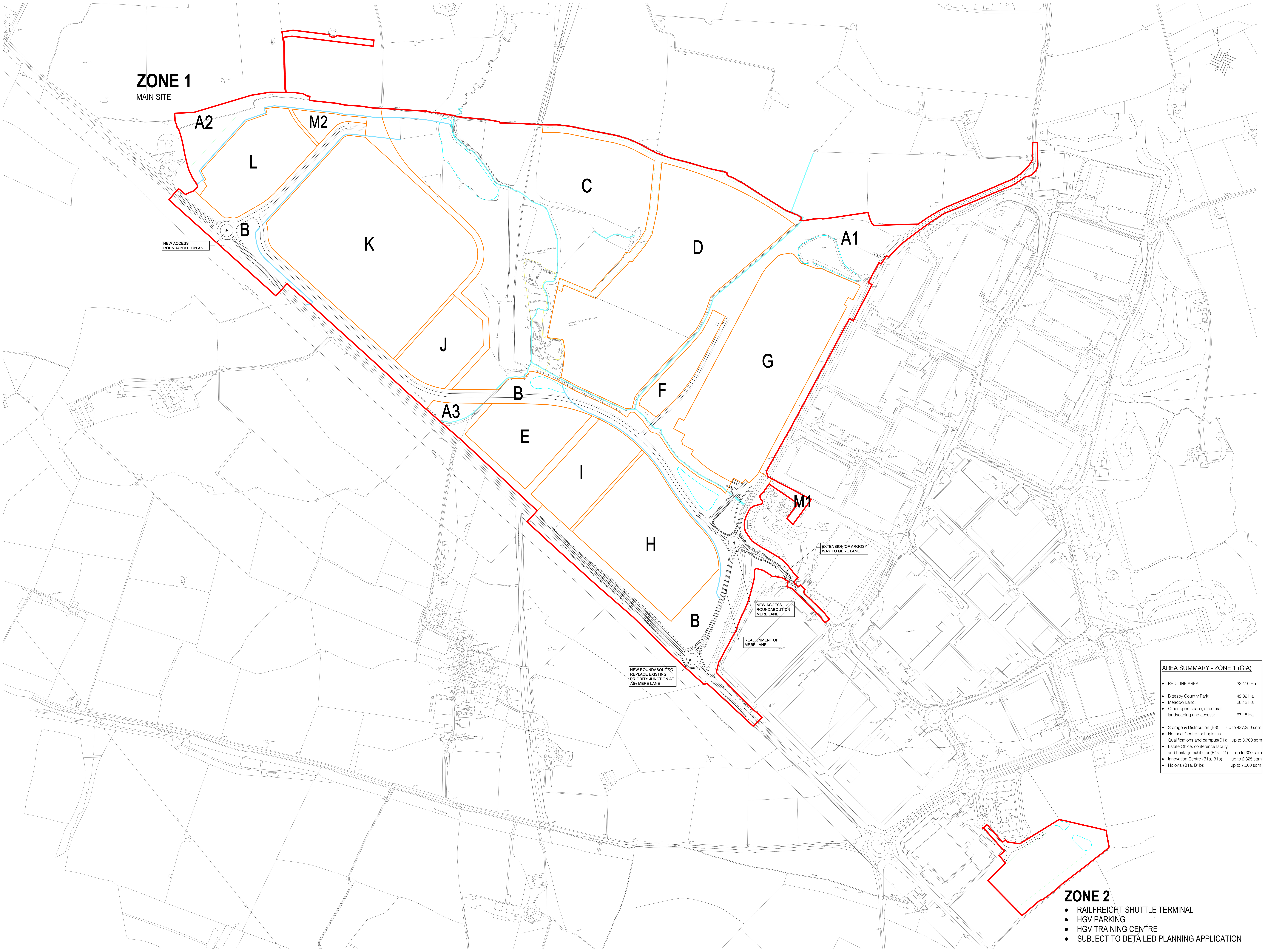
Drawn MB	Date 08.07.15	Scale A1@1:5000	Cadfile 3657-30
Reviewed by KL	Drawing No. 3657-30		Rev. 04

Appendix B – Parameter Plan

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.

Subject to statutory approvals and survey.

AREAS
Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.



Legend:

- Planning Boundary
- Parcel Boundary
- Redirected Watercourse
- Existing Watercourse
- Water attenuation Zones / Wetlands

ZONE 1: B8, B1, D1 AND PUBLIC OPEN SPACE (OUTLINE)

- Structural Landscape - Parcels A1, A2, A3
- Principal Access Corridor - Parcel B
- Bittesby Country Park - Parcel C
- Bittesby Deserted Medieval Village Schedule Monument
- The Meadow Land - Parcel D
- Magna Park Hub - Parcel E
- Small Business - Parcel F
- B8 Storage & Distribution and ancillary office (B1) - Parcels G, H, I, J, K, L
- Reed beds & Bio-discs - Parcels M1 & M2
- Trees to be retained

ZONE 2 - RAILFREIGHT SHUTTLE TERMINAL, HGV PARKING AND HGV TRAINING CENTRE (DETAILED)

- Railfreight Shuttle Terminal

PARAMETER SCHEDULE - ZONE 1

PARCELS A1, A2, A3 - STRUCTURAL LANDSCAPE
- Parcel Area: up to 32.51 Ha
- to include: footpaths, bridleways, cyclepaths, service routes, verges, swales/ watercourses/ ponds and supporting landscape
- landscape corridor widths: 10m min between Parcel L&M2 and from 20m to >25m elsewhere

PARCEL B - PRINCIPAL ACCESS CORRIDOR
- Parcel Area: up to 34.67 Ha
- to include: main road, footpaths, bridleways, service routes, verges, swales/ watercourses/ ponds and supporting landscape

PARCEL C - BITTESBY COUNTRY PARK
- Parcel Area: up to 42.32 Ha
- to include: public footpaths/bridleway (with some sections repostitioned), watercourses, wetlands, strategic attenuation basins and Medieval Village of Bittesby

PARCEL D - THE MEADOW LAND
- Parcel Area: up to 28.12 Ha
- to include: existing permissive and a public bridleway

PARCEL E - MAGNA PARK HUB
- Parcel Area: up to 6.58 Ha
- Proposed Use: D1 National Centre for Logistics Qualifications + B1(a) & D1 Estate Office + B1 (a) & (b) Innovation Centre
- Maximum floor area - National Centre for Logistics Qualifications (D1): up to 3,700 sqm (GIA)
- Maximum floor area - Innovation Centre (B1a, B1b): up to 2,325 sqm (GIA)
- Maximum floor area - Estate office (B1a, D1): up to 300 sqm (GIA)
- Max unit height: up to 125.00m AOD
- Unit FFL: up to 110.5m(NW) and up to 113.00m (NE)

PARCEL F - SMALL BUSINESS
- Parcel Area: up to 2.68 Ha
- Use: B1 (a) & (b) - Holovis
- Maximum floor area: up to 7,000 sqm (GIA)
- Max unit height: up to 122.5m AOD
- Unit FFL: up to 111.5m

PARCEL G
- Parcel Area: up to 21.86 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 101,000sqm (GIA)
- Max unit height: up to 142.6m AOD
- Unit FFL: up to 119.6m

NB. Yards to be positioned on NW & SE elevations only. Carparking only to SW elevation, offices to face Principal Access Corridor

PARCEL H
- Parcel Area: up to 13.85 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 69,850 sqm (GIA)
- Max unit height: up to 139.00m AOD
- Unit FFL: up to 120.5m

NB. Yards to be positioned on NW & SE elevations only. Carparking only to NE elevation, offices to face Principal Access Corridor

NB. Where parcels subdivided into plots, min. 10m landscape zone will be introduced between plots.

PARCEL I
- Parcel Area: up tp 6.03 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 30,500sqm (GIA)
- Max unit height: up to 135.50m AOD
- Unit FFL: up to 119.00m

NB. Yards to be positioned on SE elevation only. Carparking only to NE elevation, offices to face Principal Access Corridor

NB. Where parcels subdivided into plots, min. 10m landscape zone will be introduced between plots.

PARCEL J
- Parcel Area: up to 5.19 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 28,000sqm (GIA)
- Max unit height: up to 130.70m AOD
- Unit FFL: up to 114.20m

NB. Yards to be positioned on NW elevation only. Carparking only to SW & SE elevations, offices only to SW elevation / western end of the unit.

NB. Where parcels subdivided into plots, min. 10m landscape zone will be introduced between plots.

PARCEL K
- Parcel Area: up to 28.57 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 163,000 sqm (GIA)
- Max unit height: up to 132.70m AOD
- Unit FFL: up to 114.20m

NB. Yards to be positioned on NW & SE elevation. Hgv circulation only to NE elevation. Carparking only to SW elevation, offices to face Principal Access Corridor

NB. Where parcels subdivided into plots, min. 10m landscape zone will be introduced between plots.

PARCEL L
- Parcel Area: up to 8.01 Ha
- Use: B8 Storage & Distribution and ancillary office (B1)
- Maximum floor area: up to 35,000 sqm (GIA)
- Max unit height: up to 132.20m AOD
- Unit FFL: up to 115.70m

NB. Yards to be positioned on SE elevation / no yard or regularly circulating traffic on NW elevation. Carparking only to SW elevation, offices to face Principal Access Corridor

PARCEL M1 - Reed beds and Bio-discs
- Existing Rees beds and Bio-discs plot expanded
- Parcel Area: up to 0.58 Ha

PARCEL M2 - Reed beds and Bio-discs
- Parcel Area: up to 1.13 Ha

AREA SUMMARY - ZONE 1 (GIA)

- RED LINE AREA: 232.10 Ha
- Bittesby Country Park: 42.32 Ha
- Meadow Land: 28.12 Ha
- Other open space, structural landscaping and access: 67.18 Ha
- Storage & Distribution (B8): up to 427,350 sqm
- National Centre for Logistics Qualifications and campus(D1): up to 3,700 sqm
- Estate Office, conference facility and heritage exhibition(B1a, D1): up to 300 sqm
- Innovation Centre (B1a, B1b): up to 2,325 sqm
- Holovis (B1a, B1b): up to 7,000 sqm

10	Drawing revised to reflect latest comments.	04.09.15	mb
09	Drawing revised to reflect latest comments.	01.09.15	mb
08	Drawing revised.	26.08.15	mb
07	Drawing revised	18.08.15	RS
06	Drawing revised. Notes added.	18.08.15	mb
05	Drawing revised. Notes amended. Area summary added.	13.08.15	mb
04	Drawing revised. Legend updated. Red line revised.	12.08.15	mb
03	Drawing revised. Drawing size amended to A0. Title amended.	12.08.15	mb
02	Drawing revised.	27.07.15	mb
01	Boundaries amended.	13.07.15	RS

revisions

PLANNING

c h e t w o o d s ®
a r c h i t e c t s
32 Frederick street, Birmingham B1 3HH
T: +44 (0) 121 234 7500 F: +44 (0) 121 234 7501

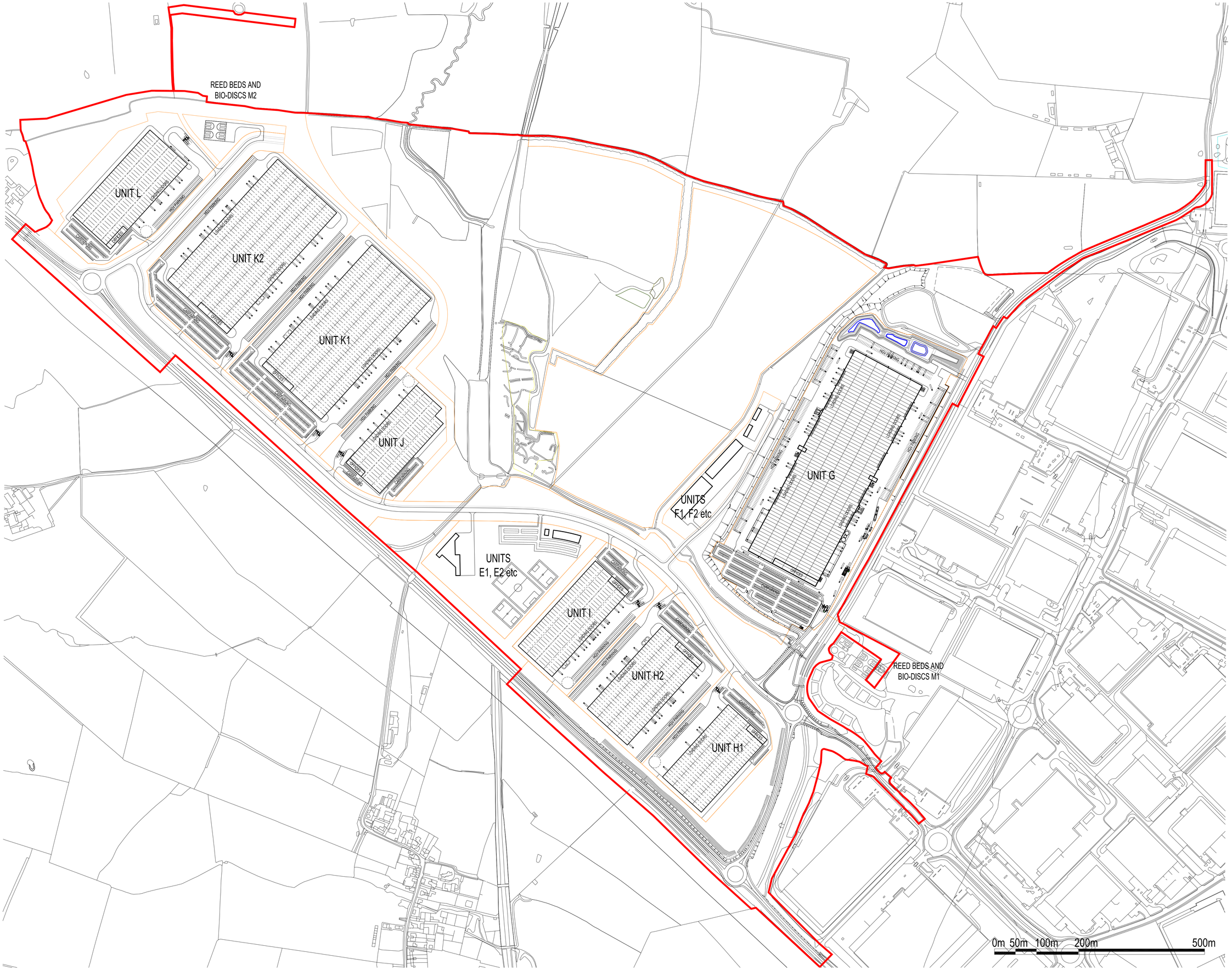
Project: MAGNA PARK EXTENSION: HYBRID PLANNING APPLICATION
Job Number 3657

IDI Gazeley
Brookfield Logistics Properties

Drawing Title: PARAMETER PLAN
Drawing Size A0

Drawn RS	Date 06.07.15	Scale 1/4000	Cadfile 3657
Reviewed by KL	Drawing No. 3657-34		Rev. 10

Appendix C – Illustrative Masterplan



Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.

Subject to statutory approvals and survey.

AREAS
Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.

N

08	Notes revised.	10.09.15 MB
07	Drawing revised to reflect latest comments.	08.09.15 MB
06	Drawing revised.	18.08.15 MB
05	Drawing revised to reflect parameter plan.	14.08.15 MB
04	Plot areas added.	03.07.15 RDN
03	Note added.	24.06.15 mb
02	Unit C & D omitted	24.06.15 mb
01	Title block amended.	03.06.15 mb

revisions

PLANNING

c h e t w o o d s ®
a r c h i t e c t s
32 Frederick street, Birmingham B1 3HH
T: +44 (0) 121 234 7500 F: +44 (0) 121 234 7501

Project Job Number 3657

MAGNA PARK EXTENSION:
HYBRID PLANNING APPLICATION

IDI Gazeley
Brookfield Logistics Properties

Drawing Title Drawing Size A1

ILLUSTRATIVE MASTERPLAN

Drawn RDN	Date 18.07.14	Scale A1@1:4000	Cadfile 3657-33
Reviewed by TW	Drawing No. 3657-33		Rev. 08

Appendix D – Factual Ground Investigation Report

CAPITA

Magna Park Extension: Hybrid Application

Ground Investigation Factual Report

15 September 2015

We | Listen Create Deliver

Quality Management

Job No	CS074680		
Project	Magna Park Extension: Hybrid Application		
Title	Ground Investigation Factual Report		
Client	IDI Gazeley		
Document Ref	CS-074680-GEA-15-131-R	**Issue / Revision**	-
File reference	U:\CS-074680 - Project Atlantis\Geotech\Reports\CS-074680-GEA-15-131-R.docx		
Date	15/09/2014		
Prepared by	GEA	Signature (for file)	
Authorised by	NRB	Signature (for file)	

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Authorised
-	15/9/15	First Issue	GEA	NRB

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Contents

Appendices

1. Introduction

1.1 Report Purpose

1.1.1 This report is intended to provide a factual record of a two phases of two-day trial pitting exercises undertaken by Capita Property and Infrastructure Limited at the site known as Magna Park Extension: Hybrid Application near Lutterworth, Leicestershire.

- Phase one took place on the 10th and 11th February 2015
- Phase two took place on the 3rd and 9th September 2015

1.1.2 The report is subject to update and/or amendment following further, more detailed investigations.

2. Site Details

2.1 Site Location

2.1.1 The site is located approximately 22 km south-southwest of Leicester City Centre and 3.3 km west of Lutterworth and can be centred on approximate Ordnance Survey grid reference 450107E, 285938N with an indicative postcode of LE17 4JH. In total the site covers an area of about 222 hectares. The A5 highway can be found to the west and Magna Park industrial estate is located directly to the south east across Mere Lane. The nearest local settlement is Willey which is 0.85 km to the south west beyond the A5.

2.2 Site Description

2.2.1 The site is divided into agricultural fields of unequal size which are currently used for the production of crops (predominantly wheat and beans) with a minor proportion used for grazing sheep. In the centre of the south eastern portion of the site a small cluster of building are located including Bittesby House and Bittesby Farm, with Bittesby Cottage found further to the east. Along the A5 in the south east Emmanuel Cottages and to the north west White House Farm can be located.

2.2.2 In terms of landscape, the site slopes away from a topographical high of Mere Lane on the eastern boundary and is shown to be approximately 125 m AOD in the north east and falls to approximately 103 m AOD at the valley bottom through the centre of the site. From the central valley, the ground rises gently towards the north-west reaching 120 m AOD.

2.2.3 Located towards the northern eastern end of the site is an artificial pond used to store groundwater runoff from Magna Park. Water enters the pond through an underground pipe to the north-east.

2.3 Proposed Development

2.3.1 Details of the proposed development design are evolving, however the following development description and parameter information has been provided to consultees.

2.3.2 The development comprises the following uses and maximum quanta:

Zone 1 (outline)

- Distribution warehousing and ancillary office space (Use Classes B8 and B1a): up to 427,350 sq. m (including 100,844 sq. m for DHL Supply Chain that is also the subject of Application Reference 15/00919/FUL that was submitted in June 2015).

- National Centre for Logistics Qualifications (Use Class D1): up to 3,700 sq. m together with its campus estate office, with heritage exhibition centre and conference facility (Use Class D1): up to 300 sq. m.
- Holovis expansion building (Use Class B1a, B1b): up to 7,000 sq. m.
- Innovation Centre: up to 2,325 sq. m.
- Public park and meadowland: c 70 ha.
- Access corridor, structural landscaping, SUDs systems.
- Demolition of existing buildings on the site.

Zone 2 (detailed)

- Railfreight shuttle terminal.
- HGV Parking (140 spaces).
- HGV Driver Training Centre.
- LPG or GNP Fuel Island and Vehicle washing facility.

2.3.3 Zone 1 already benefits from planning consent to provide an area for HGV and car parking.

2.3.4 IDI Gazeley will be seeking planning permission for each parcel and its parameters, the means of access and the details of the railfreight shuttle. The demolition of Bittesby House is required to facilitate the development of the distribution warehousing.

2.3.5 A Parameter Plan covering every part of the site is provided in Appendix A.

3. Mapped Geology / Hydrogeology

3.1 Geology

3.1.1 With reference to the British Geological Survey (BGS) GeoIndex online mapping and England and Wales Solid and Drift Editions of Sheet 169 “Coventry and Nuneaton” (at 1:50,000 Scale) the following lithologies have been identified on site.

3.1.2 The site is predominantly overlain by superficial glacial diamicton deposits of the Oadby Member, part of the Pleistocene Wolston Formation. This lithology is typically described as grey, weathering brown clay characterised by Cretaceous and Jurassic rock fragments (chalk and flint), subordinate lenses of sand and gravel, clay and silt.

3.1.3 A small area of superficial late glacial to post glacial Dunsmore Sand and Gravel deposit can be found to the south west of the site. This lithology is typically described as red, brown and yellow, commonly ochreous, matrix-supported poorly sorted flinty gravel with lenses of coarse sand.

3.1.4 Following the minor watercourses across the site, the Bosworth Clay Member, Wolston Sand and Gravel, and Alluvium are mapped.

3.1.5 The superficial geology is underlain by three bedrock units, firstly to the south east is the Blue Lias Formation (TP1-TP17 and TP116-TP119), described as thinly interbedded limestone and calcareous mudstone or siltstone.

3.1.6 To the north west of the Blue Lias Formation is the Penarth Group (TP109-TP115), described as grey to black mudstones with subordinate limestones and sandstones; predominantly marine in origin.

3.1.7 To the north west of the Penarth Group is the Mercia Mudstone Group (TP101-TP108), described as dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas.

3.2 Hydrogeology

3.2.1 Environment Agency (EA) records indicate the superficial deposits below the site to be categorised as follows;

- Secondary Aquifer (Undifferentiated layers) – Oadby Member. This unit was previously described as an unproductive stratum (non aquifer).
- Secondary (A) Aquifer (Permeable Layers) – Dunsmore Sand and Gravel, Wolston Sand and Gravel, and Alluvium.

3.2.2 The underlying 'bedrock' – i.e. the Blue Lias Formation – is indicted to be a Secondary A aquifer (minor aquifer). The EA usually applies this classification to "permeable layers capable of supporting water supplies at a local rather than a strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

3.2.3 The underlying bedrock layers are described as follows;

- Secondary (A) Aquifer (permeable layers) – Blue Lias Formation
- Secondary (B) Aquifer (lower permeability layers) – Mercia Mudstone Groups
- Secondary Aquifer (Undifferentiated layers) – Penarth Group

3.2.4 The site is not situated within a groundwater source protection zone.

4. Ground Investigation

4.1 Fieldwork Scope

4.1.1 In total 36 trial pits have been formed on site under the supervision of Capita.

4.1.2 Initially an intrusive ground investigation of 17 mechanically-excavated trail pits (TP1 to TP17) was formed under the supervision of Capita on 10th and 11th February 2015. Pit base depths ranged between 2.60 m (TP11) and 3.40 m (TP16) below ground level.

4.1.3 A further intrusive investigation of 19 mechanically-excavated trail pits (TP101 to TP119) was excavated under the supervision of Capita on 3rd and 9th September 2015. Pit base depths ranged between 2.55 m (TP119) and 3.40 m (TP104) below ground level.

4.1.4 The exploratory trial pit locations are shown in relation to the current site layout in Appendix A. Exploratory hole logs are provided in Appendix B.

5. Ground Conditions

5.1 Introduction

5.1.1 The 36 trial pits were excavated across the site with the intention of forming an indicative view of the near surface soil conditions for the whole site.

5.2 Encountered Geology

5.2.1 Across the site grass or crops overly a 0.25 m to 0.40 m thick layer of topsoil (average 0.30 m) consisting of soft brown silt/clay with some sand and rounded flint/chert gravel.

5.2.2 Across the majority of the site the topsoil layer is underlain by firm orange and yellowish brown gravelly clay, corresponding with the mapped Oadby Member glacial diamicton. The gravel fraction variously comprises poorly sorted limestone, red/yellow sandstone, chert, and chalk.

5.2.3 Bands and lenses of gravelly sand and sandy gravel up to 0.50 m thick are locally present within the top 2.0 m with occasional cobbles and boulder clasts.

5.2.4 Below 1.50 m to 2.0 m the Oadby Member grades to stiff grey clay, again with poorly sorted entrained clasts of limestone, sandstone and chert throughout.

5.2.5 To the south west of the site below the topsoil, the Dunsmore Sand and Gravel formation is observed in TP111, TP113, TP114 and TP104. This comprises orange-brown and yellow, matrix-supported, clay rich, poorly sorted flinty gravel with lenses of coarse sand.

5.3 Groundwater

5.3.1 Groundwater was observed during the phase one ground investigation as slow seepages in most of the trial pits, at depths of between about 1.00 and 2.50 mbgl. These mostly corresponded with bands of granular (sand and gravel) soil.

5.3.2 Groundwater encountered during phase one trial pit formation is summarised in the table below:

Location	Depth (mAOD)	Depth (mBGL)	Details
TP1	118.13	1.90	Seepage from medium sand
TP2	118.93	2.20	Seepage from clayey sandy gravel
TP3	115.4	2.50	Seepage from fine to medium sand
TP4	115.62	1.70	Seepage from limestone gravel and cobbles
TP5	111.72	1.30	Seepage from medium to coarse sand & gravel
TP6	114.65	1.80	Seepage from limestone gravel and cobbles
TP7	117.69	1.90	Seepage from limestone gravel and cobbles
TP10	123.24	1.30	Seepage from medium to coarse sand
TP11	113.73	1.40	Seepage from limestone and flint gravel
TP14	111.76	1.75	Seepage from limestone gravel and cobbles
TP15	110.06	1.55	Seepage from chalk and sandstone gravel

Location	Depth (mAOD)	Depth (mBGL)	Details
TP16	112.06	2.10	Seepage from sand and, flint and chalk gravel
TP17	120.69	2.40	Seepage from limestone gravel

5.3.3 Groundwater was only encountered as a slow seep during the phase two investigation in trial pit TP113 at 115.75 m AOD (2.75 m BGL), observed in slightly clayey, gravelly sand.

5.4 Visual/ Olfactory Evidence of Contamination

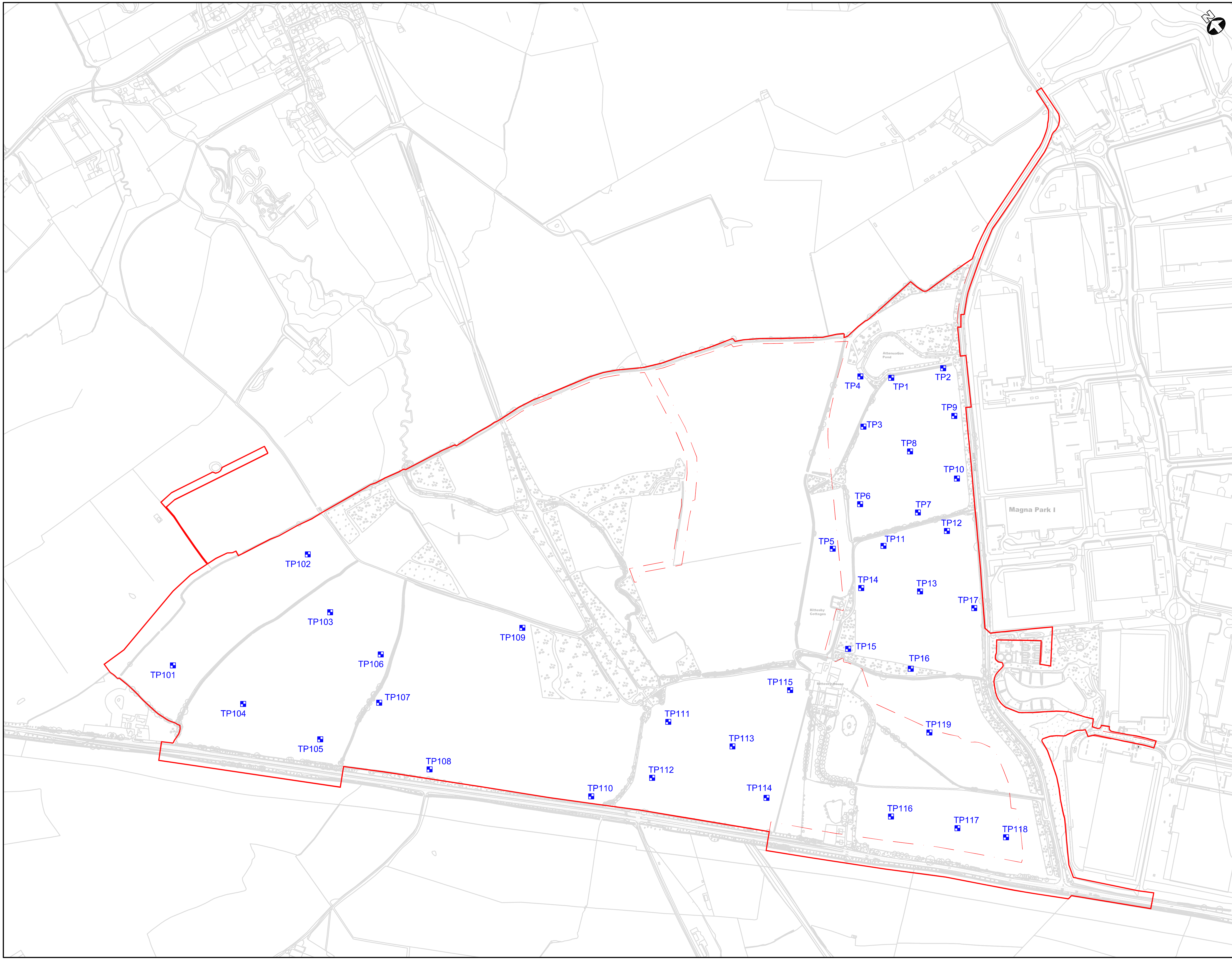
5.4.1 No visual or olfactory (odour) evidence of suspected ground contamination was observed or recorded during the recent investigation.

5.4.2 It should be noted that no chemical analysis of soil or groundwater samples was undertaken as part of this limited phase of work.

5.5 Obstructions

5.5.1 No buried obstructions were encountered during the investigation. Occasional ceramic land drains were observed in trial pits located on the edge of the fields at a depth of approximately 1.00 m bgl.

Appendix A - Figures



DO NOT SCALE this drawing (printed or electronic versions). Contractors must check all dimensions from site.

All other design team elements, where indicated, have been imported from the consultant's drawings and reference should be made to the individual consultant's drawings for exact setting out, size and type of component.

Discrepancies and / or ambiguities within this drawing, between it and information given elsewhere, must be reported immediately to the architect for clarification before proceeding.

All works are to be carried out in accordance with the latest British Standards and Codes of Practice unless specifically directed otherwise in the specification.

All setting out to be in accordance with the Architect's details, (the Architect's drawings to take precedence over any setting out shown on this drawing).

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Legend

TP8	Trial Pit locations.
	TP1 - TP17: 2014
	TP101 - TP119: 2015
🟥	Site Boundary.

Rev	Date	By	Description	Rev' check
P02	11/09/15	BMG	Additional TP's added, drawing resized to A0	PWE
P01	03/06/15	WDJ	Project title updated, boundary line updated.	PWE

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION: HYBRID APPLICATION

Drawing
EXPLORATORY HOLE LOCATION PLAN

Scale @ A0	Drawn	Checked
1:3000	WDJ	PE
Project No.	**Date**	**Office**
CS/074680	05.03.15	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	origin	zone	level	file type	role	number	revision
074680 -	CA-	0 -	GF -	DR -	SE-	501 -	P02

CAPITA

Property and infrastructure

Consulting Civil, Structural and Geo-environmental Engineers

London
Tele No: (+44) 0 20 7870 9300
Manchester
Tele No: (+44) 0 161 486 1521
Watford
Tele No: (+44) 0 1923 817537
Bristol
Tele No: (+44) 0 1275 840831

Capita Property and Infrastructure Ltd. www.capita.co.uk/property
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2018542

Appendix B - Trial Pits Logs

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
www.capita.co.uk/property

Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP1

Sheet 1 of 1

Easting: -	Northing: -	G.L. 120.03	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	119.68	Grass over soft brown sandy CLAY TOPSOIL with requent roots and rootlets.	0.35	
		Stiff yellowish brown silty slightly sandy CLAY. (OADBY TILL).		
	118.83	At 1.10 m orange medium sand lense.	1.20	
		Stiff light brown mottled grey gravelly CLAY with fine gravel of subangular to subrounded white flint and occasional rounded cobbles. (OADBY TILL).		▽
		At 1.90 m orange medium sand lense		
	117.58	Very stiff dark brown silty CLAY with gravel and cobbles of fissile mudstone and limestone. (OADBY TILL).	2.45	
	117.03	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seepage at 1.90 m

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
www.capita.co.uk/property

Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP2

Sheet 1 of 1

Easting: - | Northing: - | G.L. 121.53 | Logged By : GEA

Scale: 1:50 | Date: 10/02/2015 | Plant: JCB-3CX | Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
0.80	D	
1.20	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	121.13	Grass over soft brown silty sandy CLAY TOPSOIL with frequent rootlets.		
		Stiff yellowish brown mottled grey slightly sandy CLAY with rare subrounded flint gravel. (OADBY TILL).	0.40	
	120.43	Medium dense orange medium SAND. (OADBY TILL).	1.10	
	120.03	Firm dark grey plastic CLAY with gravel of fine subrounded chalk. (OADBY TILL).	1.50	
	119.53	Medium dense light yellowish brown clayey very sandy GRAVEL of subrounded flint and limestone. (OADBY TILL).	2.00	▽
	119.13	Stiff dark brown very silty fine sandy CLAY with occasional thin siltstone and mudstone bands. (OADBY TILL).	2.40	
	118.53	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls slightly collapsing between 2.00 and 2.40 m

Groundwater Remarks

Seepage at 2.20 m

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
www.capita.co.uk/property

Project Name: Magna Park II - Plot 1			Trial Pit Number TP3
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 117.90	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
		Grass over soft brown sandy CLAY TOPSOIL with frequent rootlets.		
	117.50	Firm yellowish brown sandy CLAY with frequent subrounded chalk gravel. (OADBY TILL).	0.40	
	116.50	Firm greyish brown mottled very sandy CLAY with rare angular vitreous black coal gravel. (OADBY TILL).	1.40	
	115.70	Medium dense to dense orange clayey fine to medium SAND. (OADBY TILL).	2.20	▽
	114.85	Stiff dark grey silty sandy CLAY with occasional chalk gravel. (OADBY TILL).	3.05	
	114.70	End of Trial Pit at 3.20 m	3.20	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls slightly collapsing after 2.50 m

Groundwater Remarks

Seepage at 2.50 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP4

Sheet 1 of 1

Easting: -	Northing: -	G.L. 117.32	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
2.60-2.80	B	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
		Grass over soft light brown sandy CLAY TOPSOIL.		
	116.92		0.40	
		Firm dark brown mottled grey sandy CLAY with frequent fine to medium chalk gravel. Terracotta pipe fragment suggests reworked upper. (OADBY TILL).		
	116.52		0.80	
		Medium dense orange medium SAND. (OADBY TILL).		
	116.22		1.10	
		Stiff orange mottled grey silty sandy gravelly CLAY with rare cobbles of limestone. (OADBY TILL).		
		At 1.70 m water seeping from limestone gravel and cobble layer.		▽
	115.52		1.80	
		Very stiff dark grey gravelly CLAY with rare cobbles. Gravel of rounded chert and subangular limestone clasts. Clay is massive and plastic. (OADBY TILL).		
	114.32		3.00	
		End of Trial Pit at 3.00 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seepage at 1.70 m

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Project Name: Magna Park II - Plot 1			Trial Pit Number: TP5
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 113.02	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.35	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	112.67	Sprouting crops over soft brown slightly sandy CLAY TOPSOIL with occasional rounded chert gravel.	0.35	
	112.12	Soft to firm orangish brown sandy CLAY with occasional flint gravel. (OADBY TILL).	0.90	
	111.52	Medium dense orange medium to coarse SAND with frequent fine flint, chalk and coal gravel. Increasing clay content with depth. (OADBY TILL).	1.50	▽
	110.02	Firm to stiff light brown becoming grey silty CLAY with fine quartz gravel and occasional limestone cobbles. (OADBY TILL).	3.00	
		End of Trial Pit at 3.00 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls slightly collapsing in saturated sand below 1.30 m

Groundwater Remarks

Seepage at 1.30 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP6

Sheet 1 of 1

Easting: - | Northing: - | G.L. 116.45 | Logged By : GEA

Scale: 1:50 | Date: 10/02/2015 | Plant: JCB-3CX | Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
2.50	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	116.10	Grass over soft sandy CLAY TOPSOIL.	0.35	
	115.65	Soft to firm orange brown mottled grey sandy CLAY with iron staining and rare subrounded black flint gravel. (OADBY TILL).	0.80	
	115.35	Firm grey plastic CLAY. (OADBY TILL).	1.10	
	114.65	Medium dense orange very clayey coarse GRAVEL of iron stone and limestone with occasional subangular cobbles. (OADBY TILL).	1.80	▽
	113.80	Firm to stiff dark grey plastic CLAY with reddish brown ironstone gravel. (OADBY TILL).	2.65	
		End of Trial Pit at 2.65 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seepage at 1.80 to 2.10 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP7

Sheet 1 of 1

Easting: - | Northing: - | G.L. 119.59

Logged By : GEA

Scale: 1:50 | Date: 10/02/2015 | Plant: JCB-3CX

Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	119.34	Sprouting crops over soft brown silty sandy CLAY TOPSOIL with frequent round chert and occasional brick fragments.	0.25	
		Soft to firm light brown mottled grey CLAY with frequent subrounded fine to medium limestone gravel becoming darker grey with depth. (OADBY TILL).		
	117.89	Stiff grey very gravelly CLAY. From 1.90 to 2.10 m cobble layer of subrounded to subangular limestone.	1.70	▽
	116.79	End of Trial Pit at 2.80 m	2.80	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

HB 3 - CSS TP Log - 16/05/2006 - PE

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seepage at 1.90 m

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Project Name: Magna Park II - Plot 1			Trial Pit Number TP8
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 122.05	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.45-1.65	B	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)
	121.85	Crops over soft brown CLAY TOPSOIL with frequent rounded chert gravel and occasional cobbles.	0.20
	121.40	Firm yellow brown sandy CLAY with fine subrounded gravel of chalk. (OADBY TILL).	0.65
		Firm to stiff dark brown mottled grey gravelly CLAY of angular limestone with softer cream chalk, rounded chert and red friable sandstone. (OADBY TILL).	
	119.75		2.30
	119.55	Medium dense chalk GRAVEL with frequent limestone cobbles. (OADBY TILL).	2.50
		Stiff dark orange brown very sandy CLAY. (OADBY TILL).	
	119.05		3.00
		End of Trial Pit at 3.00 m	

Water

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP9

Sheet 1 of 1

Easting: - | Northing: - | G.L. 125.23 | Logged By : GEA

Scale: 1:50 | Date: 10/02/2015 | Plant: JCB-3CX | Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	124.98	Grass over soft brown silty sandy CLAY TOPSOIL with frequent round chert gravel.	0.25	
		Soft to firm yellowish brown sandy CLAY with subangular to subrounded flint gravel. (OADBY TILL).		
	124.18		1.05	
	124.03	Medium dense red silty medium SAND band occasional clasts of friable sandstone. (OADBY TILL).	1.20	
		Firm dark brown mottled grey silty sandy gravelly CLAY. Various clasts of limestone up to boulder size and predominantly subrounded. (OADBY TILL).		
	122.23	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park II - Plot 1			Trial Pit Number TP10
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 124.54	Logged By : GEA
Scale: 1:50	Date: 10/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
2.20	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	124.24	Grass over soft brown CLAY TOPSOIL with abundant rootlets and rounded chert gravel.	0.30	
		Soft to firm brown sandy CLAY with occasional gravel of sandstone flint and chalk. (OADBY TILL).		
	123.44		1.10	▽
		Medium dense medium to coarse red SAND. (OADBY TILL).		
	122.94		1.60	
		Dark brown mottled dark grey slightly sandy CLAY with frequent fine to coarse rounded to sub rounded gravel and occasional cobbles. Clasts of various lithology but predominantly shelly limestone. (OADBY TILL). From 1.90 to 2.40 layer of limestone cobbles and boulders		
	121.74		2.80	
		End of Trial Pit at 2.80 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seepage at 1.30 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP11

Sheet 1 of 1

Easting: 0.00	Northing: 0.00	G.L. 115.13	Logged By : GEA
Scale: 1:50	Date: 11/02/2015	Plant:	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				114.83	Grass over soft brown CLAY TOPSOIL with abundant rootlets.	0.30	
					Soft to firm yellowish brown sandy CLAY with occasional round flint and subrounded limestone cobbles. Red tiles suggest reworked upper. (OADBY TILL).		
				113.83	Dense light yellowish brown very clayey cobbly GRAVEL of subangular limestone and subrounded flint. (OADBY TILL).	1.30	▽
				112.53	End of Trial Pit at 2.60 m	2.60	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls collapsing below 1.40 m

Groundwater Remarks

Seepage at 1.40 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP12

Sheet 1 of 1

Easting: - | Northing: - | G.L. 120.29

Logged By : GEA

Scale: 1:50 | Date: 11/02/2015 | Plant: JCB-3CX

Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
2.75	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	119.99	Grass over brown sandy CLAY TOPSOIL.	0.30	
		Soft becoming firm dark yellowish brown mottled grey silty CLAY with rare chalk gravel and subangular cobbles. (OADBY TILL).		
	119.19		1.10	
		Firm dark grey mottles brown sandy CLAY with subrounded chalk and limestone gravel and rare flint. Frequent flat limestone cobbles and ocasional boulder (OADBY TILL).		
	118.29		2.00	
		Stiff dark grey sandy plastic CLAY with occasional subrounded chert, chalk and friable sandstone gravel. (OADBY TILL).		
	117.39		2.90	
		End of Trial Pit at 2.90 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park II - Plot 1			Trial Pit Number TP13
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 119.63	Logged By : GEA
Scale: 1:50	Date: 11/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	119.33	Crops over soft brown CLAY TOPSOIL with frequent round chert gravel.	0.30	
		Soft becoming firm yellow brown very sandy CLAY with occasional chalk gravel. (OADBY TILL).		
	118.73		0.90	
		Medium dense red medium SAND. (OADBY TILL).		
	118.48		1.15	
		Firm to stiff dark grey mottled brown CLAY with gravel of chalk, friable yellow and red sandstone, and occasional cobbles. Frequency and size of gravel increases with depth. (OADBY TILL).		
	116.53		3.10	
		End of Trial Pit at 3.10 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park II - Plot 1			Trial Pit Number TP14
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 113.51	Logged By : GEA
Scale: 1:50	Date: 11/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.10-1.30	B	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	113.26	Grass over soft brown sandy CLAY TOPSOIL.		
		Soft light orangish brown very sandy CLAY. (OADBY TILL).	0.25	
	112.56	Firm yellow brown mottled grey slightly sandy CLAY with clasts of cream subrounded to rounded limestone gravel and rare cobbles. (OADBY TILL).	0.95	
	111.51	Firm to stiff dark greyish brown silty fine sandy CLAY with infrequent fine to medium black coal gravel. Clay is slightly crumbly due to high silt and sand content. (OADBY TILL).	2.00	
		After 3.00 m occasional rounded chalk cobbles.		
	110.21	End of Trial Pit at 3.30 m	3.30	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seeping at 1.75 m

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Project Name: Magna Park II - Plot 1			Trial Pit Number TP15
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 111.61	Logged By : GEA
Scale: 1:50	Date: 11/02/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	111.36	Grass over sandy brown CLAY TOPSOIL with abundant roots.	0.25	
	110.86	Soft becoming firm dark yellowish brown sandy CLAY with rare fine to medium coal and chalk gravel. (OADBY TILL).	0.75	
		Firm dark brown mottled grey CLAY with fine gravel of sandstone, coal and coarse rounded chalk. (OADBY TILL).		▽
	108.81	Stiff dark grey CLAY with subrounded limestone gravel and cobbles. (OADBY TILL).	2.80	
	108.61	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls remained stable

Groundwater Remarks

Seeping at 1.55 m

CAPITA

Project Name: Magna Park II - Plot 1			Trial Pit Number TP16
Project Number: CS074680			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 114.16	Logged By : GEA
Scale: 1:50	Date: 11/02/2015	Plant: JCB-3CX	Checked By : PWE

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SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
2.20	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	113.81	Grass over soft brown silty sandy CLAY TOPSOIL with frequent rootlets.	0.35	
		Soft light orange brown sandy gravelly CLAY with gravel of subrounded chalk and occasional fine charcoal. (OADBY TILL).		
	113.16	Firm brown mottled grey sandy gravelly CLAY with gravel of chalk and occasional red and yellow friable sandstone clasts. (OADBY TILL).	1.00	
	112.06	Medium dense coarse orange SAND with rounded chert and chalk fine to coarse gravel. (OADBY TILL).	2.10	▽
	111.76	Stiff dark grey silty CLAY with fine chalk gravel. (OADBY TILL).	2.40	
		From 3.10 to 3.20 m predominantly limestone gravel From 3.20 to 3.25 m layer of dark red sand		
	110.76	End of Trial Pit at 3.40 m	3.40	

SAMPLE/TEST KEY
B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
▽ Water Strike
▼ Water Level

Comments :
Backfilled with arisings

Stability : Pit walls crumbling below 2.10 in sand

Groundwater Remarks

Seeping at 2.10 m

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Project Name: Magna Park II - Plot 1

Project Number: CS074680

Client: IDI Gazeley

Trial Pit Number: TP17

Sheet 1 of 1

Easting: - | Northing: - | G.L. 123.09

Logged By : GEA

Scale: 1:50 | Date: 11/02/2015 | Plant: JCB-3CX

Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				122.79	Grass over soft brown sandy CLAY TOPSOIL with frequent rootlets and occasional rounded gravel.	0.30	
					Soft yellowish brown sandy gravelly CLAY with gravel of rounded chert. subrounded chalk. and crumbly coal. (OADBY TILL).		
				122.09	At 0.95 m limestone boulder	1.00	
					Soft becoming firm brown mottled grey plastic CLAY with subrounded medium to coarse limestone gravel. (OADBY TILL).		
				120.09	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings

Stability : Pit walls are stable

Groundwater Remarks

Seeping at 2.40 m

CAPITA

Project Name: Magna Park Extension: Hybrid Application			Trial Pit Number TP101
Project Number: CS074680-2			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 117.09	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

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SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				116.89	Wheat crop over soft dark brown slightly sandy CLAY (TOPSOIL).	0.20	
				116.44	Soft becoming firm brown mottled grey gravelly CLAY. Gravel of angular limestone and orange sandstone. Rare black coal. (OADBY MEMBER).	0.65	
					Firm dark brown gravelly CLAY. Gravel of rounded flint and occasional grey limestone cobbles. (OADBY MEMBER).		
				114.99	Stiff dark grey silty sandy slightly gravelly CLAY. Gravel of limestone and orange/yellow friable sandstone. (OADBY MEMBER).	2.10	
				114.19	End of Trial Pit at 2.90 m	2.90	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP102

Sheet 1 of 1

Easting: -	Northing: -	G.L. 107.29	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.20	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	107.04	Wheat crop over brown slightly sandy CLAY with rare rounded flint gravel. (TOPSOIL).	0.25	
	106.74	Firm orangish brown slightly sandy gravelly CLAY. Gravel of flint and chalk. (OADBY MEMBER).	0.55	
		Firm to stiff brown mottled grey slightly sandy gravelly CLAY. Gravel of rounded chalk, red/yellow sandstone and light brown mudstone. Occasional cobbles and ferruginous mudstone boulder. (OADBY MEMBER).		
	104.54	End of Trial Pit at 2.75 m	2.75	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP103

Sheet 1 of 1

Easting: -

Northing: -

G.L. 107.62

Logged By : GEA

Scale: 1:50

Date: 03/09/2015

Plant: JCB-3CX

Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
0.40	D			107.32	Wheat crop over soft brown silty CLAY. (TOPSOIL).	0.30	
					Soft orangish brown very sandy CLAY with orange sand lenses. (OADBY MEMBER).		
				106.72		0.90	
					Firm brown mottled grey slightly sandy very gravelly CLAY. Gravel of subangular to subrounded limestone, and rounded chalk and flint. Occasional yellow sandstone clasts. (OADBY MEMBER).		
				105.52		2.10	
					Stiff dark brown mottled dark grey waxy CLAY with fine to coarse gravel of chalk, flint, and coal. (OADBY MEMBER).		
				104.62		3.00	
					End of Trial Pit at 3.00 m		

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP104

Sheet 1 of 1

Easting: -	Northing: -	G.L. 116.44	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				116.19	Wheat crop over soft brown sandy CLAY. (TOPSOIL).	0.25	
				115.34	Loose orangish brown very clayey SAND. (DUNSMORE SAND AND GRAVEL).	1.10	
3.10	D			113.04	Loose becoming medium dense yellowish brown coarse SAND with occasional fine black coal gravel. Rare friable mudstone cobbles with visible bedding. (DUNSMORE SAND AND GRAVEL). End of Trial Pit at 3.40 m	3.40	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP105

Sheet 1 of 1

Easting: -	Northing: -	G.L. 116.96	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
1.00	D			116.66	Wheat crop over greyish brown silty slightly sandy CLAY with occasional round flint gravel. (TOPSOIL).	0.30	
					Soft yellowish brown silty sandy gravelly CLAY. Fine to coarse gravel of rounded flint and occasional limestone. (OADBY MEMBER).		
				116.06		0.90	
					Firm brown silty gravelly CLAY. Fine gravel of rounded chalk, occasional coal, and orange sandstone clasts. (OADBY MEMBER).		
					At 2.45 m coarse orange sand lense.		
				113.96	At 2.90 m limestone boulder.	3.00	
					End of Trial Pit at 3.00 m		

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP106

Sheet 1 of 1

Easting: -	Northing: -	G.L. 109.58	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA			STRATIGRAPHIC RECORD				
Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
1.80	D			109.33	Wheat crop over soft dark brown sandy CLAY. (TOPSOIL).	0.25	
					Firm light brown mottled orange sandy CLAY. (OADBY MEMBER).		
				108.83		0.75	
					Firm orangish brown mottled grey silty slightly sandy gravelly waxy CLAY. Coarse gravel of flint, chalk, orange friable sandstone, and limestone. Fine sandy horizons. (OADBY MEMBER).		
				106.68	End of Trial Pit at 2.90 m	2.90	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP107

Sheet 1 of 1

Easting: -	Northing: -	G.L. 113.99	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
0.45	D			113.69	Grass over soft brown sandy CLAY. (TOPSOIL).	0.30	
				113.44	Soft dark brown slity very sandy gravelly CLAY with occasional rootlets. (OADBY MEMBER).	0.55	
				112.99	Soft orangish brown slightly sandy very gravelly CLAY. Gravel of rounded flint limestone, chalk, and orange sandstone clasts. (OADBY MEMBER).	1.00	
					Firm dark greyish brown slightly sandy very gravelly CLAY. Gravel of rounded flint limestone, chalk, and orange/yellow sandstone clasts. (OADBY MEMBER).		
				111.89	Stiff dark grey slightly gravelly waxy CLAY. Occasional gravel of rounded flint and chalk. (OADBY MEMBER).	2.10	
				111.39	End of Trial Pit at 2.60 m	2.60	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP108

Sheet 1 of 1

Easting: -	Northing: -	G.L. 118.44	Logged By : GEA
Scale: 1:50	Date: 03/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA / STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				118.09	Grass over dark brown sandy CLAY. (TOPSOIL).	0.35	
				117.59	Soft yellowish brown sandy gravelly CLAY. Occasional gravel of rounded flint and limestone. Red tile cobble suggests reworked upper surface. (OADBY MEMBER).	0.85	
2.55	D			115.79	Firm dark brown mottled dark grey gravelly cobbly CLAY. Various clasts of limestone and sandstone. Occasional lenses or coarse orange sand. (OADBY MEMBER).	2.65	
					End of Trial Pit at 2.65 m		

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Project Name: Magna Park Extension: Hybrid Application			Trial Pit Number TP109
Project Number: CS074680-2			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 114.50	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

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Reeds Crescent
Watford
WD24 4QP
Tel: 01923 817537
Fax: 01923 228516
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SAMPLING DATA / STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				114.25	Grass over soft dark brown slightly sandy CLAY with rare rounded coarse flint gravel. (TOPSOIL).	0.25	
				113.80	Soft yellowish brown silty sandy gravelly CLAY. With gravel of limestone and flint. (OADBY MEMBER).	0.70	
					Firm dark yellowish brown mottled grey sandy gravelly CLAY with dark orange lenses of coarse sand. Occasional bedded grey mudstone/very fine sandstone cobbles and limestone boulders. (OADBY MEMBER).		
				112.40		2.10	
2.50	D				Firm dark grey sandy very gravelly CLAY. (OADBY MEMBER).		
				111.80		2.70	
					End of Trial Pit at 2.70 m		

SAMPLE/TEST KEY
B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks
No Groundwater Encountered

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Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP110

Sheet 1 of 1

Easting: -	Northing: -	G.L. 112.62	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
0.50	D			112.32	Grass over soft brown slightly sandy CLAY with occasional rootlets. (TOPSOIL).	0.30	
					Soft yellowish brown slightly gravelly CLAY with lenses of coarse orange sand. Gravel of rounded flint. (OADBY MEMBER).		
				111.67	Firm grey mottled brown gravelly CLAY with subrounded fine to medium chalk gravel and orange sand lenses. (OADBY MEMBER).	0.95	
				109.77	End of Trial Pit at 2.85 m	2.85	

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP111

Sheet 1 of 1

Easting: -	Northing: -	G.L. 112.30	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.70	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)	Water
	112.10	Wheat crop over soft dark brown CLAY. (TOPSOIL).	0.20	
		Soft dark brown mottled orange very sandy gravelly CLAY. Occasional gravel of fine to coarse limestone and ferruginous sandstone. Rare black organic patches. (DUNSMORE SAND AND GRAVEL).		
	111.10	Medium dense grey with yellow bands clayey SAND with occasional black organic patches. (DUNSMORE SAND AND GRAVEL).	1.20	
	109.30	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

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Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP112

Sheet 1 of 1

Easting: -	Northing: -	G.L. 109.15	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				108.85	Wheat crop over soft brown sandy gravelly CLAY. Gravel of rounded flint and rare brick and tile fragments. (TOPSOIL).	0.30	
				108.45	Soft becoming firm light brown mottled grey sandy gravelly CLAY. Gravel of rounded chalk and flint. (OADBY MEMBER).	0.70	
					Firm light greyish brown sandy gravelly cobbly CLAY. Cobbles of subangular to subrounded limestone. Chalk degraded into cream calcareous sand. (OADBY MEMBER).		
				107.45	Firm dark brown mottled grey sandy gravelly CLAY with orange sand lenses. Rare black organic patches. (OADBY MEMBER).	1.70	
				106.35	End of Trial Pit at 2.80 m	2.80	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP113

Sheet 1 of 1

Easting: -	Northing: -	G.L. 118.50	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

Depth (m)	Type	Test Results / Remarks
1.30	D	

STRATIGRAPHIC RECORD

Legend	Level (mAOD)	Description	Depth (m)
	118.20	Wheat crop over soft dark brown sandy CLAY. (TOPSOIL).	0.30
	117.80	Loose orangish brown clayey sandy GRAVEL of subrounded flint with occasional cobbles. (DUNSMORE SAND AND GRAVEL).	0.70
	116.85	Medium dense orange very clayey gravelly SAND. Gravel of poorly sorted flint and occasional yellow/light grey coarse sandstone cobbles. Frequent red ochre patches and iron staining. Rare black organic patches. (DUNSMORE SAND AND GRAVEL).	1.65
	115.75	Firm dark grey sandy gravelly cobbly CLAY. Gravel of poorly sorted flint and occasional yellow/light grey coarse sandstone cobbles. Rare black organic patches. (DUNSMORE SAND AND GRAVEL).	2.75
	115.50	Medium dense light orangish brown slightly clayey gravelly SAND. (DUNSMORE SAND AND GRAVEL).	3.00
		End of Trial Pit at 3.00 m	

Water

SAMPLE/TEST KEY

B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP114

Sheet 1 of 1

Easting: -	Northing: -	G.L. 120.29	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				119.99	Wheat crop over soft dark brown sandy CLAY. (TOPSOIL).	0.30	
				119.69	Soft orangish brown sandy CLAY with occasional flint gravel. (OADBY MEMBER).	0.60	
					Soft greyish brown sandy gravelly CLAY with orange and yellow sand layers. Abundant round flint gravel. (DUNSMORE SAND AND GRAVEL).		
				118.79	Medium dense greyish brown clayey gravelly SAND with orange and yellow sand layers. Abundant round flint gravel. (DUNSMORE SAND AND GRAVEL).	1.50	
				117.04	End of Trial Pit at 3.25 m	3.25	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Project Name: Magna Park Extension: Hybrid Application			Trial Pit Number TP115
Project Number: CS074680-2			
Client: IDI Gazeley			Sheet 1 of 1
Easting: -	Northing: -	G.L. 112.33	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

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Reeds Crescent
Watford
WD24 4QP
Tel: 01923 817537
Fax: 01923 228516
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SAMPLING DATA / STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				112.03	Wheat crop over dark brown sandy CLAY with rare round coarse flint gravel. (TOPSOIL).	0.30	
				111.73	Soft light brown mottled grey sandy CLAY. With occasional rounded flint gravel. (OADBY MEMBER).	0.60	
0.90	D				Firm dark greyish brown sandy gravelly CLAY. Gravel of chalk, flint, sandstone and coal. Rare fossiliferous limestone cobbles and boulders (OADBY MEMBER).		
				110.63	Firm dark grey mottled dark brown gravelly cobbly CLAY. Gravel of limestone, sandstone and flint. (OADBY MEMBER).	1.70	
				109.33	End of Trial Pit at 3.00 m	3.00	

SAMPLE/TEST KEY
B - Bulk Sample
D - Small Disturbed Sample
W - Water Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks
No Groundwater Encountered

CAPITA

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Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP116

Sheet 1 of 1

Easting: -	Northing: -	G.L. 123.00	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				122.65	Wheat crop over soft dark brown sandy CLAY. (TOPSOIL).	0.35	
					Soft becoming firm light grey sandy gravelly CLAY. Bands of coarse orange sand and gravel of limestone, sandstone and rounded flint. (OADBY MEMBER).		
				121.60	Firm dark grey sandy gravelly CLAY with iron staining. (OADBY MEMBER).	1.40	
				120.15	End of Trial Pit at 2.85 m	2.85	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP117

Sheet 1 of 1

Easting: -	Northing: -	G.L. 119.79	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
0.60	D			119.49	Wheat crop over soft dark brown sandy CLAY. (TOPSOIL).	0.30	
					Soft becoming firm light brown mottled grey gravelly CLAY. Gravel of poorly sorted fine to coarse chalk, limestone, sandstone and flint. Occasional limestone cobbles and coarse orange sand bands. (OADBY MEMBER).		
				118.54	Firm dark grey mottled brown gravelly cobbly CLAY. Gravel of rounded chalk with rare red ochreous sandstone clasts. (OADBY MEMBER).	1.25	
				116.94	End of Trial Pit at 2.85 m	2.85	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

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Reeds Crescent
Watford
WD24 4QP
Tel: 01923 817537
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number: TP118

Sheet 1 of 1

Easting: -	Northing: -	G.L. 121.29	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

No Photograph

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				121.04	Wheat crops over soft brown sandy CLAY. (TOPSOIL).	0.25	
					Soft yellowish brown sandy gravelly CLAY. Occasional rounded flint gravel and orange sand bands. (OADBY MEMBER).		
				120.39		0.90	
2.45	D				Firm greyish brown mottled orange sandy gravelly cobbly CLAY. Abundant round gravel and cobbles of flint and ferruginous mudstone. Gravel of friable chalk and red ochreous and yellow sandstone. (OADBY MEMBER).		
				118.54	End of Trial Pit at 2.75 m	2.75	

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

CAPITA

Oak House
Reeds Crescent
Watford
WD24 4QP

Tel: 01923 817537
Fax: 01923 228516
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Project Name: Magna Park Extension: Hybrid Application

Project Number: CS074680-2

Client: IDI Gazeley

Trial Pit Number

TP119

Sheet 1 of 1

Easting: -	Northing: -	G.L. 120.07	Logged By : GEA
Scale: 1:50	Date: 09/09/2015	Plant: JCB-3CX	Checked By : PWE

SAMPLING DATA

STRATIGRAPHIC RECORD

Depth (m)	Type	Test Results / Remarks	Legend	Level (mAOD)	Description	Depth (m)	Water
				119.72	Wheat crop over soft brown sandy gravelly CLAY with occasional rounded flint gravel. (TOPSOIL).	0.35	
				119.17	Soft orangish brown sandy gravelly CLAY. Frequent subrounded to rounded flint gravel. (OADBY MEMBER).	0.90	
					Firm brown mottled light grey sandy gravelly cobbly CLAY. Gravel and cobbles of chalk, limestone and ferruginous sandstone. (OADBY MEMBER).		
				117.82		2.25	
2.55	D			117.52	Stiff dark grey gravelly waxy CLAY. (OADBY MEMBER).	2.55	
					End of Trial Pit at 2.55 m		

SAMPLE/TEST KEY

B - Bulk Sample
W - Water Sample
D - Small Disturbed Sample
V - Vane Test Result
Water Strike
Water Level

Comments :
Backfilled with arisings.

Stability : Pit walls remained stable.

Groundwater Remarks

No Groundwater Encountered

Appendix E – Surface Water Drainage Strategy (Development Zone 1)

CAPITA

DRAINAGE STRATEGY

MAGNA PARK EXTENSION: HYBRID PLANNING APPLICATION

LUTTERWORTH, LEICESTERSHIRE

Rev P00, 15/09/15

Introduction

Capita property and Infrastructure Ltd has been commissioned by IDI Gazeley to produce a drainage design strategy Appendix 'F' as part of the Flood Risk Assessment Document for the proposed Magna Park Extension: Hybrid Planning Application.

These proposals accompany an outline planning application submission to Leicestershire County Council for:

Development on the c 220 ha to the north west of and linked to Magna for:

- *up to 427,350 sq m of distribution warehousing on c 85 ha (including up 101,000 sq m for DHL Supply Chain – equating to 326,000 sq m of additional "speculative" distribution space over that needed specifically to meet the needs of DHL Supply Chain)*
- *up to 9,260 sq m of B1a and B1b space (up to 7,000 for Holovis and up to 2,260 for an innovation centre)*
- *up to 4,500 sq m D1 for the Logistics Institute (for apprenticeships, higher technical qualifications and foundation degrees) together with playing fields (for dual use with the community)*
- *up to 300 sq m B1/D1 estate office to include office, marketing suite, conference facility (for dual use with the public) and public heritage centre*
- *country park and meadowland on c 70 ha.*

The details set out in this note, and accompanying Capita Property and Infrastructure drawings, confirm that the site drainage provisions for the current proposals accord in full with the proposed flood risk and drainage strategy for the wider Magna Park Business Park.

Property and infrastructure
1st Floor Oak House, Reeds Crescent, Watford, Hertfordshire
Tel +44 (0)1923 817537 Fax +44 (0)1923 228516 www.capita.co.uk/property
Capita Property and Infrastructure Ltd

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In reviewing this document, reference should be made to the following Contents:-

- Appendix 1
  Planning drawing 3657-30 (latest revision) entitled ‘Site Location Plan’ produced by Chetwoods Architects.

- Ground Investigation Factual 2 Stage Report dated 15 September 2015, produced by Capita Property & Infrastructure.

- Appendix 2
  Topographical survey drawing 20799-OGL Rev 0, entitled ‘Topographical Survey’ produced by Greenhatch Group.

- Technical Guidance to the National Planning Policy Framework (NPPF), March 2012, published by the Department for Communities and Local Government, regarding acceptable surface water run-off from the proposed development and standards for drainage design within the development to control pollution and the promotion / inclusion of suitable Suds measures (available separately).

- Appendix 3
  Greenfield run-off calculations.

- Appendix 4
  Capita drawing 074680-CA-0-GF-DR-S-003-P02 ‘Catchment Areas’.
  Capita drawing 074680-CA-0-GF-DR-S-016-P00 ‘Catchment Areas’.

- Appendix 5
  Capita drawing 074680-CA-0-GF-DR-S-001-P06 ‘Drainage Strategy Sheet 1’
  Capita drawing 074680-CA-0-GF-DR-S-002-P06 ‘Drainage Strategy Sheet 2’
  Capita drawing 074680-CA-0-GF-DR-S-010-P00 ‘Drainage Strategy Units 1, H1 & H2 Sheet 1’
  Capita drawing 074680-CA-0-GF-DR-S-011-P00 ‘Drainage Strategy Units 1, H1 & H2 Sheet 2’
  Capita drawing 074680-CA-0-GF-DR-S-012-P00 ‘Drainage Strategy Units L, J, K1 & K2 Sheet 1’
  Capita drawing 074680-CA-0-GF-DR-S-012-P00 ‘Drainage Strategy Units L, J, K1 & K2 Sheet 2’
  Capita drawing 074680-CA-0-GF-DR-S-012-P00 ‘Drainage Strategy Units L, J, K1 & K2 Sheet 3’
  Capita drawing 074680-CA-0-GF-DR-S-012-P00 ‘Drainage Strategy Units L, J, K1 & K2 Sheet 4’

- Appendix 6
  Surface Water Drainage Design Strategy Calculations.

- Appendix 7
  Environment Agency Flood Map.

This report aims to provide a synopsis of the site drainage strategy and to demonstrate compatibility with the standard requirements of the Environment Agency & NPPF.

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Existing Surface Water Drainage Within The Site Catchment Area

An estimate of the existing Greenfield run-off rate for the site has been assessed using the MicroDrainage software, using the IH 124 method, the resulting green field run-off (QBar) rate for the site has been estimated at 4.4 l/s / ha, with the 1:30 year event estimated at a rate of 6.6 l/s / ha and the 1:100 year +20% climate change event being estimated at a rate of 13.5 l/s / ha. The IH 124 calculations are shown in Appendix 3.

The summary of the overall catchment areas pertaining to the scheme and this report is shown on Capita drawing 074680-CA-0-GF-DR-S-016-P02 & on Capita drawing 074680-CA-0-GF-DR-S-003-P02, located in Appendix 4.

The drawings details the proposed site area (including proposed building context) with the surrounding topography. The surface water catchment areas have been assessed and illustrated on the drawing in numbered catchment areas that currently drain to critical points within the site area. These catchments drain via overland flow, and are directed to a network of existing drainage ditches (shown coloured dark blue on the plan) within the surrounding agricultural fields.

Watercourse 1 (shown on drawing 016) has its source within agricultural fields to the west of the A5 and drains approximately from north west to south east towards the A5 (Watling Street) to a point approximately 200m north of the junction of Main Street (village of Willey) with the A5. It is noted that along this section of the watercourse are a series of sluice gates and ponds, which are anticipated to provide on-line attenuation to the ditch. The ditch then passes under the A5 via a 1050mm & 900mm diameter culvert where it enters the proposed development site, reverting back to an open ditch for approximately 300m draining from south west to north east to a headwall. At the headwall the ditch reverts to a 1500 diameter culvert approximately 55m long (which passes under the disused railway line embankment from west to east) flowing in an approximate west to east direction. From this location the watercourse reverts back to a short length of ditch (approximately 25m) before reverting back to a 2nd 1500 diameter culvert approximately 10m long flowing to the north east, before reverting back to an open ditch. This ditch is approximately 660m long flowing approximately from south to north (with a meandering section) the ditch ending at a headwall to facilitate a further crossing under the disused railway embankment. At a point approximately 25m from the start of this section of ditch is the junction with Watercourse 2. Within the meandering section is a small footbridge which is formed by a short culvert section. From the headwall the ditch reverts to a brickwork railway tunnel flowing from south east to north west, passing under the disused railway embankment for a distance of approximately 90m. From this point the watercourse reverts back to an open ditch flowing from south east to north west to a steel bridge crossing at the northern site boundary of the proposed development site. From this point the ditch continues towards the north via a series of meandering sections.

Watercourse 2 (shown on drawing 016) has its source within the Magna Park I Storage Pond to the north west of the Magna Park I development south of Mere Lane. The ditch is culverted under Mere Lane and flows from south to north for approximately 480m before joining Watercourse 3 at a location north west of the proposed Magna Park II Plot 1 (Unit G) development site.

Watercourse 3 (shown on drawing 016) has its source within the agricultural land to the north of the Plot 1 (Unit G). The ditch drains from north east to south west north of the Plot 1 (Unit G) site where it joins Watercourse 2 and then heads north west to its junction with Watercourse 3 (described above). Within the Plot 1 (Unit G) site, the ditch is culverted in 3 areas as detailed on drawing 003.

A summary of the catchments draining into the watercourses is described below:

The Plot 1 / Unit G Site:

Catchment 1 is generated from the area to the west of Chuckey Hall including the area around Springfields Farm to the north of Mere Lane. This covers an approximate area of 54.22 hectares, with an estimated resultant Greenfield run-off of 239 l/s. This run-off outflows into the site from Catchment 1 via a 400mm diameter pipe located within the east / west drainage ditch (Watercourse 3) at the site's eastern boundary. It is estimated that this pipe forms a control to the run-off and would restrict flows into the site area to approximately 150 l/s and would cause some exceedance flooding within the adjacent field to the east.

Catchment 2 is generated from within the site area to the west of the 400mm attenuation pipe inlet, bounded by Mere Lane to the south and the upslope to the north, this area drains into Watercourse 3 within the central area of the site. The catchment is assessed separately up to a 1000mm culvert located within the ditch. The catchment area is approximately 13.08 hectares, with an estimated resultant Greenfield run-off of 56 l/s. Within Catchment 2 is located the 'Mere Lane Lagoon', which serves as an attenuation pond for outflows generated from Magna Park 1 Zone 5, this is defined as Catchment 5.

Design data for the Magna Park I surface water drainage network is detailed on Edward Roscoe Associates Drawing 'Magna Park Storage Facilities' No. M6612-200, located in Appendix 5.

The outflow from this pond is controlled to 298 l/s, outfalling into the Watercourse 3 ditch via a 150mm diameter main outlet pipe and 225mm diameter overflow pipe located in the northern area of the attenuation pond. An additional 300mm diameter overflow pipe is located in the western area of the pond, outfalling into a ditch heading north west. Both outlets to the attenuation pond outfall into Watercourse 3 ditch located centrally within the site. It was noted that over several months of monitoring and during reasonable rainfall events, the overflow ditch remained dry as the water levels within the pond did not reach the overflow outlet pipe level. This is an indication that the storage pond is functioning correctly.

Catchment 3 is generated from within the site to the west of the 1000mnm culvert located within Watercourse 3, bounded by Mere Lane to the south and the upslope to the north, this area drains into Watercourse 3 within the central area of the site. The catchment is assessed separately up to a 600mm culvert located within the ditch, just prior to its outfall into the south to north flowing ditch (Watercourse 2) located adjacent to the western boundary of the site. The catchment area is approximately 31.37 hectares, with an estimated resultant Greenfield run-off of 138 l/s.

Catchment 4 is generated from within the site to the west of the 600mm culvert located within Watercourse 3. This catchment is bounded to the north by the residual upslope, to the west by the upslope south & west of Bittesby House and to the south by Mere Lane. The catchment drains into Watercourse 2, exiting the Plot 1 (Unit G) Development site catchment area at the north west corner of the site. The catchment area is approximately 11.17 hectares, with an estimated resultant Greenfield run-off of 49 l/s.

Catchment 5 outfalls into the 'Mere Lane Lagoon' (described above). The catchment area is reported as 32.346 ha with a corresponding controlled run-off of 298 l/s, attenuated within the pond. The attenuated Greenfield outflow is 298 l/s which is directed to the north via a culvert under Mere Lane and outfalls into the Mere Lane Lagoon.

Catchment 6 is generated from Magna Park I, Zone 1 & the Recreational Area, with a total catchment area of 92.406 hectares. The outflow from the catchment is controlled via the Magna Park I storage pond to a reported outflow rate of 791 l/s. This outflow is directed to the north across Mere Lane via a culvert, outfalling into the Watercourse 2 ditch located adjacent to the western boundary of the site.

The total generated Greenfield (QBAR) flow from all catchments flowing through the Plot 1 (Unit G) site and exiting at the north west corner has been calculated at 1,572 l/s, which is accommodated sufficiently within the existing ditch network within the area of the Plot 1 (Unit G) site.

The Expansion Site:

Catchment 7 is generated from the area of agricultural land to the west of the A5 to its boundary with Coal Pit Lane to the west, the change in topography to the north of Penn Lane towards to the B4455 Fosse Way and to by the change in topography to the south / east of the village of Willey, a total area of approximately 535 hectares. This area generates an estimated Greenfield (QBAR) run-off of 2,350 l/s. It is noted however, that along this section of the watercourse are a series of sluice gates and ponds, which are anticipated to provide on-line attenuation to the ditch, reducing the downstream outfall flow rate to the catchment.

Catchment 8 is generated from within the site area and is assessed as the effective area draining to the junction of Watercourse 1 with Watercourse 2. The catchment is currently agricultural land approximately 34 hectares in size generating an approximate Greenfield (QBAR) run-off of 148 l/s.

Catchment 9 is assessed as the area within the development site draining into Watercourse 1 up to the northern boundary of the site beyond the junction of Watercourse 1 and Watercourse 2. The catchment is currently agricultural land approximately 60 hectares in size generating an approximate Greenfield (QBAR) run-off of 263 l/s.

The total generated Greenfield (QBAR) flow from all catchments flowing through the Plot 1 (Unit G) site and within the expansion site has been calculated at 4,339 l/s, which is typically accommodated sufficiently within the existing ditch network and various culverts as detailed in the table below:

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Watercourse 1: Summary of Catchment Drainage

Location Reference	Type	Approximate Greenfield (QBAR) Flow (M^3/s)	Approximate Capacity (M^3/s)	Comments
1	Twin Culverts	2.35	2.19	Culverts **would attenuate Greenfield flows** entering site from the west.
2	Open Ditch	0.15+2.19=2.34	7.51	All Greenfield flows confined within the ditch profile.
3 & 4	Culvert	2.34	7.09	Sufficient capacity to accommodate Greenfield flows.
5	Open Ditch	2.34+1.57=3.91	5.51	Sufficient capacity to accommodate Greenfield flows.
6	Culverted footbridge	3.91+(0.1x0.263)=3.94	2.63	33% under capacity to accommodate estimated Greenfield flows.
7	Open Ditch	3.91+(0.5x0.263)=4.04	19.27	Sufficient capacity to accommodate Greenfield flows.
8	Brickwork Railway Culvert	3.91+(0.6x0.263)=4.07	12.99	Sufficient capacity to accommodate Greenfield flows.
9	Open Ditch	3.91+0.263=4.17	9.06	Sufficient capacity to accommodate Greenfield flows.
10	Steel Bridge Over Ditch	4.17	4.17	Sufficient capacity to accommodate Greenfield flows.

It can be seen from the table above, that the majority of the watercourse within the site area does provide sufficient capacity for the estimated Greenfield flows when the Catchment 1 inlet restriction adjacent to the A5 is taken into account. Based on this, the Environment Agency flood map, detailing the extent of the 0.1% flood appears to be an **over estimation** of the event based on actual site conditions.

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Surface Water Drainage Design Philosophy

Flood level data provided by the Environment Agency (refer to Appendix 7) indicates that the Plot 1 (Unit G) development site is located within Flood Zone 1 and is at low probability of flooding from fluvial or tidal sources. The proposed development areas within the expansion site are also located within Flood Zone 1, although the Environment Agency map does indicate a Zone 2-3 flood following the alignment of Watercourse 1. The extent of this fluvial flood is to be subject to review, based on the constraint at Location 1 detailed above. However it has been shown that the exent of the flood zone is an over estimation.

In accordance with the requirements of NPPF, a review of the development site was undertaken for the use of suitable SUD's techniques. Storage ponds, ditches and below ground cellular storage vessels have been utilised along with suitable off-site flow controls. However, due to the low permeability of the underlying strata across the site, it is not practicable to rely on infiltration techniques. Refer to Capita Property and Infrastructure Ground Investigation 2 Stage Report dated 15 September 2015. It is evident that the near-surface geology predominantly comprises of soft to firm clay soils, with thin bands of granular material, up to 2.0 mbgl. Below which the Oadby Member graded to stiff grey clay. The site is therefore not suitable for infiltration drainage.

The drainage will be designed in accordance with the requirements of BS EN 752-2008 and the current Building Regulations Part H.

From Appendix 3, all surface water discharge rates & storage systems detailed are based on an allowable `Greenfield' (QBAR) discharge rate of 4.4 l/sec/ha for all rainfall events up to and including the 1:100 year +20% for climate change event.

Presently the site is classed as 'Greenfield' and Sustainable Drainage Systems (SUDS) have been incorporated within the site in the form of attenuation swales / storage ponds and areas of permeable paving within the proposed car parking areas.

The on-site surface water drainage networks has been designed in accordance with the requirements of BS EN 752:2008, namely no surcharging during a critical storm event of 1 in 2 years return period and no flooding during a critical storm event of 1 in 30 years return period..

In addition, in accordance with the Environment Agency's requirements, via PPS25 (Planning Policy Statement 25 – Development and Flood Risk) and ICOPS (Interim Code of Practice for Sustainable Drainage Systems), the flows and volumes produced from critical storm events in excess of 1 in 30 years up to 1 in 100 years return period, plus a 20% allowance for climate change, have been assessed.

Above ground flood waters over and above a return period of 1 in 30 years are designed to be contained within the site, within the drainage network, attenuation pipes and attenuation ponds, which have been designed to contain critical design storms up to and including a 1 in 100 year return period plus a 20% allowance for climate change in accordance with Environment Agency & NPPF requirements.

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Surface Water Drainage Design Strategy

The proposed drainage design layout drawings are located in Appendix 5.

The proposed drainage design incorporates a diversion to Ditches A, B & C.

Surface water drainage strategy design storage calculations are located in Appendix 6.

Proposed Building & Service Yard Unit G,

Run-off from the proposed buildings and the service yard areas is to be directed via a siphonic roof drainage system into Tubosider storage / drainage pipes and located within the service yard. The Tubosider storage pipes will contain and direct flows towards a series of outfalls into the adjacent multi-basin attenuation pond, noted as Entry Swale, Attenuation Pond 'A', Attenuation Pond 'B' & Attenuation Pond 'C'. Sufficient storage is provided with the combination of the Tubosider pipes and the attenuation ponds to contain all volumes generated from storms up to and including a 1:100 year +20% return period event.

The Attenuation ponds are designed as a linked series of basins, containing deepened sections 'ephemeral ponds' which will remain permanently wet. The basins are linked by spillways which will direct flows between each basin. At the upper entry swale basin, a slightly raised spillway will ensure the entry swale area is also maintained as a permanently wet area. These are proposed to encourage bio-diversity within the attenuation ponds.

Surface water is not directed from the proposed site into the entry swale area, the entry swale is charged by surface water flows from the adjacent 'Mere Lane Lagoon' with a new outfall being directed to the head of the swale, via a new headwall constructed within the lake and proposed link pipe network. This proposed connection will be attenuated to a maximum flow of 10 l/s by use of a Hydrobrake flow control device fitted to the proposed outfall from the lake.

The ephemeral pond area and entry swale area will be lined with an impermeable liner to prevent softening of the sub-grade, as these areas will typically remain permanently 'wet' under normal conditions.

Outlet flows from the proposed attenuation ponds will be directed via a headwall located in the north west corner of Attenuation Pond 'C', linking to a series of Tubosider drainage flow pipes located within the proposed visual obstruction bund located to the north of the new building running east / west from the Mere Lane Lagoon, to the proposed car parking area off the building's north west corner. The Tubosider pipes are directed via a new headwall connection to the existing drainage ditch off the north west corner of the site. Upstream of the connection with the Tubosider pipes, a flow control manhole containing a Hydrobrake flow control devise is to be installed to restrict all flows from the attenuation ponds to the required Greenfield run-off rate plus the additional 10 l/s from the Mere Lane Lagoon inlet, a total maximum outflow rate of 85 l/s.

Proposed Car Park & Access Roads Unit G

The proposed car park area located to the west of the building is to be drained via a series of linked permeable paving areas constructed within the car parking bays. The parking bays are linked by a series of permeable sub-base channels, constructed between bays within the isles of the car park. The car parking area is to be constructed with a crossfall slope, enabling the isles of the car park to discharge into the adjacent car parking bays directly via the permeable paving links or via short sections of drainage channels. All the permeable paving parking bay areas are to incorporate proprietary biological filters to remove any hydrocarbons that may be present within the car park run-off. Silt pit outfalls chambers are provided to the lower car parking bays to provide a series of drainage outfalls from the car park system.

The main access road and service yard access road spur are to be drained via a series of linked proprietary drainage channels. These channels will contain a series of silt pit outfall chambers to provide the main channel surface water drainage outfalls and prevent silt entering the surface water drainage storage system.

The car park permeable paving & access road outfalls are directed to a storage system located within the access road. A Hydrobrake flow control device will be installed within the outfall manhole to the proposed storage system, which will attenuate flows to the required Greenfield rate of 12 l/s. The resultant storage volume from all storms up to and including the 1:100 year return period +20% allowance for climate change event will be contained within the surface water storage system. This will ensure no surface flooding occurs for all storms up to and including this event since any surface flooding could not be contained on site due to the proposed topography.

Spine Road

The Spine Road is to be drained via a series of gullies and carrier pipes with outfalls to storage swales / wetland areas providing both attenuation & tertiary water treatment. The swales will be designed to attenuate the run-off to the equivalent QBAR Greenfield flow rate.

Proposed Unit H1

The building roof areas and service yards are to be directed via siphonic roof drainage systems to series of storage pipes and storage / transport swale with an attenuation control located to the outfall. The system incorporates a controlled outfall to re-aligned Ditch C, to the equivalent QBAR Greenfield flow rate. The car parking is to be constructed of permeable paving, providing sufficient storage to restrict flows to the equivalent QBAR Greenfield flow rate to an outfall to diverted ditch C.

Proposed Unit H2

The building service yards are to be directed via a series of storage pipes and storage / transport swale with a storage pipe located below & along its length, outfalling into a storage swale incorporating ephemeral ponds, with an attenuation control located to the outfall. The system incorporates a controlled outfall to re-aligned Ditch C, to the equivalent QBAR Greenfield flow rate. The car parking is to be constructed of permeable paving, The building roof areas are to be directed via siphonic roof drainage systems to the permeable sub-base of the car park areas with the permeable paving providing sufficient storage to restrict flows to the equivalent QBAR Greenfield flow rate to an outfall to diverted ditch.

Proposed Unit 1

The building service yards are to be directed via Tubosider storage pipe systems to an attenuation storage swale incorporating ephemeral ponds, with an attenuation control located to the outfall. The building roof areas are to be directed via siphonic roof drainage systems and piped drainage to the attenuation storage swale. The system incorporates a controlled outfall to re-aligned Ditch C, to the equivalent QBAR Greenfield flow rate. The car parking is to be constructed of permeable paving, providing sufficient storage to restrict flows to the equivalent QBAR Greenfield flow rate to an outfall to diverted ditch C.

Proposed Unit E1

The car parking is to be constructed of permeable paving, providing sufficient storage to restrict flows to the equivalent QBAR Greenfield flow rate to an outfall to diverted ditch C. The building roof run-off is to be directed via herringbone inlet pipes to the permeable sub-base of the car parking. The outlet to the permeable car parking area to incorporate a restricted outfall flow control to restrict flows to the equivalent QBAR Greenfield flow rate.

Proposed Sports Pitches & Units E2 & E3

The sports pitches are to incorporate a land drainage system providing sufficient drainage in accordance with Sport England requirements. The flows generated from which are to be directed via gravity pipework to an attenuation storage swale located adjacent to the Spine Road. The car parking areas to Units E2 & E3 are to be drained via a series of channel drains and piped drainage systems to the attenuation storage swale. The building roof areas to be drained via traditional rainwater pipes and gutter systems, directed via piped drainage to the attenuation storage swale. The swale incorporates a flow control device located at the outfall, to control flows to the equivalent QBAR Greenfield flow rate with the swale suitably sized accordingly.

Proposed Unit J

The roof area is to be directed via siphonic roof drainage systems to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units. The service yard areas are drained via suitable channel drainage systems to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units. The car parking area to be constructed of permeable paving incorporating an uncontrolled outfall to the north via a piped drainage system directed to the combined overall wetland / storage area to the north east of the units.

Proposed Unit K1

The roof area is to be directed via 2No. siphonic roof drainage systems, the northern system directed to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units, with the southern system directed to a transportation swale located between Units K1 & K2, with flows directed to the north to an outfall to the combined overall wetland / storage area to the north east of the units. The service yard areas are drained via suitable channel drainage systems to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units. The car parking area to be constructed of permeable paving incorporating an uncontrolled outfall to the west via the transport swale located between Units K1 & K2 directed to the combined overall wetland / storage area to the north east of the units.

Proposed Unit K2

The roof area is to be directed via 2No. siphonic roof drainage systems, the northern system directed to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units, with the southern system directed to a transportation swale located between Units K1 & K2, with flows directed to the north to an outfall to the combined overall wetland / storage area to the north east of the units. The service yard areas are drained via suitable channel drainage systems to a piped drainage network directed to the combined overall wetland / storage area to the north east of the units. The car parking area to be constructed of permeable paving incorporating an uncontrolled outfall to the west via the transport swale located between Units K1 & K2 directed to the combined overall wetland / storage area to the north east of the units.

Proposed Unit L

The roof area is to be directed via siphonic roof drainage system to a piped drainage network directed to the Ditch A diversion to the north west of Unit L, outfalling into the combined overall wetland / storage area to the north east of the units. The service yard areas are drained via suitable channel drainage systems to a piped drainage network directed to the Ditch A diversion. The car parking area to be constructed of permeable paving incorporating an uncontrolled outfall to the west via a piped drainage system directed to the Ditch A diversion.

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Pollution Control Proposals

A suitable oil separator and treatment will be provided in accordance with the guidance of the Environment Agency's Pollution Prevention Guidance Document 3 2006 to all the service yard areas to the approval of the Environment Agency. The interceptors will be of the Class 1 type, designed to achieve a discharge of less than 5 mg/litre of oil under standard conditions.

Silts will be prevented from entering the surface water drainage system by use of deep trapped gullies, channels with silt traps, catchpit manholes and suitable silt containment provision within the interceptors.

Further secondary treatment will be provided by the attenuation ponds, within the transport / storage swales & additional ephemeral pond areas due settlement of any residual silt during low flow conditions and the promotion of good biodiversity via suitable plant growth within the ponds themselves.

Any facilities for the storage of oils, fuels or chemicals shall be sited on impervious bases and surrounded by impervious bund walls. The volume of the bunded compound shall be at least equivalent to the capacity of the tank plus 10%. If there is multiple tankage, the compound shall be at least equivalent to the capacity of the largest tank, vessel or the combined capacity of the interconnected tanks or vessels plus 10%. All filling points, associated pipework, vents, gauges and sight glasses must be located within the bund or have separate secondary containment. The drainage system of the bund shall be sealed with no discharge to any watercourse, land or underground strata. Associated pipework shall be located above ground and protected from accidental damage. All filling points and tank / vessels overflow pipe outlets shall be detailed to discharge downwards into the bund.

Roof water will not be drained through the petrol separators.

The proposed re-fuelling facility (To Plot 1 / Unit G) will be drained via a separate forecourt separator, designed by specialist forecourt supplier to the approval of the Environment Agency.

The proposed vehicle wash facility (To Plot 1 / Unit G) will be isolated from the service yard area via a series of channel drains and will discharge via a suitable Class 2 separator to the foul drainage network. The separator will be designed by specialist supplier to the approval of the Environment Agency.

All manhole covers will be badged 'FW' for foul water and 'SW' for surface water to identify the drainage networks and assist in preventing accidental pollution incidents.

The proposed car parking permeable paving areas will be designed to incorporate a biological filter membrane, capable of removing hydrocarbons to the equivalent level of the Class 1 bypass interceptor in accordance with Environment Agency requirements.

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Foul Water Drainage Design Strategy

The foul water from the proposed Plot 1 / Unit G scheme will drain via a separate gravity system and will be directed to the proposed pump station located within south west corner of the service yard, via suitably sized gravity pipes. The network will include a condensate connection from the adjacent sprinkler tanks area and a foul water connection form the proposed gatehouse.

The pump station will be designed by specialist to accommodate the peak foul water flows generated from the site. These flows will be directed via a proposed rising main connection to the existing Magna Park I sewage treatment facility to the south the site to the east of Mere Lane.

The foul water from the proposed Units H1, H2 & 1 are to be directed via a gravity drainage system to a pump station located to the east of the Spine Road, fronting Unit H2. The pump station will be designed by specialist to accommodate the peak foul water flows generated from the sites. These flows will be directed via a proposed rising main connection to the Plot 1 Site drainage gravity system (adjacent to the gatehouse described above).

New rotating biodisc units will be introduced to the existing Magna Park I sewage treatment facility in order to increase its capacity and accommodate the additional flow.

The foul water from the Heart (Units E1, E2, E3), Units J, K , K1 & K2 will be drained via a separate gravity system to a new sewage treatment plant located to the north east of Unit L. The plant will be designed by specialist to provide outflows to a suitable effluent quality in accordance with the requirements of and under licence from the Environment Agency. The sewage treatment plant will outfall via a gravity piped system into the northern end of the proposed wetland which will incorporate a reed bed lagoon area, providing tertiary treatment and improving the quality of the effluent.

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Conclusions

The surface water drainage strategy has been produced in accordance with the NPPF guidance to ensure all proposed surface water flows generated from all storms up to and including the 1:100 year storm event plus 20% allowance for climate change will be contained on each site and will be attenuated to existing Greenfield levels before being discharged into the surrounding drainage ditch network.

The surrounding drainage ditch network has sufficient capacity to discharge the majority of existing Greenfield flows generated from the site and surrounding catchment, with the area adjacent to Location 6 which is estimated to potentially not have sufficient capacity to be adjacent to proposed weland areas, capable of storing any temporary exceedance flows generated.

No pollution will be allowed to leave the proposed development site into the surrounding drainage ditches in accordance with Environment Agency requirements.

The foul water drainage is to connect into the adjacent Magna Park I sewage works, which will be extended and upgraded to accommodate the proposed increase in flows.

A new sewage treatment plant & tertiary treatment wetland area will be provided in the north west area of the development site, to accomodate & treat to an acceptable effluent quality under Enviroment Agency licence, the remaining foul water flows from the north western units & 'Heart' development.

For and on behalf of
CAPITA PROPERTY AND INFRASTRUCTURE LIMITED

NEIL R. BUTHEE
BSc CEng MIStructE FConsE
DIRECTOR OF STRUCTURAL ENGINEERING

CAPITA

Appendix 1

Planning drawing ‘Site Location Plan’ dwg. No. 3657-31 (latest revision), produced by Chetwoods Architects.

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.

Subject to statutory approvals and survey.

AREAS:
Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.

N

Notes:

This drawing is a collation of information received from Osborne Clarke.

Please note Title Plans have been scaled using Ordnance Survey features which may have altered over time. Complete accuracy cannot be guaranteed without further on-site survey.

Any dimensions given are to be confirmed with site measure.

0m 50m 100m 200m 500m

01 Drawing amended to Site Location Plan 09.09.15 mb

revisions

PLANNING

chetwoods architects

32 Frederick street, Birmingham B1 3HH
T: +44 (0) 121 234 7500 F: +44 (0) 121 234 7501

Project Job Number 3657

MAGNA PARK EXTENSION:
HYBRID PLANNING APPLICATION

IDI Gazeley
Brookfield Logistics Properties

Drawing Title Drawing Size A0

SITE LOCATION PLAN

Drawn RS	Date SEPT 2015	Scale 1:5000	Cadfile 3657
Reviewed by KL	Drawing No. 3657-31		Rev. 01

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Appendix 2

Topographical survey drawing 20799-OGL Rev 0, entitled ‘Topographical Survey’ produced by Greenhatch Group.

N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)	Station	Easting (m)	Northing (m)	Level (m)
GH1	448761.672	286792.223	126.750	GH30	449385.692	286741.192	116.486
GH2	448955.818	286545.872	119.382	GH31	449692.521	286636.704	104.938
GH3	449122.749	286289.941	121.668	GH32	450141.770	286493.387	110.939
GH4	449433.705	285910.584	121.505	GH33	450282.199	286462.090	120.326
GH5	449712.509	285518.128	109.941	GH34	450060.265	286066.088	109.975
GH6	449944.472	285177.854	122.952	GH35	450056.924	285679.654	106.511
GH7	450075.326	285022.989	125.540	GH36	450173.194	285345.227	119.834
GH8	450141.916	284911.205	125.003	GH37	450610.477	286280.378	123.253
GH9	450255.530	284769.064	124.917	GH38	450764.534	286204.179	125.537
GH10	450367.997	284587.808	127.581	GH39	450973.981	286002.877	117.786
GH11	450468.097	284762.825	122.056	GH40	451161.717	285967.655	120.953
GH12	450554.253	284899.049	123.940	GH40A	450695.263	285211.137	121.519
GH13	450567.064	285050.513	121.041				
GH14	450599.289	285119.042	118.739				
GH15	450772.104	285294.621	123.783				
GH16	450893.007	285450.199	123.027				
GH17	450993.758	285557.768	126.062				
GH18	451207.816	285827.939	125.432				
GH19	451356.162	285916.034	126.128				
GH20	449054.500	286415.966	120.100				

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile 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:

Buildings, Wall, Kerb line, Line marking, Drop kerb, Centre line
Overhead Cable, Concrete edge, Tarmac edge, Grass verge, Canopy/Overhang, Verge
1 100.000 — Station and Name, Station Level
Tree / Bush / Sapling
Area of Undergrowth
Woodland
R: Ridge Level
E: Eaves Level
F: Flat Roof Level
Gate

Fence types:
I\W Interwoven
I\R Iron Railings
W\M Wire Mesh
P\R Post & Rail
P\W Post & Wire
C\L Chain Link
W\P Wooden Panels
C\P Concrete Panels
S\P Steel Palisade

IC	Inspection chamber	Boll	Bollard
PInv	Pipe invert	IB	Illuminated bollard
Gy	Gully	Bin	Rubbish bin
Bg	Back gully	Vp	Vent pipe
Dp	Down pipe	Grl	Ground light
Pipe	Pipe above ground	Lbox	Letter box
MH	Manhole	Ldr	Ladder
WL	Water level	Sty	Stile
Fl	Flood light	IFL	Internal floor level
Lp	Lamp post	THL	Threshold level
Tp	Telegraph post	Sp	Sign post
Ep	Electricity post	TH	Trialhole
Tl	Traffic light	BH	Borehole
Bus	Bus stop	ELC	Electric
Sv	Stop valve	BT	British Telecom
St	Stop tap	C'box	Control box
Er	Earth rod	TT	Tactile
Wm	Water meter	BP	Brick paved
Gas	Gas valve	CPS	Concrete paving slabs
Av	Air valve	CVR	Cover
ICU	Unidentified inspection	IC	Inspection chamber
Wo	Wash out	R/wall	Retaining wall
Re	Rodding eye	UTL	Unable to lift
BB	Belisha beacon	TCL	Tree canopy level
CTV	Cable tv	G:	Girth
Mkr	Marker post	MG	Multi girth
Gmkr	Gas marker post	Stmp	Tree Stump
So	Soffit	CL:	Cover level
		IL:	Invert level

Rev	Date	Description	Drawn	Q. Ref.

greenhatch group

Topographical Surveys
Site Engineering
Utility / CCTV Surveys
Measured Building Surveys
3D Laser Scanning
Revit & BIM Models

Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR
Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans	Newcastle	Poland
Unit B, The Courtyard, Alban Park, St Albans, Hertfordshire, AL4 0LA	24 Riverside Studios, Amethyst Road, Newcastle Bus. Park, Newcastle-U-Tyne, NE4 7YL	ul. Panewnicka 91, 40-761 Katowice, Poland
t. (01727) 854481	t. (01912) 736391	t. 0048 32 202 2292 www.greenhatch.pl

CLIENT
Kam Project Consultants Ltd

PROJECT
Project Atlantis
Lutterworth

TITLE
Topographical Survey

SCALE	DATE
A0@ 1: NTS	Oct 2014
DRAWN	QUALITY REF
LM	

Level datum	See OS Note
Grid orientation	See OS Note
Job number	20799

Drawing No.	Rev.
20799 OGL	0

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

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Appendix 3

Greenfield run-off calculations

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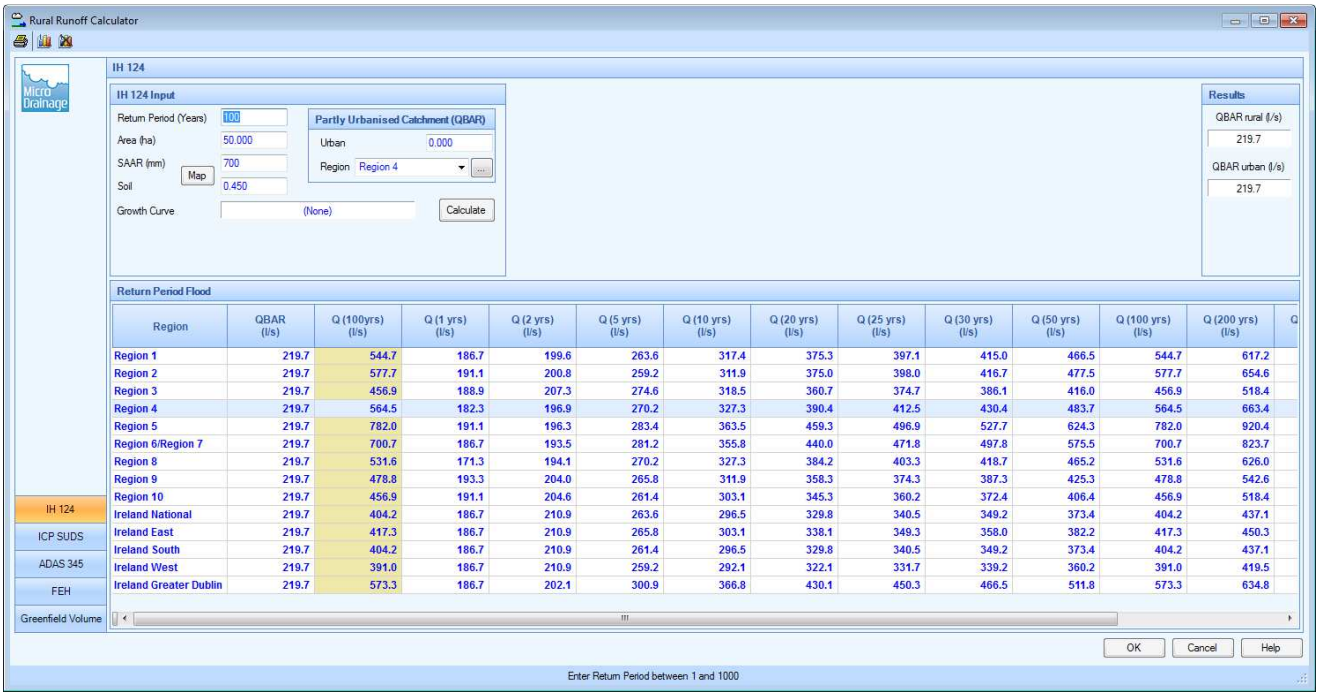
MAGNA PARK EXTENSION: HYBRID PLANNING APPLICATION, RURAL RUNOFF CALCULATION

Rev P00, 11/09/15

MicroDrainage IH 124 Input Data



Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yrs) (l/s)	Q (20 yrs) (l/s)	Q (25 yrs) (l/s)	Q (30 yrs) (l/s)	Q (50 yrs) (l/s)	Q (100 yrs) (l/s)	Q (200 yrs) (l/s)
Region 1	219.7	544.7	186.7	199.6	263.6	317.4	375.3	397.1	415.0	466.5	544.7	617.2
Region 2	219.7	577.7	191.1	200.8	259.2	311.9	375.0	398.0	416.7	477.5	577.7	654.6
Region 3	219.7	456.9	188.9	207.3	274.6	318.5	360.7	374.7	386.1	416.0	456.9	518.4
Region 4	219.7	564.5	182.3	196.9	270.2	327.3	390.4	412.5	430.4	483.7	564.5	663.4
Region 5	219.7	782.0	191.1	196.3	283.4	363.5	459.3	496.9	527.7	624.3	782.0	920.4
Region 6/Region 7	219.7	700.7	186.7	193.5	281.2	355.8	440.0	471.8	497.8	575.5	700.7	823.7
Region 8	219.7	531.6	171.3	194.1	270.2	327.3	384.2	403.3	418.7	465.2	531.6	626.0
Region 9	219.7	478.8	193.3	204.0	265.8	311.9	358.3	374.3	387.3	425.3	478.8	542.6
Region 10	219.7	456.9	191.1	204.6	261.4	303.1	345.3	360.2	372.4	406.4	456.9	518.4
Ireland National	219.7	404.2	186.7	210.9	263.6	296.5	329.8	340.5	349.2	373.4	404.2	437.1
Ireland East	219.7	417.3	186.7	210.9	265.8	303.1	338.1	349.3	358.0	382.2	417.3	450.3
Ireland South	219.7	404.2	186.7	210.9	261.4	296.5	329.8	340.5	349.2	373.4	404.2	437.1
Ireland West	219.7	391.0	186.7	210.9	259.2	292.1	322.1	331.7	339.2	360.2	391.0	419.5
Ireland Greater Dublin	219.7	573.3	186.7	202.1	300.9	366.8	430.1	450.3	466.5	511.8	573.3	634.8

Run of Rate Site Calculation:

(Based on 50 hectare site in this area).

QBAR (mean annual flood flow from a rural catchment), approx. 1:2.3 year return period.

QBAR = 219.7 l/s, flow rate = **4.4 l/s per hectare.**

1:30 year event = 430.4 l/s, flow rate = **8.6 l/s per hectare.**

1:100 year event + 20% climate change = 677.4 l/s, flow rate = **13.5 l/s per hectare.**

Property and infrastructure

1st floor, Oak House, Reeds Crescent, Watford WD24 4PH

Tel 01923 817537 www.capita.co.uk/property
Capita Property and Infrastructure Ltd

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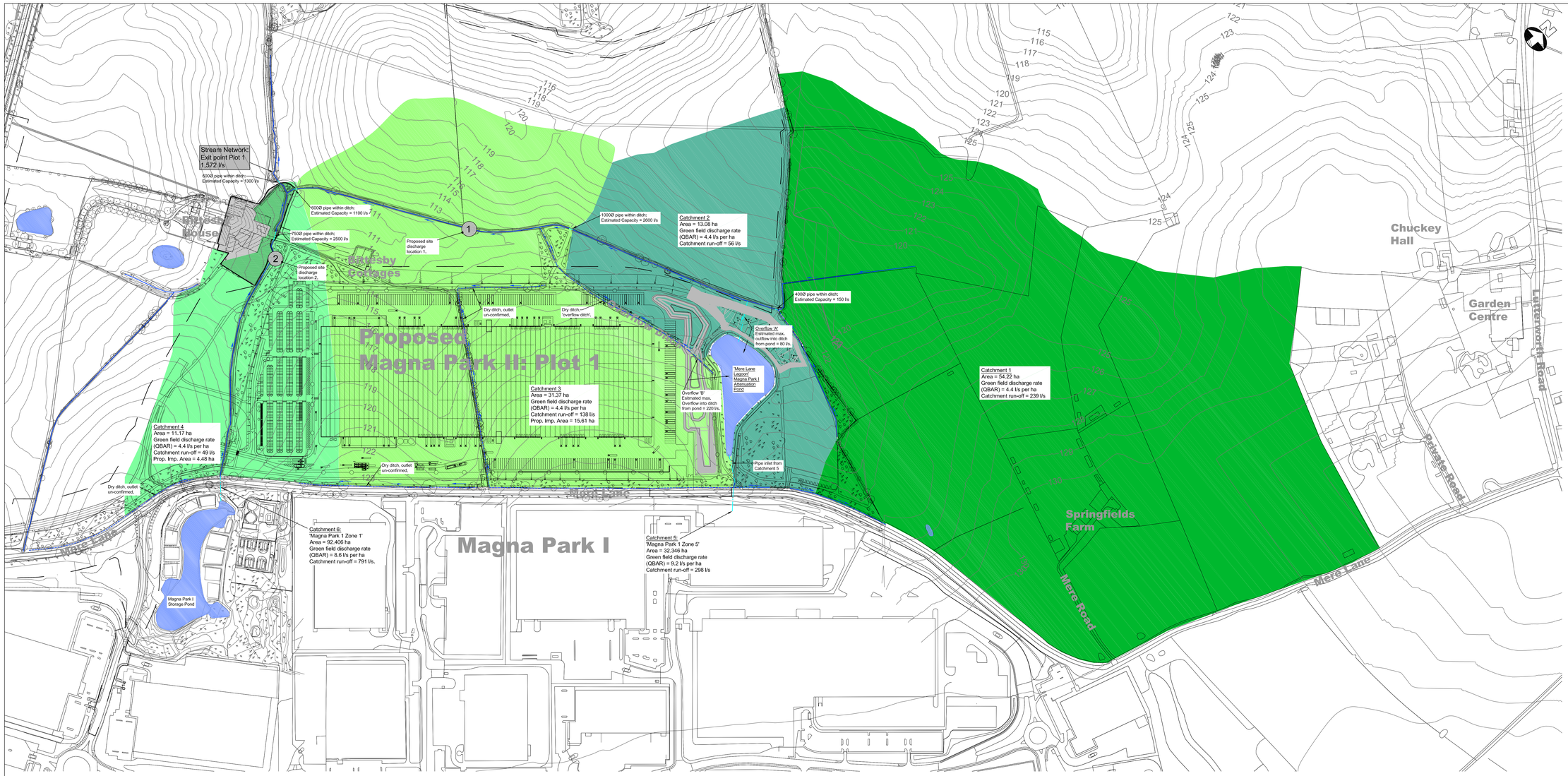
Appendix 4

Capita drawing 074680-CA-0-GF-DR-S-003-P02 ‘Catchment Areas’

Capita drawing 074680-CA-0-GF-DR-S-016-P00 ‘Catchment Areas’



SUMMARY OF CATCHMENT AREAS
(that drain to ditches within the site).

Catchment 1	= 54.22 ha
Catchment 2	= 13.08 ha
Catchment 3	= 31.37 ha
Catchment 4	= 11.17 ha
Total	= 109.84 ha

Greenfield Catchment:
Qbar = 4.4 x 109.84 = 483 l/s

Attenuated Inlet flows from Magna Park I

Zone 1	= 791 l/s
Zone 5	= 298 l/s

Total greenfield flow through ditch
@ exit point of Plot 1 = 1,572 l/s

SCHEDULE OF KEY DESIGN PARAMETERS

Site location greenfield run-off rate (Qbar)	= 4.4 l/s per ha.
Building & service yard	= 16.92 ha
Required storage	= 10,350m3
Greenfield discharge rate	= 74.4 l/s @ location 1
Parking area & access road	= 2.74 ha
Required storage	= 1,680m3
Greenfield discharge rate	= 12.0 l/s @ location 2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing entitled 'Magna Park II Plot 1', 'Site Layout', drawing No. 3662-27, Revision 04.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.
3. Additional off site levels are based on scanned Ordnance Survey map data.

Rev	Date	By	Description	Rev' check
P02	01/06/15	WDJ	Project title updated, layout updated to Architect's latest plan, minor update to notes.	NRB
P01	06/05/15	WDJ	Mere Lane Lagoon title added, site plan updated to Architect's latest design, additional notes added, dwg. ref notes updated, site boundary updated	NRB

Drawing status
PRELIMINARY

Client

Project
MAGNA PARK EXTENSION:
DHL SUPPLY CHAIN

Drawing
CATCHMENT AREAS

Scale @ A0	Drawn	Checked
1:2500	WDJ	NRB
Project No.	**Date**	**Office**
CS/074680	03/03/15	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	originator	zone	level	file type	role	number	revision
074680	- CA-	0 -	GF -	DR -	S -	003 -	P02

CAPITA
Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London Tele No: (+44) 0 20 7870 9300
Watford Tele No: (+44) 0 1923 817537
Manchester Tele No: (+44) 0 161 486 1521
Bristol Tele No: (+44) 0 1275 840831

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Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2018842
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 05.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

Note:
For further details of Magna Park Extension (DHL Supply Chain) catchment areas, refer to dwg. No. 074680-CA-0-GF-DR-S-003.

Note:
For further details of the Magna Park Extension DHL Supply Chain Catchment Areas, refer to drawing No. 074680-CA-0-GF-DR-S-003

Catchment 7
Area = 535 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 2,354 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 4,600 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 7,280 l/s

1050Ø pipe under A5 to ditch assumed to drain western section of catchment.

Ditch A terminates adj. to exig. track, forming localised wet land

Ditch A Catchment
Area = 42 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 185 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 361 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 571 l/s

Ditch B terminates adj. to exig. track, forming localised wet land

Ditch B Catchment
Area = 23,2 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 102 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 200 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 316 l/s

No observed link pipe under A5 catchment assumed to soakaway locally.

Watercourse appears to incorporate a series of sluice controls & attenuation ponds.

Location 1: 1050Ø & 900Ø pipes.
Mannings 'n' = 0,011
Pipes assumed to be @ 0,17% gradient.
Total area = 1,502 m2
Total wetted perimeter = 6,126 m
Approximate Flow Characteristics:
Max, Q = 2,19 m3 / sec
Max, u = 1,46 m / s

Location 2: Ditch.
Mannings 'n' = 0,030
Average channel gradient 0,15%
Average area = 6,88 m2
Average wetted perimeter = 8,93 m
Approximate Flow Characteristics:
Max, Q = 7,51 m3 / sec
Max, u = 1,09 m / s

Location 3: 1500Ø pipe.
Mannings 'n' = 0,011
Pipe @ approx. 0,67% gradient.
Area = 1,767 m2
Wetted perimeter = 4,712 m
Approximate Flow Characteristics:
Max, Q = 6,82 m3 / sec
Max, u = 3,86 m / s

Location 4: 1500Ø pipe.
Mannings 'n' = 0,011
Pipe @ approx. 0,72% gradient.
Area = 1,767 m2
Wetted perimeter = 4,712 m
Approximate Flow Characteristics:
Max, Q = 7,09 m3 / sec
Max, u = 4,01 m / s

Location 5: Ditch.
Mannings 'n' = 0,030
Average channel gradient 0,35%
Average area = 4,53 m2
Average wetted perimeter = 9,32 m
Approximate Flow Characteristics:
Max, Q =5,51 m3 / sec
Max, u = 1,22 m / s

Location 6: Footbridge Culvert.
Mannings 'n' = 0,011
Pipe @ approx. 0,20% gradient.
Area = 1,472 m2
Wetted perimeter = 5,043 m
Approximate Flow Characteristics:
Max, Q = 2,63 m3 / sec
Max, u = 1,79 m / s

Location 7: Ditch.
Mannings 'n' = 0,030
Average channel gradient 0,455%
Average area = 9,31 m2
Average wetted perimeter = 10,54 m
Approximate Flow Characteristics:
Max, Q = 19,27 m3 / sec
Max, u = 2,07 m / s

Location 8: Bwk. (Railway) Culvert.
Mannings 'n' = 0,016
Pipe @ approx. 0,341% gradient.
Average area = 5,571 m2
Average wetted perimeter = 9,14 m
Approximate Flow Characteristics:
Max, Q = 12,99 m3 / sec
Max, u = 2,33 m / s

Location 9: Steel Bridge Over Ditch
Mannings 'n' = 0,030
Average channel gradient 1,30%
Average area = 2,695 m2
Average wetted perimeter = 10,39 m
Approximate Flow Characteristics:
Max, Q = 4,17 m3 / sec
Max, u = 1,55 m / s

Location 9: Ditch.
Mannings 'n' = 0,030
Average channel gradient 0,34%
Average area = 6,29 m2
Average wetted perimeter = 9,80 m
Approximate Flow Characteristics:
Max, Q = 9,06 m3 / sec
Max, u = 1,44 m / s

Final discharge location Magna Park Extension scheme.

Catchment 9
Area = 59,8 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 263 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 514 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 813 l/s

Discharge location DHL Supply Chain Scheme.

Catchment 8
Area = 33,7 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 148 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 290 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 458 l/s

Ditch C terminates in approx. loon, as shown, forming localised wet land

Ditch C Catchment
Area = 19,2 ha
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 84 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 165 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 261 l/s

Magna Park Extension DHL Supply Chain
Total Catchment:
Outfalling Via Watercourse 2
Total Area = 109,94 ha
+ attenuated inlet flows from Magna Park I
Zone 1: = 791 l/s
Zone 5: = 298 l/s
Total addition = 1,089 l/s
Green field discharge rate
(QBAR) = 4.4 l/s per ha
Catchment run-off = 483 + 1,089 = 1,572 l/s
1:30 = 8,6 l/s per ha
Catchment run-off = 944 + 1,089 = 2,034 l/s
1:100+20% = 13,6 l/s per ha
Catchment run-off = 1,494 + 1,089 = 2,583 l/s

Tithe Platts Farm
Spring Farm
Willey Fields Farm
Norwood Farm
Sewage Works
Willey
Mere Lane Lagoon
Bittesby Cottages
Bittesby House
Magna Park I
Attenuation Lagoon
Penn Lane
Green Lane
Coal Pit Lane
B4455
Watercourse
Disused Railway
Watling Street (A5)

Legend

- Approximate existing ground down slope direction.
- Existing ground levels contours @ 1.0m intervals.
- Extent of catchment areas, as noted.
- A — Existing drainage ditch, with reference as shown.
- 1 — Existing watercourse, with reference as shown.
- Area of buildings.
- Route of roadway.

SUMMARY OF CATCHMENT AREAS (that drain to Watercourse 1).

Catchment 1	= 522 ha
Catchment 1a	= 13.4 ha
Catchment 2	= 33.7 ha
Catchment 3	= 59.8 ha
Total	= 628.9 ha

Greenfield Catchment:
Qbar = 4.4 x 628.9 = 2,767 l/s

Inlet flows from Magna Park Extension (DHL Supply Chain) Scheme = 1,572 l/s

Total greenfield flow through ditch @ final discharge location = 4,339 l/s

SCHEDULE OF KEY DESIGN PARAMETERS

Site location greenfield run-off rate (Qbar)	= 4.4 l/s per ha.
1:30 year return period	= 8.6 l/s per ha.
1:100 year return period + 20% C.C.	= 13.6 l/s per ha.
Building service yard & highway	= 62.2 ha
Total greenfield discharge rate	= 273.7 l/s
Required storage	= 39,700m3

Rev	Date	By	Description	Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION
LUTTERWORTH

Drawing
CATCHMENT AREAS

Scale @ A0	Drawn	Checked
1:5000	WDJ	NRB

Project No.	Date	Office
CS/074680	09/09/15	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	origin	zone	level	file type	role	number	revision
074680	- CA-	0 -	GF -	DR -	S -	016 -	P00

CAPITA
Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London
Tele No: (+44) 0 20 7870 9300
Watford
Tele No: (+44) 0 1923 817537
Manchester
Tele No: (+44) 0 161 486 1521
Bristol
Tele No: (+44) 0 1275 840831

Capita Property and Infrastructure Ltd.
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2019542
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Appendix 5

Capita drawing 074680-CA-0-GF-DR-S-001-P06 'Drainage Strategy Sheet 1'

Capita drawing 074680-CA-0-GF-DR-S-002-P06 'Drainage Strategy Sheet 2'

Capita drawing 074680-CA-0-GF-DR-S-010-P00 'Drainage Strategy

Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 1'

Capita drawing 074680-CA-0-GF-DR-S-011-P00 'Drainage Strategy

Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 2'

Capita drawing 074680-CA-0-GF-DR-S-012-P00 'Drainage Strategy

Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 3'

Capita drawing 074680-CA-0-GF-DR-S-013-P00 'Drainage Strategy

Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 4'

Capita drawing 074680-CA-0-GF-DR-S-014-P00 'Drainage Strategy

Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 5'

Capita drawing 074680-CA-0-GF-DR-S-015-P00 'Drainage Strategy

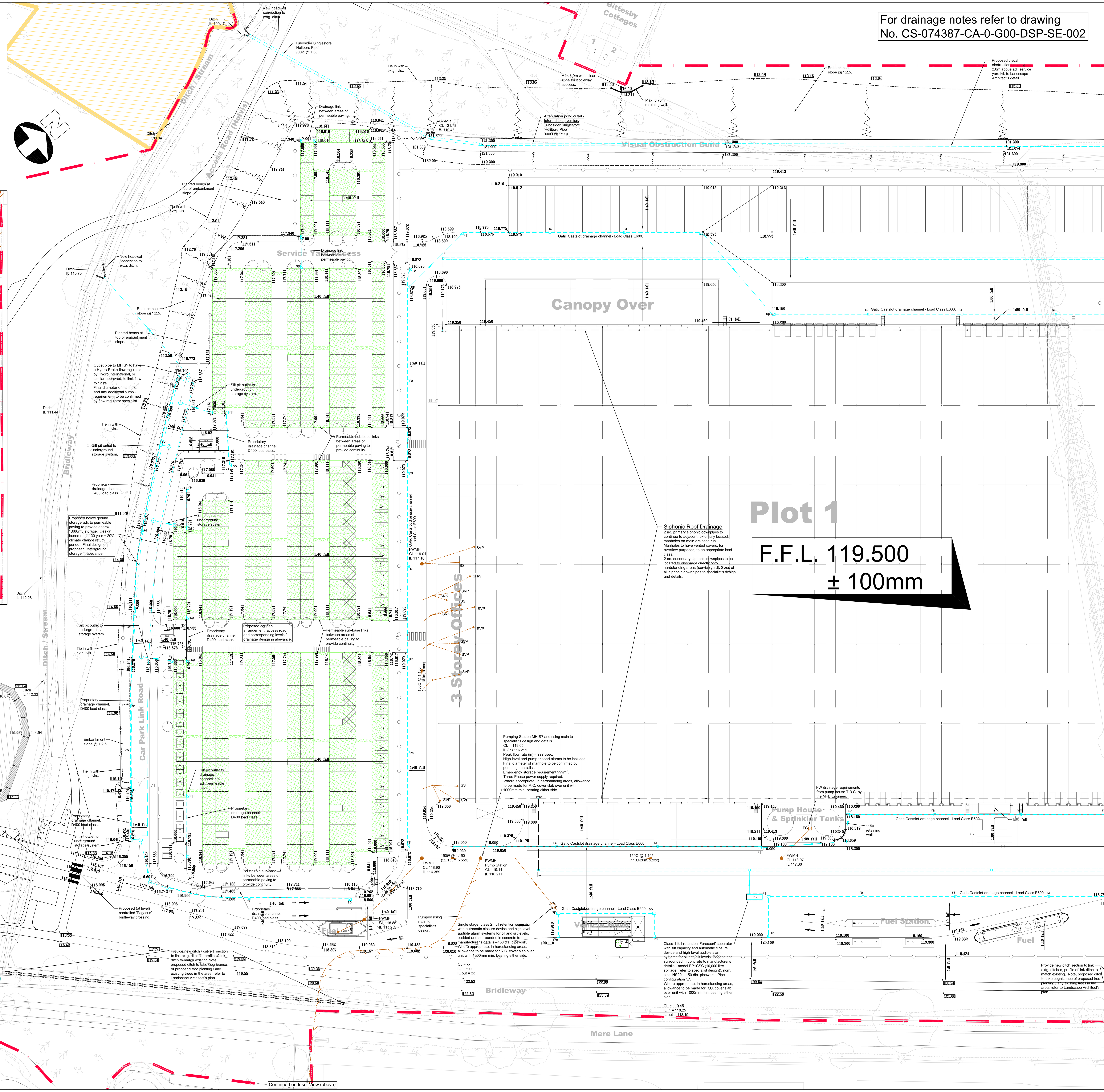
Units L, J, K1 & K2 Units 1, H1 & H2 'Sheet 6'

LEGEND

Symbol	Description
	existing foul water drain with manhole
	existing surface water drain with manhole
	new foul water drain with manhole
	new surface water drain with manhole
	new surface water manhole with vented cover
	linear drainage channel
	flow regulator
	permeable paving
	Existing drainage ditch
162.095	spot level
162.095	existing spot level
	concrete protection to pipework adjacent to tree roots

Abbreviation	Meaning
CL	Cover Level
IL	Invert level
SL	Sump level
S/A	Soakaway
RAI	Reverse Action Interceptor
bd	backdrop
re	rodding eye
svp	soil & vent pipe (rodable)
wvp	waste and vent pipe (rodable)
wp	waste pipe (rodable)
ss	stub stack (rodable)
sg	shower gully (rodable)
sp	silt pit (rodable)
ra	rodding access
rg	450Ø x 900 deep precast concrete trapped, rodable, road gully with grating area greater than 900cm^2
fg	floor gully (rodable)
rwp	rainwater downpipe (rodable)
psdp	primary siphonic downpipe
ssdp	secondary siphonic downpipe
vp	vent pipe (oil separator)
aav	air admittance valve
TOB	Top of base level
CI	Cast Iron
VC	Vitrified Clay
R	Flexible `Rocker' joint
PPIC	Polypropylene inspection chamber

Note: Final setting out of all drainage points at ground level to the Architect's and M and E Engineer's details.



This drawing is copyright and owned by Capita, and is for use on this site only unless contractually stated otherwise.

DO NOT SCALE this drawing (printed or electronic versions). Contractors must check all dimensions from site.

All other design team elements, where indicated, have been imported from the consultant's drawings and reference should be made to the individual consultant's drawings for exact setting out, size and type of component.

Discrepancies and / or ambiguities within this drawing, between it and information given elsewhere, must be reported immediately to the architect for clarification before proceeding.

All works are to be carried out in accordance with the latest British Standards and Codes of Practice unless specifically directed otherwise in the specification.

All setting out to be in accordance with the Architect's details. (the Architect's drawings to take precedence over any setting out shown on this drawing).

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

NOTES:

1. Earthworks volumes are calculated from existing survey information to proposed formation levels and exclude arisings from excavations for drainage and foundations.
2. Cut and fill isopachytes shown on this drawing are calculated from existing survey information to proposed formation levels. As such, they include existing topsoil and existing construction thicknesses unless noted otherwise. They do not include the proposed new construction thicknesses.
3. The cut and fill isopachytes and volumes assume that all cut material are suitable to be re-used as fill material.
4. The topsoil thicknesses and volumes shown on this drawing are assumed and to be confirmed by investigation on site.
5. Additional testing of head deposits is required to certain areas of the site and a volume of material may need to be stabilised prior to reuse as fill material.
6. All earthworks are to be undertaken in conjunction with Capita Symonds' NBS Specification. Full method statement to be provided for approval by the Engineer prior to any work commencing on site.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing entitled 'Magna Park II Plot 1', 'Site Layout', drawing No. 3662-27, Revision 04.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

Rev	Date	By	Description	Rev' check
P06	01/06/15	WDJ	Project title updated, extent of car parking area embankment slopes amended to suit Landscape Architect's comments, FW outfall amended, Notes added re proposed ditches, additional notes added.	NRB
P05	19/05/15	WDJ	Layout updated to Architect's revised plan, car parking area & adj. tie in batters amended, levels & drainage design updated to suit, Bunds style updated & shown consistently throughout drawing, topsoil bunds 'C' & 'D' added, additional notes added.	NRB
P04	06/05/15	WDJ	Layout updated to Architect's revised plan, access road amended, levels & drainage design updated to suit, attenuation pond design amended / reduced to suit design team comments, additional service yard bund added, FW pumped outfall updated & addtional view of STW added, additional notes added.	NRB
P03	19/03/15	WDJ	Layout updated to Architect's revised plan, car parking area and access road amended, levels & drainage design updated to suit, attenuation pond design amended / reduced to suit design team comments, additional notes added.	NRB
P02	06/03/15	WDJ	Levels generally raised by 100mm, pond outlet amended to Tubosider pipes within visual obstruction bund, car parking permeable paving amended and indicatove storage added, additional notes added, Mere lane ditches and treatments shown.	NRB
P01	24/02/15	WDJ	Site design updated to incorporate amended site layout & attenuation pond design, drainage layout updated to suit, additional notes added.	NRB

Drawing status
PRELIMINARY

Client
GAZELEY

Project
MAGNA PARK EXTENSION: DHL SUPPLY CHAIN

Drawing
DRAINAGE STRATEGY SHEET 1

Scale @ A0	Drawn	Checked
1:1000	WDJ	NRB

Project No.	Date	Office
CS/074680	03/06/14	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	origin	zone	level	file type	role	number	revision
074680	CA	0	GF	DR	S	001	P06

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Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London Tele No: (+44) 0 20 7870 9300
Watford Tele No: (+44) 0 1923 817537
Manchester Tele No: (+44) 0 161 486 1521
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SURFACE WATER ONLY
If thermoplastic pipes are to be used they are to be of the structured wall type and shall comply with WIS 4-35-01 and BS EN 13476 and must be BSI Kitemarked (e.g. Polysewer/Ridgisewer by Polypipe Civils, UltraRib by Wavin or similar). Pipes are to be installed strictly in accordance with the manufacturer's requirements and recommendations. Note that all installation must be in accordance with Building Regulations Part: H, BS EN 752:2008, Specification for Highway Works and all relevant British and European Codes of Practice.

Refer to the Architect's details for the internal, above ground, drainage layout.
Recommended minimum gradients for below ground foul drainage connections:
100 dia. at 1:40,
100 dia. at 1:80 with min 1 no. wc connection,
150 dia. at 1:150 with min 5 no. wc connections.
Final foul drainage connections to be coordinated with the Architect's internal drainage layout plans.

Important Note:
The Contractor is to exercise extreme care when excavating for drainage pipes and manholes and not to undermine existing or new column bases and/or strip footings already cast. Refer also to note 4 on this drawing and 'concreting of drains laid near foundations' detail on drawing xxxxxx-CA-0-G00-DAS-SE-00x.

For new construction, column foundations/strip footings must be taken down to below invert level of any nearby, adjacent services (drainage, gas, water, etc.)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

NOTES:

1. Earthworks volumes are calculated from existing survey information to proposed formation levels and exclude arisings from excavations for drainage and foundations.
2. Cut and fill isopachytes shown on this drawing are calculated from existing survey information to proposed formation levels. As such, they include existing topsoil and existing construction thicknesses unless noted otherwise. They do not include the proposed new construction thicknesses.
3. The cut and fill isopachytes and volumes assume that all cut material are suitable to be re-used as fill material.
4. The topsoil thicknesses and volumes shown on this drawing are assumed and to be confirmed by investigation on site.
5. Additional testing of head deposits is required to certain areas of the site and a volume of material may need to be stabilised prior to reuse as fill material.
6. All earthworks are to be undertaken in conjunction with Capita Symonds' NBS Specification. Full method statement to be provided for approval by the Engineer prior to any work commencing on site.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing entitled 'Magna Park II Plot 1', 'Site Layout', drawing No. 3662-27, Revision 04.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Luttenworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

Drainage Notes

1. All private drainage works are to be carried out in accordance with BS EN 752:2008 and Building Regulations Part H.
2. All drainage works within adoptable areas are to comply with the requirements of the Water UK/Water Research Centre publication `Sewers for Adoption' (current edition).
3. All connections to existing public sewers to be in accordance with and to the satisfaction of the Local Authority.
4. Concrete protection (bedding class `Z') to pipework to be provided as follows;
(i) all pipework within soft areas with a cover of less than 600mm.
(ii) all pipework beneath roads, car parks and all other trafficked hardstanding areas with a cover less than 1200mm.
(iii) all pipework adjacent to existing and proposed trees/dense vegetation in landscaped areas.
An expansion joint shall be provided at all joint locations.
5. All below ground foul drainage from within building footprint to be 100mm dia. unless stated otherwise. Refer to separate note for recommended minimum gradients.
All below ground surface water drainage from RWP locations to main carrier drains to match the diameter of the downpipe (to Architect's and specialist contractor's details) unless stated otherwise.
All below ground drainage from road gullies to be 150mm dia. unless stated otherwise.
6. All pipework in manholes are to be laid soffit to soffit unless noted otherwise. All chamber invert levels, shown on the drawing, are for the outgoing pipe.
7. All internal drainage to be to the Architect's and M & E Engineer's drawings and details.
8. The position and invert levels of all existing drains, sewers and manholes to be confirmed by the contractor prior to the commencement of the proposed works and any discrepancies reported immediately to Capita (Property and Infrastructure) Ltd.
9. All pipes are to have a class `S' bed and surround unless noted otherwise (see note 4 above).
10. All concrete pipes are to be high strength and to be in accordance with BS EN 1916 and BS 5911.
11. All vitrified clay pipes are to be in accordance with BS EN 295.
12. Refer to drawing nos. xxxxxx-CA-0-G00-DAS-SE-00x and 00x for drainage construction details.
13. For setting out of foul and rainwater outlets refer to the Architect's drawings.
14. This drawing to be read in conjunction with all other relevant Engineer's and Architect's drawings, specifications and documentation.
15. The contractor is to allow for grease traps in the kitchen and other appropriate areas.
16. Drainage channels and silt pits to be designed by a specialist manufacturer for storms of 1:5 year return period, and a time of entry of 5 minutes, to suit site conditions and in accordance with load class requirements as shown on Capita's drainage layout drawing.
Design to be approved in writing by Capita Property and Infrastructure Ltd. prior to ordering.
17. All external finished levels and manhole cover levels shown on this drawing are indicative and subject to adjustment on site to suit the finished ground levels. For final levels refer to the Architect's drawings.
18. All levels are in metres and all dimensions are in millimetres unless noted otherwise.
19. Any coordinates provided for manholes or inspection chambers are relevant to the main drainage run intersection and not the centre of the manhole.
20. Chalk and limestone are not to be used as bedding or backfilling material in soils with a pH value less than 7.
21. A CCTV drainage survey is to be carried out both at the pre-commencement of construction and at the completion of the contract to prove the integrity of the as-built drainage systems. At the completion of the contract this is to be carried out prior to the issue of the practical completion certificate.
22. Sewers, manholes, gullies, drainage channels, silt pits and flow controls should be inspected and cleaned out as necessary at 6 monthly intervals. A full CCTV survey should also be carried out at 10 yearly intervals. Refer also to specialist drainage channel and oil separator manufacturer's information and maintenance requirements.
In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in `Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services.

Rev	Date	By	Description	Rev' check
P06	01/06/15	WDJ	Project title updated, extent of Area 'A' topsoil bund reduced, to suit Landscape Architect's comments, additional notes added.	NRB
P05	19/05/15	WDJ	Layout updated to Architect's revised plan, levels & drainage design updated to suit, Bunds style updated & shown consistently throughout drawing, additional notes added.	NRB
P04	06/05/15	WDJ	Layout updated to Architect's revised plan, access road amended, levels & drainage design updated to suit, attenuation pond design amended / reduced to suit design team comments, additional service yard bund added, additional notes added.	NRB
P03	19/03/15	WDJ	Layout updated to Architect's revised plan, car parking area and access road amended, levels & drainage design updated to suit, attenuation pond design amended / reduced to suit design team comments, additional notes added.	NRB
P02	06/03/15	WDJ	Levels generally raised by 100mm, attenuation pond design updated to incorporate Landscape Architect's comments, pond outlet amended to Tubosider pipes within visual obstruction bund and Inlet added, diversion added to Magna Park I attenuation pond outlet, additional low flow outlet added, additional notes added. Mere Lane ditches & treatments shown.	NRB
P01	24/02/15	WDJ	Site design updated to incorporate amended site layout & attenuation pond design, drainage layout updated to suit, additional notes added.	NRB

Drawing status
PRELIMINARY

Client
GAZELEY

Project
MAGNA PARK EXTENSION: DHL SUPPLY CHAIN

Drawing
DRAINAGE STRATEGY SHEET 2

Scale @ A0	Drawn	Checked
1:500	WDJ	NRB
Project No.	Date	Office
CS/074680	03/06/14	WATFORD

Drawing Identifier (BS1192:2007 / Avanti Compliant)
project origin zone level file type role number revision
074680 -CA- 0 - GF - DR - S - 002 - P06

CAPITA
Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers
London Tele No: (+44) 0 20 7870 9300
Watford Tele No: (+44) 0 1923 817537
Manchester Tele No: (+44) 0 161 486 1521
Bristol Tele No: (+44) 0 1275 840631
Capita Property and Infrastructure Ltd.
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2019542
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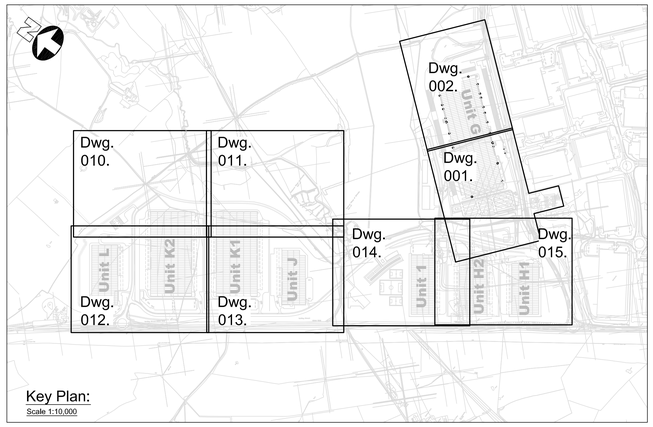

Key Plan:

Scale 1:10,000

LEGEND

- existing foul water drain with manhole
- existing surface water drain with manhole
- new foul water drain with manhole
- new surface water drain with manhole
- new surface water manhole with vented cover
- linear drainage channel
- flow regulator
- permeable paving
- Existing drainage ditch
- 162.095 spot level
- 162.095 existing spot level
- concrete protection to pipework adjacent to tree roots

CL	Cover Level
IL	Invert level
SL	Sump level
S/A	Soakaway
RAI	Reverse Action Interceptor
bd	backdrop
re	rodding eye
svp	soil & vent pipe (rodable)
wvp	waste and vent pipe (rodable)
wp	waste pipe (rodable)
ss	stub stack (rodable)
sg	shower gully (rodable)
sp	silt pit (rodable)
ra	rodding access
rg	450ø x 900 deep precast concrete trapped, rodable, road gully with grating area greater than 900cm²
fg	floor gully (rodable)
rwp	rainwater downpipe (rodable)
psdp	primary siphonic downpipe
ssdp	secondary siphonic downpipe
vp	vent pipe (oil separator)
aav	air admittance valve
TOB	Top of base level
CI	Cast Iron
VC	Vitrified Clay
R	Flexible `Rocker' joint
PPIC	Polypropylene inspection chamber

Note: Final setting out of all drainage points at ground level to the Architect's and M and E Engineer's details.

Drainage Notes

1. All private drainage works are to be carried out in accordance with BS EN 752:2008 and Building Regulations Part H.

2. All drainage works within adoptable areas are to comply with the requirements of the Water UK/Water Research Centre publication `Sewers for Adoption' (current edition).

3. All connections to existing public sewers to be in accordance with and to the satisfaction of the Local Authority.

4. Concrete protection (bedding class `Z') to pipework to be provided as follows;
(i) all pipework within soft areas with a cover of less than 600mm,
(ii) all pipework beneath roads, car parks and all other trafficked hardstanding areas with a cover less than 1200mm,
(iii) all pipework adjacent to existing and proposed trees/dense vegetation in landscaped areas.
An expansion joint shall be provided at all joint locations.

5. All below ground foul drainage from within building footprint to be 100mm dia. unless stated otherwise. Refer to separate note for recommended minimum gradients.
All below ground surface water drainage from RWP locations to main carrier drains to match the diameter of the downpipe (to Architect's and specialist contractor's details) unless stated otherwise.
All below ground drainage from road gullies to be 150mm dia. unless stated otherwise.

6. All pipework in manholes are to be laid soffit to soffit unless noted otherwise. All chamber invert levels, shown on the drawing, are for the outgoing pipe.

7. All internal drainage to be to the Architect's and M & E Engineer's drawings and details.

8. The position and invert levels of all existing drains, sewers and manholes to be confirmed by the contractor prior to the commencement of the proposed works and any discrepancies reported immediately to Capita (Property and Infrastructure) Ltd.

9. All pipes are to have a class `S' bed and surround unless noted otherwise (see note 4 above).

10. All concrete pipes are to be high strength and to be in accordance with BS EN 1916 and BS 5911.

11. All vitrified clay pipes are to be in accordance with BS EN 295.

12. Refer to drawing nos. xxxxxx-CA-0-G00-DAS-SE-00x and 00x for drainage construction details.

13. For setting out of foul and rainwater outlets refer to the Architect's drawings.

14. This drawing to be read in conjunction with all other relevant Engineer's and Architect's drawings, specifications and documentation.

15. The contractor is to allow for grease traps in the kitchen and other appropriate areas.

16. Drainage channels and silt pits to be designed by a specialist manufacturer for storms of 1:5 year return period, and a time of entry of 5 minutes, to suit site conditions and in accordance with load class requirements as shown on Capita's drainage layout drawing. Design to be approved in writing by Capita Property and Infrastructure Ltd. prior to ordering.

17. All external finished levels and manhole cover levels shown on this drawing are indicative and subject to adjustment on site to suit the finished ground levels. For finall levels refer to the Architect's drawings.

18. All levels are in metres and all dimensions are in millimetres unless noted otherwise.

19. Any coordinates provided for manholes or inspection chambers are relevant to the main drainage run intersection and not the centre of the manhole.

20. Chalk and limestone are not to be used as bedding or backfilling material in soils with a pH value less than 7.

21. A CCTV drainage survey is to be carried out both at the pre-commencement of construction and at the completion of the contract to prove the integrity of the as-built drainage systems. At the completion of the contract this is to be carried out prior to the issue of the practical completion certificate.

22. Sewers, manholes, gullies, drainage channels, silt pits and flow controls should be inspected and cleaned out as necessary at 6 monthly intervals. A full CCTV survey should also be carried out at 5 yearly intervals. Refer also to specialist drainage channel and oil separator manufacturer's information and maintenance requirements. In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in `Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services.

Refer to the Architect's details for the internal, above ground, drainage layout.
Recommended minimum gradients for below ground foul drainage connections:
100 dia. at 1:40,
100 dia. at 1:80 with min 1 no. wc connection,
150 dia. at 1:150 with min 5 no. wc connections.
Final foul drainage connections to be coordinated with the Architect's internal drainage layout plans.

Important Note:
The Contractor is to exercise extreme care when excavating for drainage pipes and manholes and not to undermine existing or new column bases and/or strip footings already cast. Refer also to note 4 on this drawing and `concreting of drains laid near foundations' detail on drawing xxxxxx-CA-0-G00-DAS-SE-00x.

For new construction, column foundations/strip footings must be taken down to below invert level of any nearby, adjacent services (drainage, gas, water, etc.)

SURFACE WATER ONLY
If thermoplastic pipes are to be used they are to be of the structured wall type and shall comply with WIS 4-35-01 and BS EN 13476 and must be BSI Kitemarked (e.g. Polysewer/Ridgisewer by Polypipe Civils, UltraRib by Wavin or similar). Pipes are to be installed strictly in accordance with the manufacturer's requirements and recommendations. Note that all installation must be in accordance with Building Regulations Part: H, BS EN 752:2008, Specification for Highway Works and all relevant British and European Codes of Practice.

Sewage Treatment Plant: Location / discharge quality subject to licence agreement with the Environment Agency.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 1,868m2
Type `Spel P040/1CSC' - max. 300 dia. pipework, or similar approved.
Max. 2,222m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

Note:
Storage swale / wetland for Spine Road drainage, sized to attenuate to greenfield run-off.

Inlet to wetland habitat, forming tertiary treatment to effluent from sewage treatment plant.

Maintain extg. 5000w bridge above watercourse

Culvert.

Drainage Ditch

Sewage Treatment Plant

Siphonic Roof Drainage

7 no. primary siphonic downpipes to continue to adjacent, externally located, manholes on main drainage run.
Manholes to have vented covers, for overflow purposes, to an appropriate load class.
7 no. secondary siphonic downpipes to be located to discharge directly onto hardstanding areas. Sizes of all siphonic downpipes to specialist's design and details.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 20,080

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 23,560m2
Type `Spel P500/1CSC' - max. 600 dia. pipework, or similar approved.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 05.

2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

Rev	Date	By	Description	Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION
LUTTERWORTH

Drawing
DRAINAGE STRATEGY:
UNITS L, J, K1 & K2
UNITS 1, H1 & H2
(SHEET 1)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	Date	Office
CS/074680	09/09/15	WATFORD

Drawing Identifier (BS1192:2007 / Avanti Compliant)

project	origin	zone	level	file type	role	number	revision
074680	- CA-	0 -	GF -	DR -	S -	010 -	P00

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Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London
Tele No: (+44) 0 20 7870 9300

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Tele No: (+44) 0 1923 817537

Manchester
Tele No: (+44) 0 161 486 1521

Bristol
Tele No: (+44) 0 1275 840631

Capita Property and Infrastructure Ltd.
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2019542

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

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2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

For drainage notes & legend refer to drawing No. CS-074680-CA-0-GF-DR-S-010

Watercourse

Maintain extg. 2000w x 3000h bwk. culvert.

Extg. ditch outlet to wetland area maintained / re-used, as shown.

Outlet pipe to wetland ditch to have a weir flow regulator, to limit flow to 177 l/s greenfield run-off.
Volume =

based on 4.4 l/s per ha greenfield run-off

= 38.1 ha (site) + 2.2 ha (A5) = 40.3 x 4.4 = 177 l/s.

approx. reqd. storage volume = 26,300m3 based on 1:100 year +20% cc design.

Wetland Area (refer to Landscape Architect's details)

Watercourse

Medieval Village of Bittesby (site of)

Bridleway

Maintain extg. 2000x950 bwk. arch bridge.

Siphonic Roof Drainage

7 no. primary siphonic downpipes to continue to adjacent, externally located, manholes on main drainage run.
Manholes to have vented covers, for overflow purposes, to an appropriate load class.
7 no. secondary siphonic downpipes to be located to discharge directly onto hardstanding areas. Sizes of all siphonic downpipes to specialist's design and details.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 21,650m2
Type `Spel P400/1QSC' - max. 600 dia. pipework, or similar approved.
Max. 22,220m2 area.
Where appropriate, In hardstanding areas

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's

Rev	Date	By	Description	Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION
LUTTERWORTH

Drawing
DRAINAGE STRATEGY:
UNITS L, J, K1 & K2
UNITS 1, H1 & H2
(SHEET 2)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	**Date**	**Office**
CS/074680	09/09/15	WATFORD

Drawing Identifier (BS1192:2007 / Avanti Compliant)

project	origin	zone	level	file type	role	number	revision
074680	CA	0	GF	DR	S	011	P00

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Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London
Tele No: (+44) 0 20 7870 9300

Watford
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Capita Property and Infrastructure Ltd.
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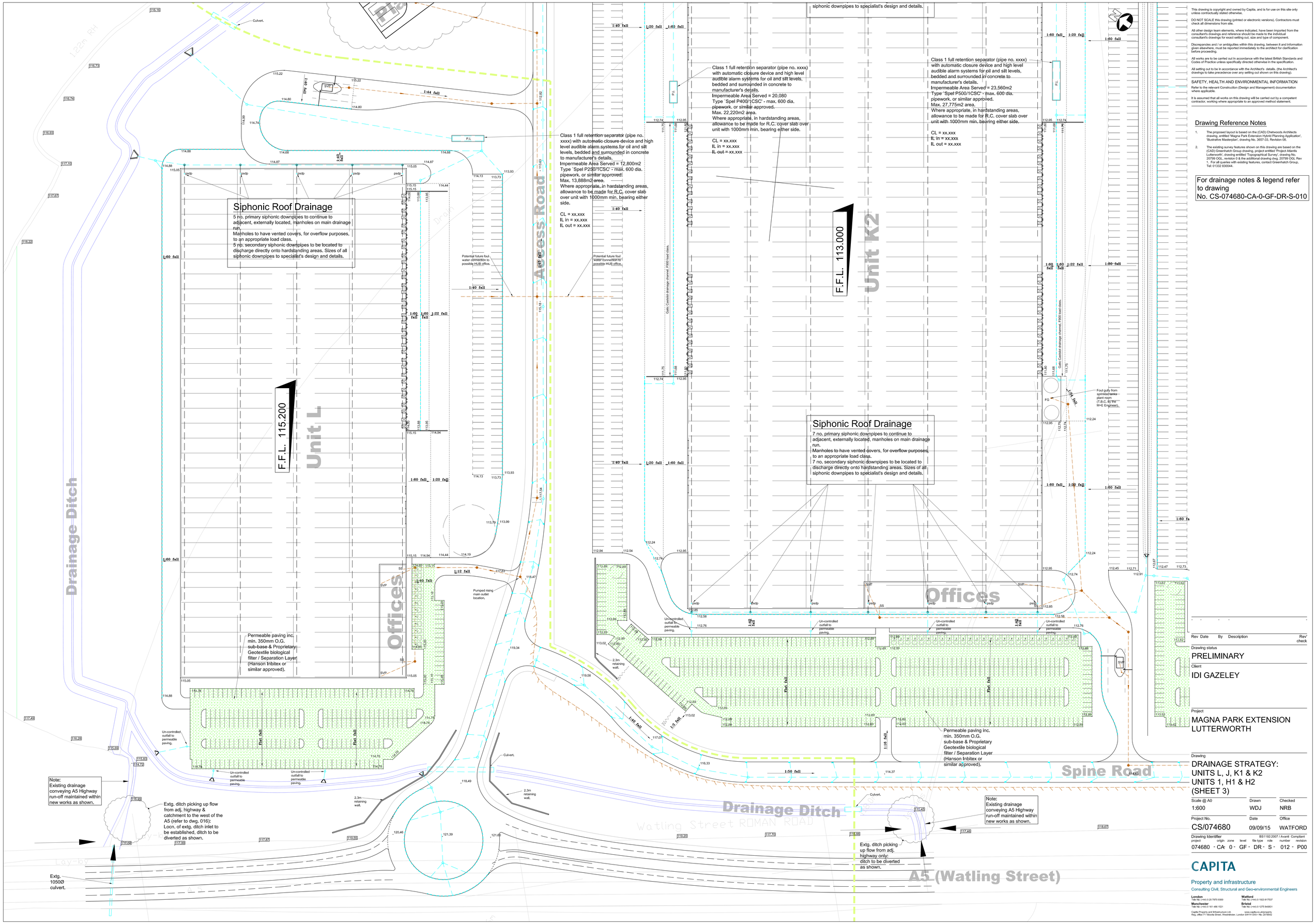

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 08.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

For drainage notes & legend refer to drawing No. CS-074680-CA-0-GF-DR-S-010

Rev	Date	By	Description	Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION
LUTTERWORTH

Drawing
DRAINAGE STRATEGY:
UNITS L, J, K1 & K2
UNITS 1, H1 & H2
(SHEET 3)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	Date	Office
CS/074680	09/09/15	WATFORD

Drawing Identifier (BS1192:2007 / Avant Compliant)

project	origin	zone	level	file type	role	number	revision
074680	- CA-	0 -	GF -	DR -	S -	012 -	P00

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Consulting Civil, Structural and Geo-environmental Engineers

London
Tele No: (+44) 0 20 7870 9300
Watford
Tele No: (+44) 0 1923 817537
Manchester
Tele No: (+44) 0 161 486 1521
Bristol
Tele No: (+44) 0 1275 840631

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 05.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

For drainage notes & legend refer to drawing No. CS-074680-CA-0-GF-DR-S-010

Siphonic downpipes to specialist's design and details.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 21,650m2
Type `Spel P400/1QSC' - max. 600 dia. pipework, or similar approved.
Max. 22,220m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

F.F.L. 113.700

Unit K1

Gatic Castdot drainage channel, F900 load class.

Siphonic Roof Drainage

7 no. primary siphonic downpipes to continue to adjacent, externally located, manholes on main drainage run.
Manholes to have vented covers, for overflow purposes, to an appropriate load class.
7 no. secondary siphonic downpipes to be located to discharge directly onto hardstanding areas. Sizes of all siphonic downpipes to specialist's design and details.

Foul gully from sprinkler tanks plant room (T.B.C. by the M+E Engineer).

Offices

Un-controlled outfall to permeable paving.

Permeable paving inc. min. 350mm O.G. sub-base & Proprietary Geotextile biological filter / Separation Layer (Hanson Inbitex or similar approved).

Pumped rising main; Approx 990m long. 12m pumped head. Outfall to Unit L, situ, gravity drainage system.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 21,950m2
Type `Spel P400/1CSC' - max. 600 dia. pipework, or similar approved.
Max. 22,220m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

F.F.L. 114.000

Unit J

Siphonic Roof Drainage

5 no. primary siphonic downpipes to continue to adjacent, externally located, manholes on main drainage run.
Manholes to have vented covers, for overflow purposes, to an appropriate load class.
5 no. secondary siphonic downpipes to be located to discharge directly onto hardstanding areas. Sizes of all siphonic downpipes to specialist's design and details.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 13,160m2
Type `Spel P250/1CSC' - max. 600 dia. pipework, or similar approved.
Max. 13,888m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

Un-controlled outfall to permeable paving.

Flat fall

Offices

Permeable paving inc. min. 350mm O.G. sub-base & Proprietary Geotextile biological filter / Separation Layer (Hanson Inbitex or similar approved).

Note:
Storage swale / wetland for Spine Road drainage, sized to attenuate to greenfield run-off.

FWMH Pump Station CL 109.00 IL 104.70

Spine Road

Bridge / culvert, construction details to be agreed with LLFA / EA.

Extg. ditch picking up flow from adj. highway & catchment to the west of the A5 (refer to dwg. 016); Environment Agency flooding map appears to be an over estimation of the actual on site conditions and it is anticipated the actual flooding event will be more confined within the existing ditch profile.

Extg. 1050Ø & 900Ø culverts.

Watling Street (A5)

Watling Street

ROMAN ROAD

Rev	Date	By	Description	Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION LUTTERWORTH

Drawing
DRAINAGE STRATEGY: UNITS L, J, K1 & K2 UNITS 1, H1 & H2 (SHEET 4)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	Date	Office
CS/074680	09/09/15	WATFORD

Drawing Identifier (BS1192:2007 / Avanti)

project	origin	zone	level	file type	role	number	Compliant revision
074680	- CA-	0 -	GF -	DR -	S -	013 -	P00

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Watford Tele No: (+44) 0 1923 817537
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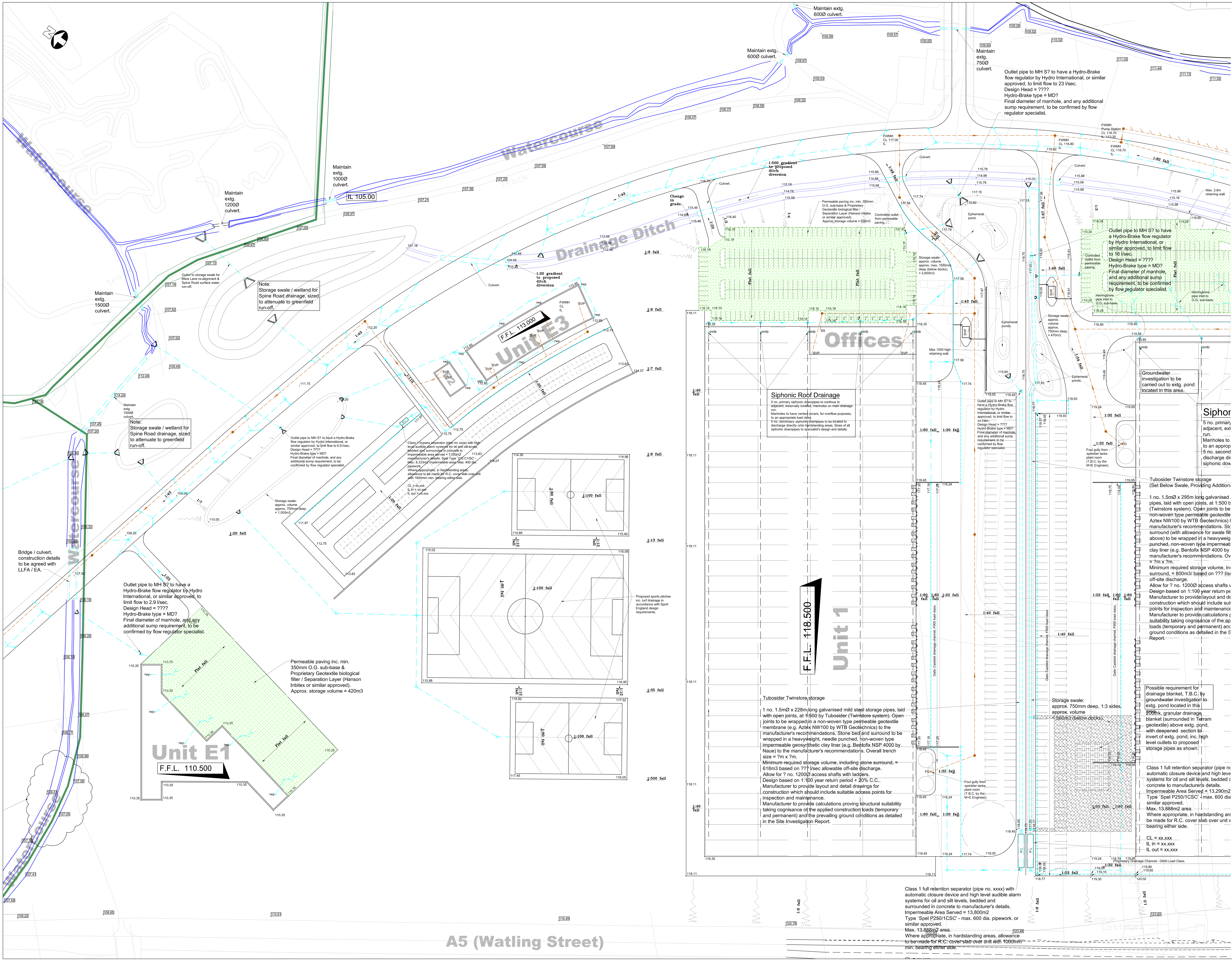

DO NOT SCALE this drawing (printed or electronic versions). Contractors must check all dimensions from site.

All other design team elements, where indicated, have been imported from the consultant's drawings and reference should be made to the individual consultant's drawings for exact setting out, size and type of component.

Discrepancies and / or ambiguities within this drawing, between it and information given elsewhere, must be reported immediately to the architect for clarification before proceeding.

All works are to be carried out in accordance with the latest British Standards and Codes of Practice unless specifically directed otherwise in the specification.

All setting out to be in accordance with the Architect's details. (the Architect's drawings to take precedence over any setting out shown on this drawing).

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 08.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

For drainage notes & legend refer to drawing No. CS-074680-CA-0-GF-DR-S-010

Rev	Date	By	Description	Rev' check
-	-	-	-	-

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION LUTTERWORTH

Drawing
DRAINAGE STRATEGY: UNITS L, J, K1 & K2 UNITS 1, H1 & H2 (SHEET 5)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	Date	Office
CS/074680	28/08/15	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	origin	zone	level	file type	role	number	revision
074680	CA	0	GF	DR	S	014	P00

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Property and infrastructure
Consulting Civil, Structural and Geo-environmental Engineers

London Tele No: (+44) 0 20 7870 9300
Watford Tele No: (+44) 0 1923 817537
Manchester Tele No: (+44) 0 161 486 1521
Bristol Tele No: (+44) 0 1275 840831
Capita Property and Infrastructure Ltd. www.capita.co.uk/property
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2018542

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Refer to the relevant Construction (Design and Management) documentation where applicable.

It is assumed that all works on this drawing will be carried out by a competent contractor, working where appropriate to an approved method statement.

Drawing Reference Notes

1. The proposed layout is based on the (CAD) Chetwoods Architects drawing, entitled 'Magna Park Extension Hybrid Planning Application', 'Illustrative Masterplan', drawing No. 3657-33, Revision 05.
2. The existing survey features shown on this drawing are based on the (CAD) Greenhatch Group drawing, project entitled 'Project Atlantis Lutterworth', drawing entitled 'Topographical Survey', drawing No. 20799 OGL, revision 0 & the additional drawing dwg. 20799 OGL Rev 1. For all queries with existing features, contact Greenhatch Group, Tel: 01332 830044.

For drainage notes & legend refer to drawing No. CS-074680-CA-0-GF-DR-S-010

Maintain extg. 750Ø culvert.

Outlet pipe to MH S? to have a Hydro-Brake flow regulator by Hydro International, or similar approved, to limit flow to 23 l/sec. Design Head = ???? Hydro-Brake type = MD? Final diameter of manhole, and any additional sump requirement, to be confirmed by flow regulator specialist.

Watercourse

Permeable paving inc. min. 450mm O.G. sub-base & Proprietary Geotextile biological filter / Separation Layer (Hanson Inbiltex or similar approved). Approx. storage volume = 820m3

Outlet pipe to MH S? to have a Hydro-Brake flow regulator by Hydro International, or similar approved, to limit flow to 16 l/sec. Design Head = ???? Hydro-Brake type = MD? Final diameter of manhole, and any additional sump requirement, to be confirmed by flow regulator specialist.

Note: Storage swale / wetland for Spine Road drainage, sized to attenuate to greenfield run-off.

Pumped rising main: Approx 500m long, 4m pumped head, Outfall to Magna Park Extension: DHL Supply Chain FW network., Note, Magna Park I sewage treatment works to be upgraded to accommodate additional flows, final design to be confirmed by specialist.

Spine Road Drainage Ditch

Note: Storage swale for Mere Lane re-alignment & Spine Road surface water run-off.

Outlet pipe to MH S? to have a Hydro-Brake flow regulator by Hydro International, or similar approved, to limit flow to 16 l/sec. Design Head = ???? Hydro-Brake type = MD? Final diameter of manhole, and any additional sump requirement, to be confirmed by flow regulator specialist.

Outlet pipe to MH S? to have a Hydro-Brake flow regulator by Hydro International, or similar approved, to limit flow to 4 l/sec. Design Head = ???? Hydro-Brake type = MD? Final diameter of manhole, and any additional sump requirement, to be confirmed by flow regulator specialist.

Offices

Groundwater investigation to be carried out to extg, pond located in this area.

Possible requirement for drainage blanket, T.B.C. by groundwater investigation to locate possible extg. spring located in this area. 200thk, granular drainage blanket (surrounded in Terram geotextile) above extg. spring, inc. high level outlet to proposed storage swale as shown.

Storage swale: approx. volume approx. 750mm deep, = 560m3

Siphonic Roof Drainage

5 no. primary siphonic downpipes to continue to adjacent, externally located, manholes on main drainage run.
Manholes to have vented covers, for overflow purposes, to an appropriate load class.
5 no. secondary siphonic downpipes to be located to discharge directly onto hardstanding areas. Sizes of all siphonic downpipes to specialist's design and details.

Tubosider Twinstore storage (Set Below Swale, Providing Additional Storage)

1 no. 1.5mØ x 295m long galvanised mild steel storage pipes, laid with open joints, at 1:500 by Tubosider (Twinstore system). Open joints to be wrapped in a non-woven type permeable geotextile membrane (e.g. Aztex NW100 by WTB Geotechnics) to the manufacturer's recommendations. Stone bed and surround (with allowance for swale filtration drainage above) to be wrapped in a heavyweight, needle punched, non-woven type impermeable geosynthetic clay liner (e.g. Bentofix NSP 4000 by Naue) to the manufacturer's recommendations. Overall trench size = ?m x ?m.
Minimum required storage volume, including stone surround, = 800m3 based on ??? l/sec allowable off-site discharge.
Allow for ? no. 1200Ø access shafts with ladders.
Design based on 1:100 year return period +20%CC.
Manufacturer to provide layout and detail drawings for construction which should include suitable access points for inspection and maintenance.
Manufacturer to provide calculations proving structural suitability taking cognisance of the applied construction loads (temporary and permanent) and the prevailing ground conditions as detailed in the Site Investigation Report.

Tubosider Twinstore storage (Set Below Swale, Providing Additional Storage)

1 no. 1.5mØ x 296m long galvanised mild steel storage pipes, laid with open joints, at 1:500 by Tubosider (Twinstore system). Open joints to be wrapped in a non-woven type permeable geotextile membrane (e.g. Aztex NW100 by WTB Geotechnics) to the manufacturer's recommendations. Stone bed and surround (with allowance for swale filtration drainage above) to be wrapped in a heavyweight, needle punched, non-woven type impermeable geosynthetic clay liner (e.g. Bentofix NSP 4000 by Naue) to the manufacturer's recommendations. Overall trench size = ?m x ?m.
Minimum required storage volume, including stone surround, = 800m3/ based on ??? l/sec allowable off-site discharge.
Allow for ? no. 1200Ø access shafts with ladders.
Design based on 1:100 year return period +20%CC.
Manufacturer to provide layout and detail drawings for construction which should include suitable access points for inspection and maintenance.
Manufacturer to provide calculations proving structural suitability taking cognisance of the applied construction loads (temporary and permanent) and the prevailing ground conditions as detailed in the Site Investigation Report.

Possible requirement for drainage blanket, T.B.C. by groundwater investigation to extg. pond located in this area. 200thk. granular drainage blanket (surrounded in Terram geotextile) above extg. pond, with deepened section to invert of extg. pond, inc. high level outlets to proposed storage pipes as shown.

Storage swale: approx. 750mm deep, 1:3 sides, approx. volume = 560m3 (below docks).

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 13,290m2
Type `Spel P250/1CSC' - max. 600 dia. pipework. or similar approved.
Max. 13,888m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 16,275m2
Type `Spel P300/1CSC' - max. 600 dia. pipework. or similar approved.
Max. 16,665m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details.
Impermeable Area Served = 11,800m2
Type `Spel P250/1CSC' - max. 600 dia. pipework. or similar approved.
Max. 13,888m2 area.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

CL = xx.xxx
IL in = xx.xxx
IL out = xx.xxx

Permeable paving inc. min. 350mm O.G. sub-base & Proprietary Geotextile biological filter / Separation Layer (Hanson Inbiltex or similar approved). Approx. storage volume = 420m3

Tubosider Twinstore storage

1 no. 1mØ x 175m long galvanised mild steel storage pipes, laid with open joints, at 1:500 by Tubosider (Twinstore system). Open joints to be wrapped in a non-woven type permeable geotextile membrane (e.g. Aztex NW100 by WTB Geotechnics) to the manufacturer's recommendations. Stone bed and surround to be wrapped in a heavyweight, needle punched, non-woven type impermeable geosynthetic clay liner (e.g. Bentofix NSP 4000 by Naue) to the manufacturer's recommendations. Overall trench size = ?m x ?m.
Minimum required storage volume, including stone surround, = 240m3/ based on ??? l/sec allowable off-site discharge.
Allow for ? no. 1200Ø access shafts with ladders.
Design based on 30 year return period.
Manufacturer to provide layout and detail drawings for construction which should include suitable access points for inspection and maintenance.
Manufacturer to provide calculations proving structural suitability taking cognisance of the applied construction loads (temporary and permanent) and the prevailing ground conditions as detailed in the Site Investigation Report.

Unit H2 F.F.L. 120.000

Unit H1 F.F.L. 117.500

Mere Lane Diversion

Note: Existing ditch picks up Mere Lane carriageway, ditch to be removed and new culvert / piped system from re-aligned Mere Lane installed as shown.

Outlet pipe to MH S? to have a Hydro-Brake flow regulator by Hydro International, or similar approved, to limit flow to 18 l/sec. Design Head = ???? Hydro-Brake type = MD? Final diameter of manhole, and any additional sump requirement, to be confirmed by flow regulator specialist.

IL 118.68

Swale temporary exceedance storage: approx. volume = 230m3.

Storage swale; approx. volume @ 1.18m deep = 1800m3 (below docks).

Gatic Castdot drainage channel, F900 load class.

Proprietary Drainage Channel - D400 Load Class.

Drainage channel blank end @ midpoint.

Docks temporary exceedance storage; approx. volume = 1,100m3.

Max. 1.6m high retaining wall.

Max 1000 high retaining wall.

Max. 2.6m retaining wall.

Ephemeral ponds.

Controlled outlet from permeable paving.

Herringbone pipe inlet to O.G. sub-base.

Foul gully from sprinkler tanks plant room (T.B.C. by the M+E Engineer).

Culvert.

FWMH Pump Station CL 116.70 IL 111.30

FWMH CL 116.80 IL 116.62

FWMH CL 116.70 IL

FWMH CL 118.60

FWMH CL 117.50 IL

FWMH CL IL

SWMH `Catchpit' CL 117.32 IL 115.28

xxxmmØ @ 1:xxx (x.xxx, 15.215m)

xxxmmØ @ 1:xxx (x.xxx, 15.215m)

Rev Date By Description Rev' check

Drawing status
PRELIMINARY

Client
IDI GAZELEY

Project
MAGNA PARK EXTENSION LUTTERWORTH

Drawing
DRAINAGE STRATEGY: UNITS L, J, K1 & K2 UNITS 1, H1 & H2 (SHEET 6)

Scale @ A0	Drawn	Checked
1:600	WDJ	NRB
Project No.	Date	Office
CS/074680	28/08/15	WATFORD

Drawing Identifier — BS1192:2007 / Avanti Compliant

project	origin	zone	level	file type	role	number	revision
074680	- CA	0	- GF	- DR	- S	- 015	- P00

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Manchester Tele No: (+44) 0 161 486 1521
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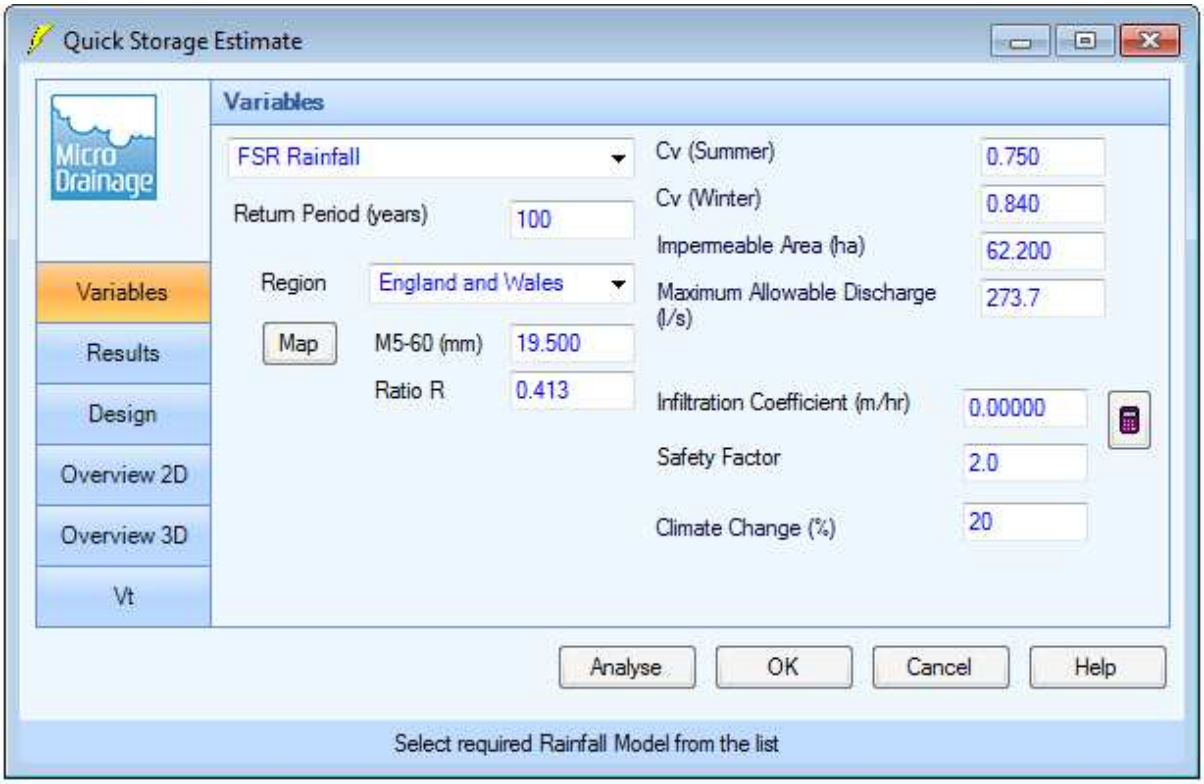
Appendix 6

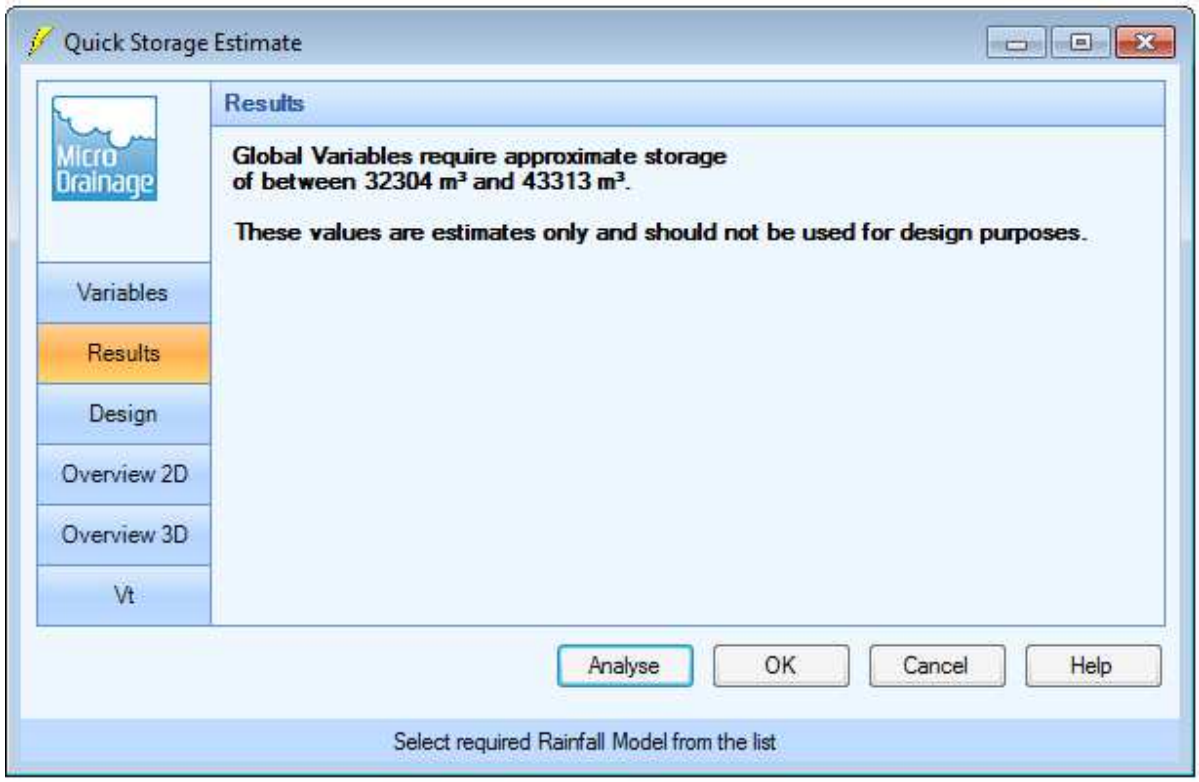
Surface Water Drainage Design Strategy Calculations

Units H1, H2, 1, 'Heart', Unit J, L, K1, K2 & Access Road

Micro Drainage WinDes Source Control**,** Quick Storage Estimate Variables



Micro Drainage WinDes Source Control: Quick Storage Estimate Results:



Approximate required storage = average (+5%) = **39,700m3**

Storage to be provided by attenuation measures detailed on drawings located in Appendix 6.

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Appendix 7

Environment Agency Flood Map.

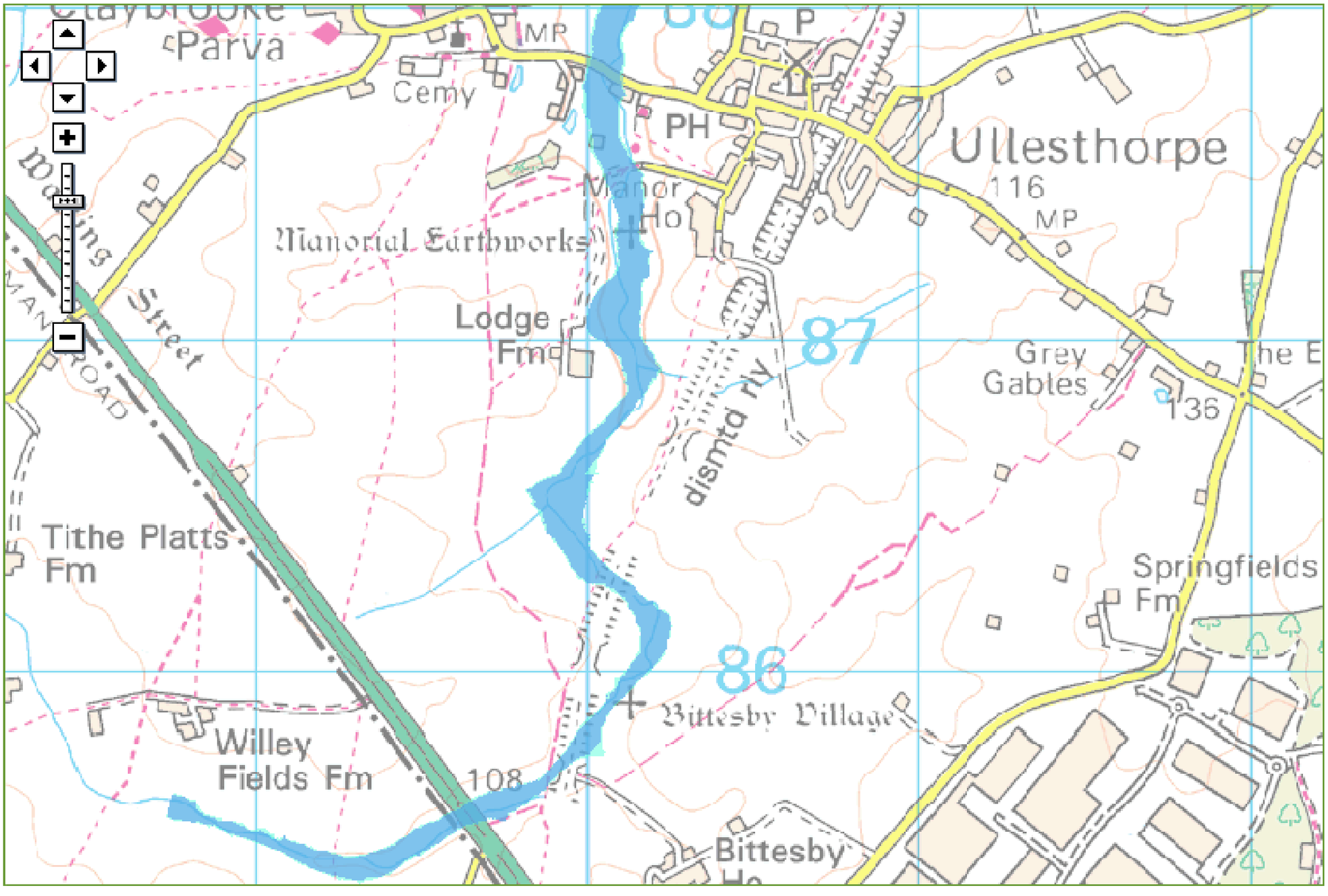
LE17 4JH at scale 1:20,000

Other maps ● Data search ● Text only version ●

Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

- [x] Flood Map for Planning (Rivers and Sea)
  - Flood Zone 3
  - Flood Zone 2
  - Flood defences (Not all may be shown*)
  - Areas benefiting from flood defences (Not all may be shown*)
- [x] Main River Line
  - Main River Line
- [x] Other national environmental organisations
  - Natural Resources Wales Area of responsibility
  - Scottish Environment Protection Agency Area of responsibility



Appendix F – Surface Water Chemical Analysis Results, August 2015

ALS Environmental Ltd
Torrington Avenue
Coventry
CV4 9GU

T: +44 (0)24 7642 1213
F: +44 (0)24 7685 6575
www.alsenvironmental.co.uk

Mr Beard
Magna Park Management Co. Ltd
The Estate Office
Harrier Parkway
Magna Park
Lutterworth LE17 4XT
Leicestershire

14 August 2015

Test Report: COV/1208163/2015

Dear Mr Beard

Analysis of your sample(s) submitted on 07 August 2015 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using ALS Environmental Ltd and we look forward to receiving your next samples.

Yours Sincerely,

Signed:

Name: C. Law

Title: Inorganics Operations Manager

Report Summary

UKAS TESTING
1314
0897
4409

ALS Environmental

Mr Keith Beard
Magna Park Management Co. Ltd
The Estate Office
Harrier Parkway
Magna Park
Lutterworth
Leicestershire
LE17 4XT

Date of Issue: **14 August 2015**

Report Number: **COV/1208163/2015** Issue **1**

Job Description: Magna Park Management Co. Ltd

Job Location: Magna Park - Lutterworth

Number of Samples included in this report **10**

Job Received: **07 August 2015**

Number of Test Results included in this report **43**

Analysis Commenced: **08 August 2015**

Signed:

Name: **C. Law** Date: **14 August 2015**

Title: **Inorganics Operations Manager**

ALS Environmental Ltd was responsible for sampling. Sampling is not covered by our UKAS accreditation.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.

Certificate of Analysis

UKAS TESTING
1314
0897
4409

ALS Environmental

Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752137** Sample **1** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **Biofilter Effluent**
Sample Description: **Biofilter Effluent**
Sample Matrix: **Effluent**
Sample Date/Time: **07 August 2015** **10:00**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Detergents, Anionic as NaLS	<0.21	mg/l	13/08/2015	N Cov	WAS020
pH	7.8	pH units	08/08/2015	N Cov	WAS039
Turbidity	9.94	NTU	11/08/2015	N Cov	WAS066
Ammoniacal Nitrogen as N	42.0	mg/l	09/08/2015	N Cov	WAS036
Nitrogen, Total Oxidised as N	14.3	mg/l	09/08/2015	N Cov	WAS036
Phosphate, Ortho as P	7.4	mg/l	09/08/2015	N Cov	WAS036
Total Suspended Solids	12.0	mg/l	11/08/2015	N Cov	WAS006
BOD + ATU (5 day)	19	mg/l	13/08/2015	N Cov	WAS001
COD (Total)	71.0	mg/l	10/08/2015	N Cov	WAS040
Nitrif Inhib Diln	2	Dil	11/08/2015	N Wak	WTOX4
Nitrif Inhib Result	<10	%	11/08/2015	N Wak	WTOX4
Nitrif Inhib EC50	<2	tu	11/08/2015	N Wak	WTOX4

Analyst Comments for 14752137: This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

ALS Environmental Ltd
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

Certificate of Analysis

UKAS TESTING
1314
0897
4409

ALS Environmental

Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752138** Sample **2** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **Lagoon Outlet**
Sample Description: **Lagoon Outlet**
Sample Matrix: **Effluent**
Sample Date/Time: **07 August 2015** **10:10**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Detergents, Anionic as NaLS	<0.21	mg/l	13/08/2015	N Cov	WAS020
pH	8.0	pH units	08/08/2015	N Cov	WAS039
Turbidity	8.44	NTU	11/08/2015	N Cov	WAS066
Ammoniacal Nitrogen as N	2.20	mg/l	09/08/2015	N Cov	WAS036
Nitrogen, Total Oxidised as N	11.0	mg/l	09/08/2015	N Cov	WAS036
Phosphate, Ortho as P	4.5	mg/l	09/08/2015	N Cov	WAS036
Total Suspended Solids	10.0	mg/l	11/08/2015	N Cov	WAS006
BOD + ATU (5 day)	6	mg/l	13/08/2015	N Cov	WAS001
COD (Total)	42.0	mg/l	10/08/2015	N Cov	WAS040
Nitrif Inhib Diln	2	Dil	11/08/2015	N Wak	WTOX4
Nitrif Inhib Result	<10	%	11/08/2015	N Wak	WTOX4
Nitrif Inhib EC50	<2	tu	11/08/2015	N Wak	WTOX4

Analyst Comments for 14752138: This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

ALS Environmental Ltd
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752139** Sample **3** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **Raw Sewage**
Sample Description: **Raw Sewage**
Sample Matrix: **Effluent**
Sample Date/Time: **07 August 2015** **10:05**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Detergents, Anionic as NaLS	0.39	mg/l	13/08/2015	N Cov	WAS020
pH	8.1	pH units	08/08/2015	N Cov	WAS039
Turbidity	139	NTU	11/08/2015	N Cov	WAS066
Ammoniacal Nitrogen as N	74.1	mg/l	09/08/2015	N Cov	WAS036
Nitrogen, Total Oxidised as N	<0.42	mg/l	09/08/2015	N Cov	WAS036
Phosphate, Ortho as P	7.9	mg/l	09/08/2015	N Cov	WAS036
Total Suspended Solids	234	mg/l	11/08/2015	N Cov	WAS006
BOD + ATU (5 day)	220	mg/l	13/08/2015	N Cov	WAS001
COD (Total)	620	mg/l	10/08/2015	N Cov	WAS040
Nitrif Inhib Diln	2	Dil	11/08/2015	N Wak	WTOX4
Nitrif Inhib Result	48.9	%	11/08/2015	N Wak	WTOX4
Nitrif Inhib EC50	<2	tu	11/08/2015	N Wak	WTOX4

Analyst Comments for 14752139: This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752140** Sample **4** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP1**
Sample Description: **Lagoon SP1**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:15**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	2.13	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752140: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752141** Sample **5** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP2**
Sample Description: **Lagoon SP2**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:20**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	2.04	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752141: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752142** Sample **6** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP3**
Sample Description: **Lagoon SP3**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:25**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	1.75	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752142: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752143** Sample **7** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP4**
Sample Description: **Lagoon SP4**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:35**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	2.30	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752143: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752144** Sample **8** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP5**
Sample Description: **Lagoon SP5**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:38**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	2.37	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752144: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752145** Sample **9** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **SP6**
Sample Description: **Lagoon SP6**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:41**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	2.29	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752145: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

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Report Number: **COV/1208163/2015** Issue **1**
Laboratory Number: **14752146** Sample **10** of **10**

Sample Source: **Magna Park Management Co. Ltd**
Sample Point Description: **Stream in Bittesby Farm**
Sample Description: **Stream in Bittesby Farm**
Sample Matrix: **Surface Water**
Sample Date/Time: **07 August 2015** **10:55**
Sample Received: **07 August 2015**
Analysis Complete: **14 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation	Method
Ammoniacal Nitrogen as N	0.56	mg/l	09/08/2015	Y Cov	WAS036

Analyst Comments for 14752146: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: Name: **C. Law** Date: **14 August 2015**
Title: **Inorganics Operations Manager**

ANALYST COMMENTS FOR REPORT COV/1208163/2015 Issue 1

Date of Issue: **14 August 2015**

Sample No	Analysis Comments
14752137	This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
14752138	This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
14752139	This sample has been analysed for Detergents, Anionic as NaLS outside recommended stability times. It is therefore possible that the results provided may be compromised. {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
14752140	
14752141	
14752142	
14752143	
14752144	
14752145	
14752146	

Signed: 

Name: **C. Law** Date: **14 August 2015**

Title: **Inorganics Operations Manager**

DETERMINAND COMMENTS FOR REPORT COV/1208163/2015 ISSUE 1

Date of Issue : 14 August 2015

Sample No	Description	Determinand	Comments

Signed: 

Name: **C. Law** Date: **14 August 2015**

Title: **Inorganics Operations Manager**

Appendix G – EA Flood Zone Map

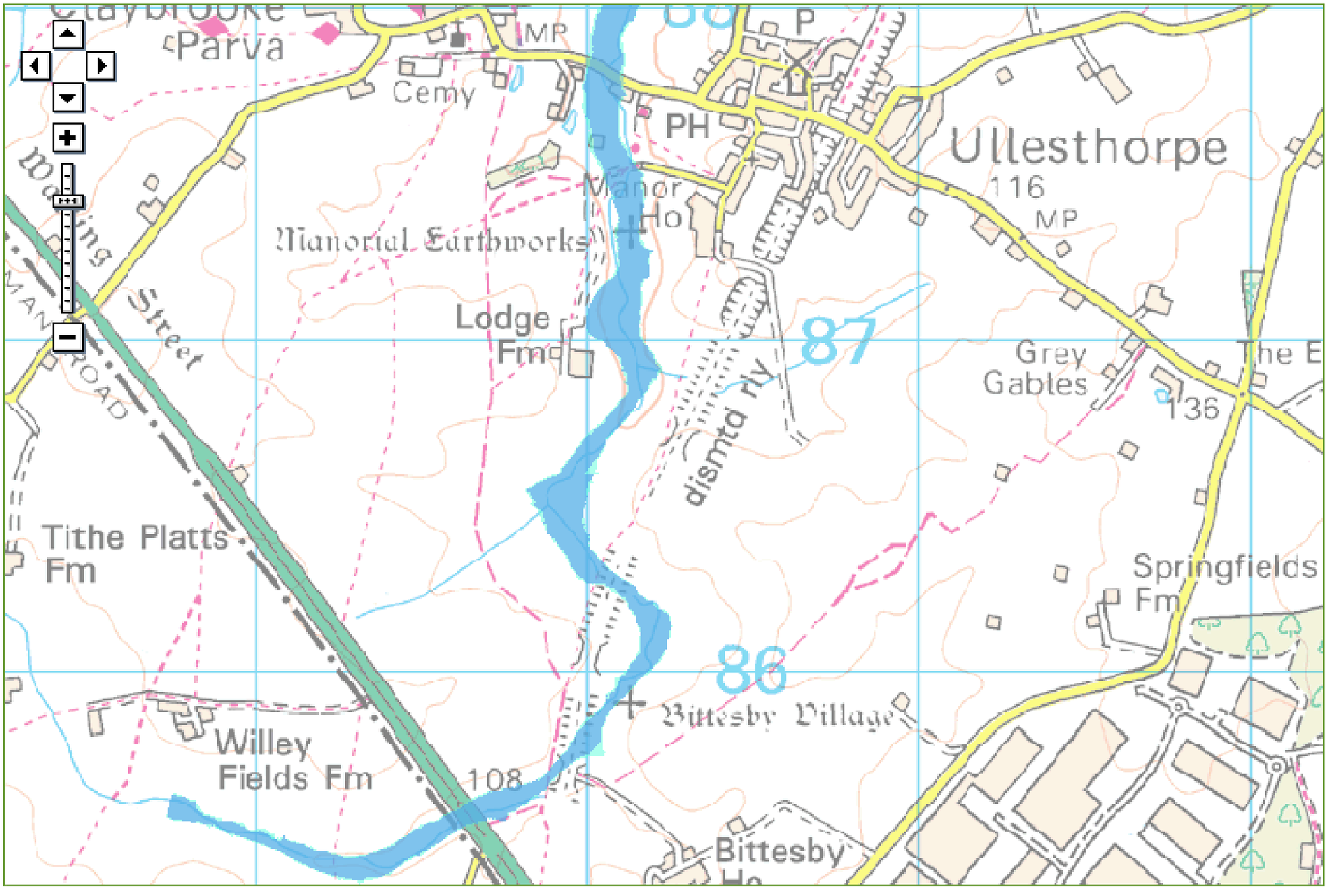
LE17 4JH at scale 1:20,000

Other maps ● Data search ● Text only version ●

Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

- [x] Flood Map for Planning (Rivers and Sea)
  - Flood Zone 3
  - Flood Zone 2
  - Flood defences (Not all may be shown*)
  - Areas benefiting from flood defences (Not all may be shown*)
- [x] Main River Line
  - Main River Line
- [x] Other national environmental organisations
  - Natural Resources Wales Area of responsibility
  - Scottish Environment Protection Agency Area of responsibility



Appendix H – FRA and Drainage Strategy for Development Zone 2

Flood Risk Assessment
Land to the rear of Asda George Building, Lutterworth Leicestershire, adjacent junction of A5 and A4303

Gazeley UK Limited

Rev E | 29 May 2012

CAPITA SYMONDS
STRUCTURES

Oak House, Reeds Crescent, Watford WD24 4QP
Tel 01923 817537 Fax 01923 228516

www.capitasymonds.co.uk

Quality Management

Job No	SS018341	**Doc No.**	Rev E | 29 May 2012
Title	Flood Risk Assessment, Land to the rear of Asda George Building, Lutterworth Leicestershire, adjacent junction of A5 and A4303		
Location	Lutterworth, Leicestershire		
Document Ref	SS018341-NRB-JP-11-243-R		
File reference	U:\SS-018341 - Magna Park Lutterworth Plots 7200 & 7300\Admin\Reports\SS018341-NRB-JP-11-243-R-Rev E FRA.doc		
Prepared by	PWE	Signature (for file)	
Checked by	GM	Signature (for file)	
Authorised by	NRB	Signature (for file)	

REPORT REVISION HISTORY				
Revision	**Description**	**Date**	**Author**	**Approval**
A	Change in plot numbers	4/11/11	NRB	PDB
B	Surface water drainage strategy updated	17/11/11	NRB	PDB
C	Substantial revision of Chapters 3 and 4	1/3/12	PWE	NRB
D	Title sheet and Quality Management Table amended, appendices updated to suit	15/05/12	WDJ	NRB
E	References to PPG25 replaced with references to National Planning Policy Framework, minor changes to site area descriptions, Appendix D & additional introduction text added	29/05/12	WDJ	NRB

Contents

Appendices

1. Introduction

1.1 Appointment

1.1.1 Capita Symonds (Structures) Limited (CSS) was appointed by Gazeley UK Limited (the Client) to draft a Flood Risk Assessment (FRA) for the site known as Land to the rear of Asda George Building, Lutterworth Leicestershire, adjacent junction of A5 and A4303.

1.2 Site Location and Proposed Development

1.2.1 The western & eastern areas of the site are located south of the existing Octavia building and Asda George building fronting the A427 in the Magna Park industrial area, approximately 4km west of Lutterworth and immediately east of the A5 Trunk Road. The areas are proposed to be redeveloped to comprise a Low Carbon Energy Centre (a biomass plant) on the western area (site), with ancillary office space, service yard and car parking. The development at the eastern area (site) is intended to comprise HGV lorry parking with an ancillary gate house, vehicle maintenance unit, fuel island and vehicle wash.

1.3 Planning Matters

1.3.1 Planning consent has been applied for at Harborough District Council. This FRA is intended to support the application.

1.4 Report Objectives

1.4.1 The Flood Risk Assessment presented herein has been completed taking cognisance of National Planning Policy Framework (NPPF) published March 2012 by the Department for Communities and local Government (DCLG) and other applicable technical guidance. Its objectives can be defined as:

- Review all sources of flooding which are likely to affect the development site, both now and in the future.
- Consider the merit and practicability of various SuDS options.
- Provide an assessment of whether the site development will increase flood risk elsewhere.
- Establish whether the current measures (where they exist) to mitigate such risks are appropriate.

1.5 Recent Environment Agency Correspondence & Approval

1.5.1 Capita Symonds issued the flood risk assessment (FRA) (ref: Rev. C dated 1 March 2012, ref SS018341-NRB-JP-011-243-R) to the Environment Agency on 1st March 2012.

1.5.2 The Environment Agency confirmed acceptance of the Rev. C FRA report in their letter dated 18 April 2012, ref LT/2012/114159/02-L01, confirming that the proposed development would be acceptable on flood risk grounds, if the measures in the Rev. C report are implemented.

2. Policy and Guidance - General

2.1 National Planning Policy Framework (NPPF) – March 2012

2.1.1 This recent guidance supersedes the previous Planning Policy Statement 25 (PPS 25).

2.1.2 UK Government guidance stipulates that during the planning process for new developments due consideration must be given to flood risk. NPPF was issued by the Department for Communities and Local Government (DCLG) in March 2012 advising that a strategic and risk-based approach should be adopted, and that this should be in keeping with wider government sustainability objectives.

2.1.3 The policy requires that an FRA be completed for developments covering an area greater than 1 hectare situated within Flood Zone 1, and all new developments in Zones 2 and 3. Consideration should be given to risks of on site flooding from sources such as groundwater and surface water features; to the potential for an increased risk of flooding elsewhere; and to opportunities to reduce the probability and consequences of flooding.

2.1.4 NPPF refers to:

- The concept of classifying development vulnerability to flood risk.
- The need to undertake different levels of flood risk assessments to inform the various levels of the planning process.
- The need, where appropriate, to undertake a 'Sequential Test' to ensure flood risk is considered alongside other sustainability factors.
- The need to conform to the requirements of the 'Exception Test' in circumstances where it is necessary to locate certain types of developments in higher risk zones.
- The concept of flood risk reduction, particularly where a development has been sanctioned on the basis of the Exception Test.

2.2 Technical Guidance to the National Planning Policy Framework, DCLG (March 2012)

2.2.1 The technical guidance to the National Policy Framework provides additional guidance to local planning authorities to ensure the effective implementation of the planning policy set out in the National Policy Framework on development in areas at risk of flooding. The guidance retains key elements of the now superseded PPS 25.

2.2.2 The document provides information on:

- The application of the sequential approach and Sequential and Exception Tests;
- Definitions of flood zones and flood risk requirements;
- Measures to reduce flood risk to acceptable levels;
- How to manage residual risks; and
- Guidance on how to take climate change into account.

2.3 Development and Flood Risk: Guidance for the Construction Industry. CIRIA C624, 2006

2.3.1 C624 provides guidance on good practise in relation to flood risk and the development process. It advises that:

- All developments may lead to an increase in downstream flooding; therefore surface run-off should be carefully considered and controlled.
- Provision should be made for safe site access / egress during a flood.
- The development design should not affect the availability of insurance or mortgage finance for future site users.
- These issues should be considered for the lifetime of the development and take account of climate change projections.

2.4 SUDS MANUAL, CIRIA C697 (2007)

2.4.1 The CIRIA SUDS Manual provides advice on the implementation of sustainable drainage techniques in the UK. It provides guidance on:

- Initial planning;
- Design through to construction;
- The management of SUDS in the context of the current regulatory framework; and
- Advice on landscaping, waste management, cost, and community engagement.

2.5 LEVEL 1 SFRA, SCOTT WILSON ON BEHALF OF HARBOROUGH DISTRICT COUNCIL (APRIL 2009)

2.5.1 NPPF (paragraph 100) indicates that local planning authorities prepare a Strategic Flood Risk Assessment (SFRA) for their administrative area in consultation with the Environment Agency. The principal aims of the Harborough assessment were to determine variations in flood risk across the Borough and assist in the allocation of sites for future development.

2.5.2 The SFRA provides (*inter alia*) information on:

- Areas that may flood from both rivers and non-fluvial sources (it is noted that less than 10% of the borough falls within Flood Zone 3).
- Application of the sequential test and appropriate land uses within flood affected areas.
- Guidance in relation to Site Specific FRAs.
- Potential impacts of climate change.
- Application of the exception test and mitigation of risks to developments in flood affected areas.

3. Flood Probability and Hazard

3.1 Flood Zone

3.1.1 Environment Agency (EA) Flood Zones describe the extent of flooding that would occur if no flood defences were in existence. The definition of Flood Zones is provided in Table D.1 of PPS 25.

3.1.2 The subject site is located within **Flood Zone 1**, based on current (February 2012) publicly available EA mapping. Land within this zone is defined as having less than 1 in 1000 annual probability of river or sea flooding (<0.1%).

3.1.3 The nearest significant surface water course is the River Swift, which is situated approximately 1.5km to the east and south. The Swift is fed by a number of smaller tributaries, the nearest of which passes in close proximity to the site's south-eastern boundary. Assessment of the prevailing topography indicates that ground levels generally fall away from the site to the south and east, from approximately 120mAOD just beyond the south-eastern boundary to around 100mAOD at the river. An annotated extract of the EA flood zone, provided in Appendix C, illustrates the site setting.

3.1.4 In this context it is likely therefore that were any of the tributaries to flood, the associated run-off would follow the topography to flow south-eastwards away from the site. The site is further protected from such theoretical flood waters by the proposal to construct (for visual screening purposes) a raised soil bund around the south-eastern boundary, the crest of which is to be at a minimum level of 125.1mAOD.

3.1.5 Appended Capita Symonds drawings SS/018341-411 and 412 provide an earthworks cut-and-fill analysis and cross sections through the site, illustrating final ground levels and the bund details.

3.1.6 It is concluded therefore that given the designated flood zone, the topography of the site and surrounding area, and the proposal to construct a raised bund along the southern perimeter, risks to the site from flooding of these existing surface water courses is low.

3.2 Flooding from Adjacent Land

3.2.1 As noted above, flooding of or from land to the south/south-east is not anticipated to affect the site due to the prevailing topography and proposed new raised bund. However there are two existing developed plots to the north/north-west of the site, known as Octavia and Asda George. Risks associated with surface run-off from these plots are considered below.

3.2.2 At present, run-off from Octavia is directed via a 600mm diameter out-fall pipe into an existing stream which extends roughly north-west to south-east through the proposed eastern site. Flow into this stream is unrestricted (i.e. there are no controls regulating the inflow), and on the basis of the known pipe diameter and a 1:160 gradient has been calculated to reach a maximum of 566 litres per second (l/s) in a 1:2 year storm, and 1080l/s in a 1:30 year event. Run-off from Asda George is also directed into the existing stream but is restricted to a 'greenfield rate' of 5l/s/ha, corresponding to 10l/s.

3.2.3 The developments at both the western & eastern sites require the diversion of this stream, as illustrated on appended Capita Symonds drawings SS018341-05 and 06. In summary, this will comprise construction of a new stream flowing south-west to north-east along the northern boundary of the eastern site, which will receive all surface run-off from the current Octavia and Asda George sites. This will be directed north-eastwards and flow into a new surface water detention basin which is to be situated in the north-eastern sector of the eastern site.

3.2.4 Discharge from the detention basin will in turn be directed into the existing drainage ditch network to the east of the eastern site via a new 300mm outfall pipe at a restricted rate of 165 l/s for the 1:2 year event and 245 l/s for the 1:30 year storm. The topography is such that overflow associated with the 1:100 +20% critical storm will be directed eastwards and overflow directly into the ditch.

3.2.5 This is considered to be a substantial improvement on the existing arrangements given the current uncontrolled run-off from Octavia.

3.2.6 Supporting calculations relating to these proposed arrangements are provided in Appendix B.

3.2.7 In respect of flood risk from surface run-off generated within the western & eastern sites, this is discussed in the Surface Water Drainage strategy provided in Chapter 4.

3.3 Flooding from Groundwater

3.3.1 Groundwater flooding is caused by subterranean water that flows back above ground, occurring at the point where the water table meets the surface. The subsurface geology is recorded to comprise firm and stiff clay soils, which are unlikely to be water-bearing. It is unlikely therefore that there is a substantive risk of groundwater flooding.

3.4 Flooding from Sewers

3.4.1 The Harborough SFRA provides information on a number of locations within the borough known by the local council to have been affected historically by flooding from sewers. The locations where such flooding takes place are generally well documented as the problem tends to reoccur and is generally associated with sewer under-capacity. Magna Park is not recorded to have been affected historically by this issue and is not considered to be at risk in this regard.

3.4.2 If sewer blockages were to occur within the boundaries of the site itself, localised surface ponding is conceivable. The visibility of this ponding would allow any defective sewers to be identified and promptly addressed.

3.5 Flooding from Reservoirs

3.5.1 A reservoir can be defined as a body of water that holds at least 25,000m^3 of water above natural ground level. The SFRA notes that reservoirs carry with them an inherent flood risk as they have the potential to breach or overtop.

3.5.2 There are no known reservoirs within 5km of Magna Park and there is no known history of flooding from any reservoir within the SFRA study area. The associated flood risk to the site is therefore considered to be low.

3.6 CLIMATE CHANGE

3.6.1 For the UK, projections of future climate change indicate that more frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall can be expected. The surface water drainage strategy for the proposed development takes cognisance of this possible increase in rainfall.

4. Drainage Strategy and SuDS

4.1 INTRODUCTION

4.1.1 SuDS – Sustainable Drainage Systems - is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment.

4.1.2 Due to the presence of impermeable ground cover, a greater volume of runoff will be generated by a developed site compared to its undeveloped condition regardless of the magnitude of any given storm event. This can lead to an increase in downstream flood risk. Consequently the Environment Agency generally requires runoff to be restricted as far as reasonably practicable. Based on the development layout and site constraints, the suitability of several SuDS options has been assessed.

4.2 INFILTRATION DEVICES

4.2.1 The viability of infiltration devices is dependant upon the infiltration coefficient of the soil below the site and the prevailing groundwater level.

4.2.2 Exploratory borehole and published geological map records indicate an extensive thickness of low permeability clay soil below the subject site. Consequently infiltration devises are not considered appropriate for the proposed development.

4.3 GREEN ROOFS

4.3.1 Due to the high costs associated with incorporating a green roof - due to modifications such as substantially upgraded foundations and more extensive use of structural steelwork - it is considered that this option would not be viable or appropriate for this type of development.

4.4 DETENTION BASINS

4.4.1 Two detention basin (referenced No.1 and No.2) are proposed to be incorporated into the development's drainage scheme, both situated within the eastern site. No.1 is intended to accommodate run-off from the up-stream Octavia and Asda George sites, while No.2 will receive surface run-off from the major part of the eastern site itself. These are discussed in more detail in Section 4.7 below.

4.5 FILTER DRAINS

4.5.1 It is proposed that filter drains be incorporated into the drainage arrangements of western site, as described below.

4.6 PERMEABLE PAVING

4.6.1 This is considered a suitable and feasible SuDS option and as such is proposed to be incorporated into the new car park at the eastern site.

4.7 SURFACE WATER DRAINAGE STRATEGY

4.7.1 The proposed surface water drainage strategy incorporates a number of elements, selected on the basis of the published SuDS hierarchy and the practical constraints presented by the site.

4.7.2 Details are indicated on Capita Symonds drawing Nos. SS018341-04/P1, 05/P1 and 06/P1, copies of which are provided in Appendix A.

4.7.3 The western & eastern sites are to be sited in areas that formally occupied the old sewage works as part of the original Bitteswell Aerodrome. The majority of the buildings and plant of the old sewage works have been substantially demolished and or removed.

4.7.4 The effluent from the former plant originally discharged into a stream centrally located in the new plots adjacent to an existing hedgerow. This stream presently receives the surface water run off from the existing Octavia Building and Asda George Building located due north of the two new plots. As described in Sections 3.1 and 3.2 this stream is to be re-routed and will feed into a new detention basin (No.1) which will in turn discharge at a controlled rate into the existing drainage ditch network.

4.7.5 In respect of the western site, surface water is to be directed into filter drains to be situated along the new building's south-western and south-eastern elevations. Run-off from the external areas will enter the filter drains via a full retention, alarmed petrol interceptor. All surface water will then discharge into an existing drainage ditch situated immediately beyond the site's south-eastern boundary at a controlled greenfield rate of 5 l/s/ha, corresponding to 7 l/s.

4.7.6 At the eastern site, surface water from the sector currently to the west of the north-south stream (approximately one third of the total plot) will also be directed into the existing southern ditch. This sector is proposed to be occupied by external service yards only and the run-off will therefore pass through a full retention, alarmed petrol interceptor prior to discharge at greenfield rates. This arrangement, along with that for the western site, is intended to maintain a west-to-east flow within the existing ditch, mimicking current (i.e. pre-development) conditions.

4.7.7 Surface run-off from the eastern two-thirds of the eastern site is proposed to be directed, via an alarmed full retention interceptor, into a second, larger detention basin (No.2) in the site's eastern corner. As noted above, run-off into the basin from the proposed car park will be via permeable paving. Out-flow from the basin is to be directed southwards into the existing ditch network at a rate of 15 l/s (corresponding to a greenfield rate of 5 l/s/ha).

4.7.8 It should be noted that specific arrangements are to be incorporated at the proposed vehicle re-fuelling island. Surface run-off from this area is to be 'isolated' by a separate channel which will feed into a dedicated full retention forecourt interceptor.

4.7.9 Supporting calculations developed using Micro Drainage WinDes, which provide further details of run-off areas and storage volumes, are provided in Appendix B.

4.8 Foul Water Drainage Strategy

4.8.1 Foul water from the development is proposed to comprise a gravity system which will discharge into on site pumping stations which will then pump the effluent to a manhole located immediately outside Plot 2110 in Hunter Boulevard situated north of the existing Octavia and Asda George buildings. The resultant effluent will flow by gravity and ultimately discharge into an established waste water treatment works on the Magna Park site north of the new plots.

4.8.2 An emergency storage tank with capacity to store 24 hours of foul waste is to be incorporated into the systems, to be utilised in the event of pump failure.

4.8.3 In respect of the proposed new vehicle wash, waste water is to be processed by on-site treatment and recycling plant and the residual effluent will be directed into the foul network.

5. Conclusions

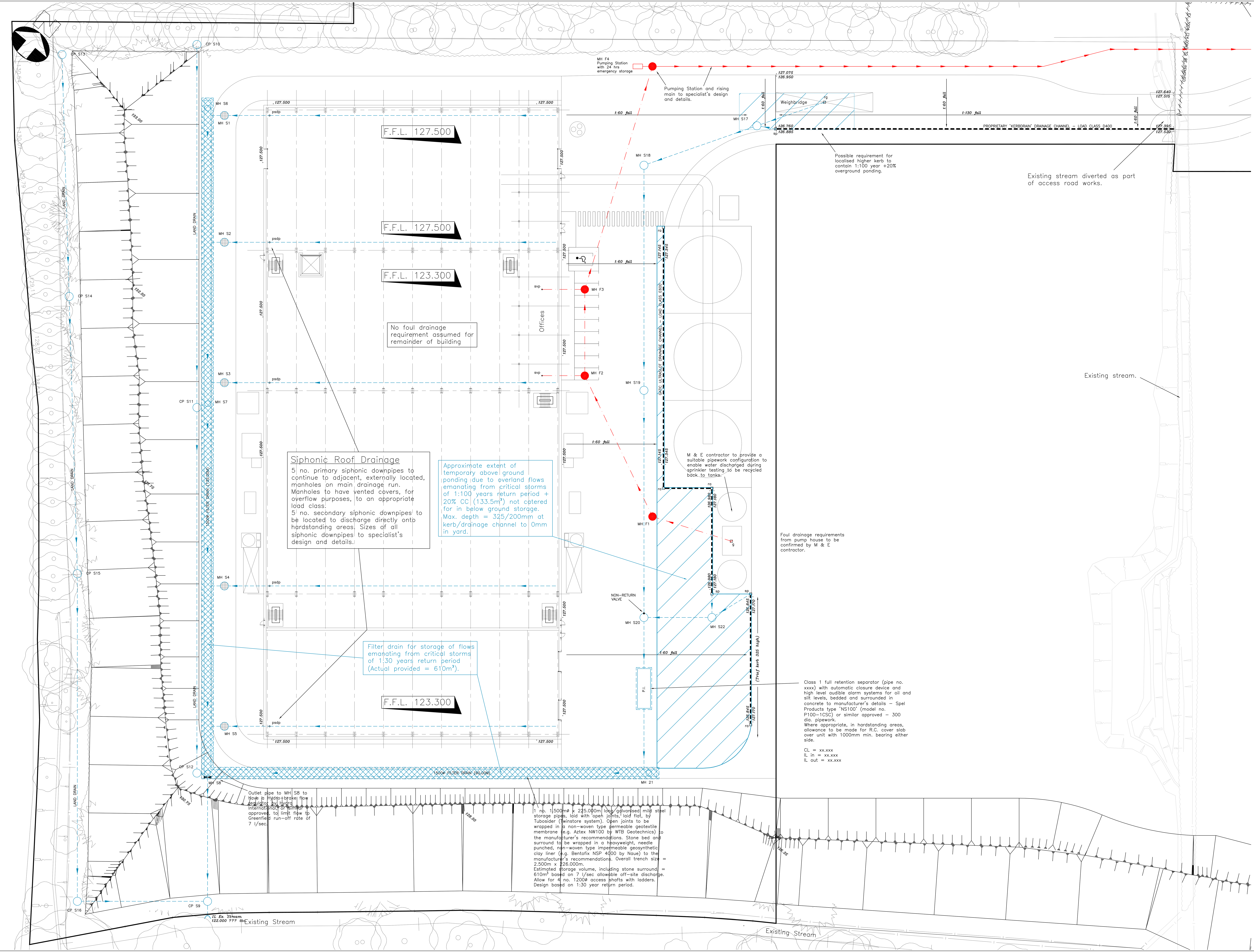
5.1 Capita Symonds was appointed by Gazeley UK Limited to undertake a Flood Risk Assessment for the western & eastern sites within Magna Park, which form part of the wider Magna Park industrial area.

5.2 Both areas of the site are located in Flood Zone 1 and are considered to be at low probability of flooding from fluvial or tidal sources. Risks of flooding from all other sources have also been assessed as low.

5.3 A surface water drainage strategy has been developed to address potential flood risks, both on and off-site, from site-generated runoff. Sustainable drainage elements have been incorporated as far as possible into the design, including the use of permeable paving, filter drains and detention basins. Drainage arrangements have been designed based on a 1 in 100 year return period plus 20% allowance for climate change with off-site discharge directed into the existing stream network and restricted to greenfield run off of 5l/sec/ha.

5.4 The development is considered to be at low risk from flooding from all sources and is not considered to increase such risk to others.

Appendix A Drawings



LEGEND

■	existing foul water drain with manhole
⊠	existing surface water drain with manhole
●	new foul water drain with manhole
○	new surface water drain with manhole
●	new surface water manhole with vented cover
■ ■ ■	linear drainage channel
⧓	flow regulator
•162.095	spot level
•162.095	existing spot level
▨	concrete protection to pipework adjacent to tree roots

REV	DATE	NAME	REVISION	REV' CHECK
P2	15.05.12	WDJ	TITLE SHEET UPDATED TO REVISED JOB INFORMATION.	NRB
P1	29.02.12	GM	FILTER DRAINS NOW CONNECTED AT CORNER WITH ONE FLOW CONTROL. EMERGENCY STORAGE AT FOUL PUMPING STATION INDICATED.	NRB

DRAWING STATUS

PRELIMINARY

ALL SETTING OUT TO BE IN ACCORDANCE WITH THE ARCHITECT'S DETAILS. (THE ARCHITECT'S DRAWINGS TO TAKE PRECEDENCE OVER ANY SETTING OUT SHOWN ON THIS DRAWING).

REAR OF ASDA GEORGE BLDG.
FOUL AND SURFACE WATER
DRAINAGE STRATEGY

CAPITA SYMONDS
STRUCTURES
Consulting Civil, Structural & Geotechnical Engineers
Manchester Tele No: (+44) 0 161 486 1521 · Watford Tele No: (+44) 0 1923 817537 · Cambridge Tele No: (+44) 0 114 275 2200
London Tele No: (+44) 0 20 7870 9300 · Bristol Tele No: (+44) 0 1275 840831 · Southampton Tele No: (+44) 0 2380 265053
Capita Symonds (Structures) Ltd. www.capitasymonds.co.uk
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2082106

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WATFORD		GM	
SCALE 1:250 @ A0	DATE Feb 2012	CHECKED BY NRB	

GAZELEY LAND TO THE REAR OF ASDA GEORGE BUILDING, LUTTERWORTH LEICESTERSHIRE, ADJACENT JUNCTION OF A5 AND A4303

DRAWING No.
SS/018341-04/P2

(40mm/hr) = 566 L/sec.
Est. ave. design flow 1:30yrs
(76mm/hr) = 1080 L/sec.

Existing pipework serving Octavia, ASDA George and access road diverted as part of new access road works.

Diverted stream

Existing stream diverted as part of access road works.

Pumping Station and rising main to specialist's design and details. Rising main to extend to foul manhole adjacent to Plot 2110. Length of this run approximately 650m with a lift of approximately 8m.

Permeable paving (4035m² approx.) with stepped, level, sub-base and control weirs and pipes.

CONTINUED ON DRAWING SS/018341-06

Gabion retaining wall RETAINING WALL

Filter drain and sub-base for storage of flows emanating from critical storms of 1:100 years return period + 20% CC over this width of hardstanding (Approx. 500m³ filter drain + 175m³ sub-base).

1 no. 1.500mø x 185.000m long galvanised mild steel storage pipes, laid with open joints, laid flat, by Tubaside (Twinstore system). Open joints to be wrapped in a non-woven type permeable geotextile membrane (e.g. Aztex NW100 by WTB Geotechnics) to the manufacturer's recommendations. Stone bed and surround to be wrapped in a heavyweight, needle punched, non-woven type impermeable geosynthetic clay liner (e.g. Bentofix NSP 4000 by Nque) to the manufacturer's recommendations. Overall trench size = 2.500m x 186.000m.
Estimated storage volume, including stone surround, = 500m³ based on 5 l/sec allowable off-site discharge. Allow for 5 no. 1200ø access shafts with ladders. Design based on 1:30 year return period.

Class 1 full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details – Spel Products type 'NS200' (model no. P200-1CSC) or similar approved – 450 dia. pipework.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

Vehicle wash area assumed to be enclosed and therefore no spray or runoff able to enter the surface water drainage network.

Filtration trench

Vehicle wash silt trap by Spel Products, or similar approved, bedded and surrounded in concrete to manufacturer's details – grating load class to be E600

Vehicle Washes

Jet Wash Plant Rm. | Jet Wash base | Reclaim sump tank

Class 1 forecourt separator (pipe no. xxxx) with automatic closure device and high level audible alarm system, bedded and surrounded in concrete to manufacturer's details – Spel Products type 'NS20' (model no. FP1CSC) or similar approved – 225 dia. pipework.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

GATIC ULTRASLOT DRAINAGE CHANNEL – LOAD CLASS E600

Fuel Islands

MH S1 | MH F7 | MH F8 | MH S21 | MH S22

Single stage, class 2, full retention separator (pipe no. xxxx) with automatic closure device and high level audible alarm systems for oil and silt levels, bedded and surrounded in concrete to manufacturer's details – Spel Products type 'NSX' (model no. FR0065C) or similar approved – 150 dia. pipework.
Where appropriate, in hardstanding areas, allowance to be made for R.C. cover slab over unit with 1000mm min. bearing either side.

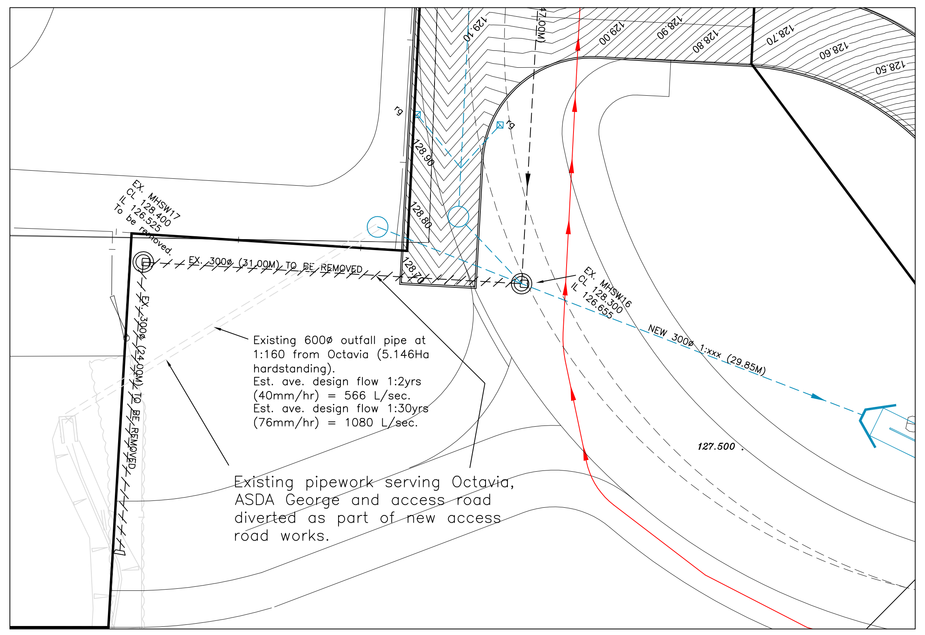
Outlet pipe to MH S21 to have a Hydro-brake flow regulator by Hydro International, or similar approved, to limit flow to 5 L/sec (5 L/sec/Ha).
Final diameter of manhole to be confirmed by flow regulator specialist.

Existing Stream

4m wide level maintenance zone required adjacent to existing streams.

New piped connection to replace existing stream connection

Headwall IL 119.200



REV	DATE	NAME	REVISION	REV' CHECK
P2	15.05.12	WDJ	TITLE SHEET UPDATED TO REVISED JOB INFORMATION.	NRB
P1	29.02.12	GM	DUE TO FLOW DISTANCE, FROM FUEL ISLANDS TO FULL RETENTION OIL SEPARATOR, ADDITIONAL FORECOURT SEPARATOR AND ISOLATING CHANNEL ADDED ADJACENT TO FUEL ISLANDS. NOTE ADDED RE: WASH AREA ENCLOSURE.	NRB

DRAWING STATUS
PRELIMINARY

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REAR OF ASDA GEORGE BLDG.
FOUL AND SURFACE WATER
DRAINAGE STRATEGY
SHEET 1 OF 2

CAPITA SYMONDS
STRUCTURES
Consulting Civil, Structural & Geotechnical Engineers
Manchester Tele No: (+44) 0 161 486 1521 | Watford Tele No: (+44) 0 1923 817537 | Cambridge Tele No: (+44) 0 114 275 2200
London Tele No: (+44) 0 20 7870 9300 | Bristol Tele No: (+44) 0 1275 840831 | Southampton Tele No: (+44) 0 2380 265053
Capita Symonds (Structures) Ltd. www.capitasymonds.co.uk
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2082106

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	WATFORD	GM	
SCALE	DATE	CHECKED BY	
1:250 @ A0	Feb 2012	NRB	

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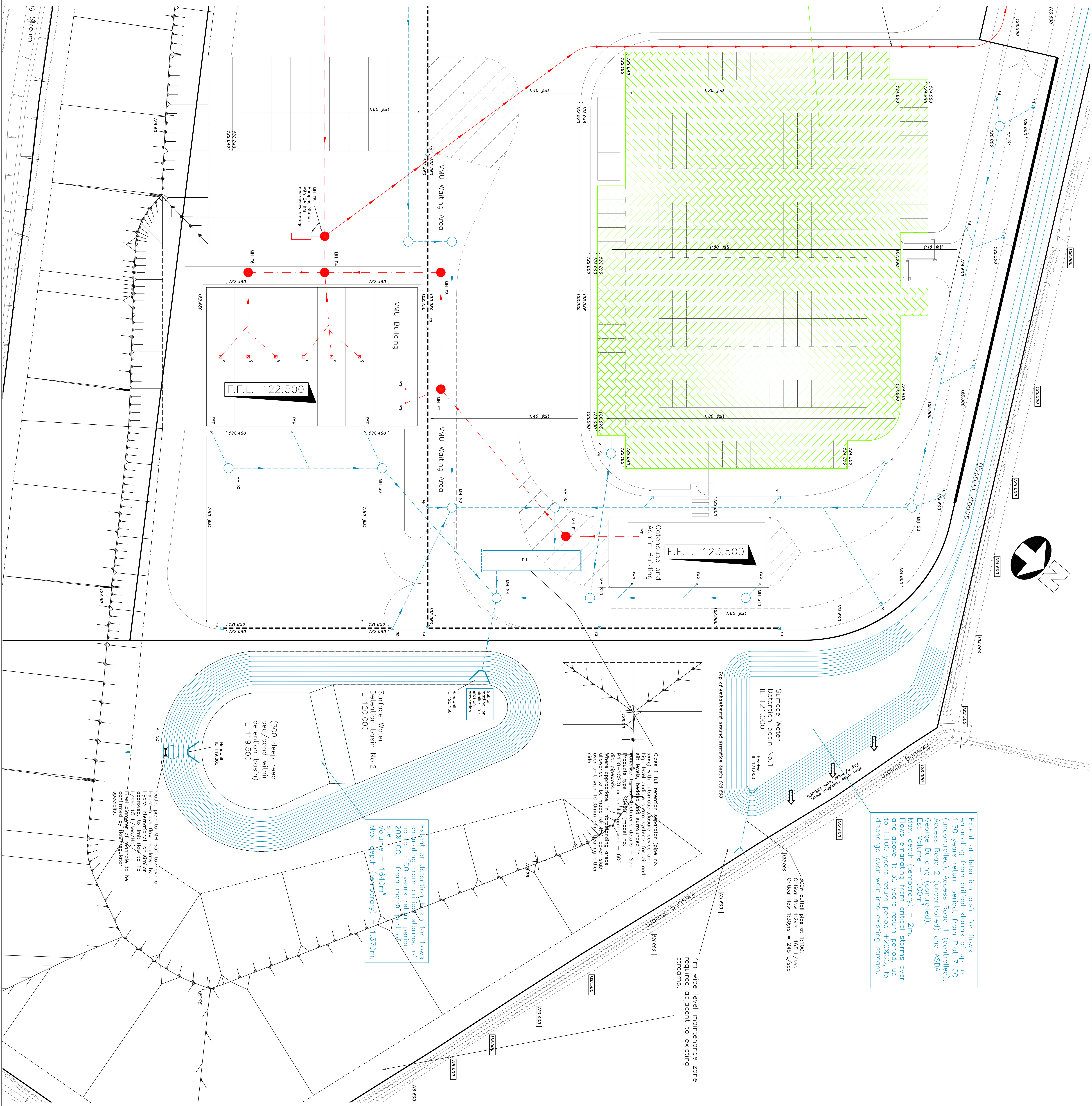
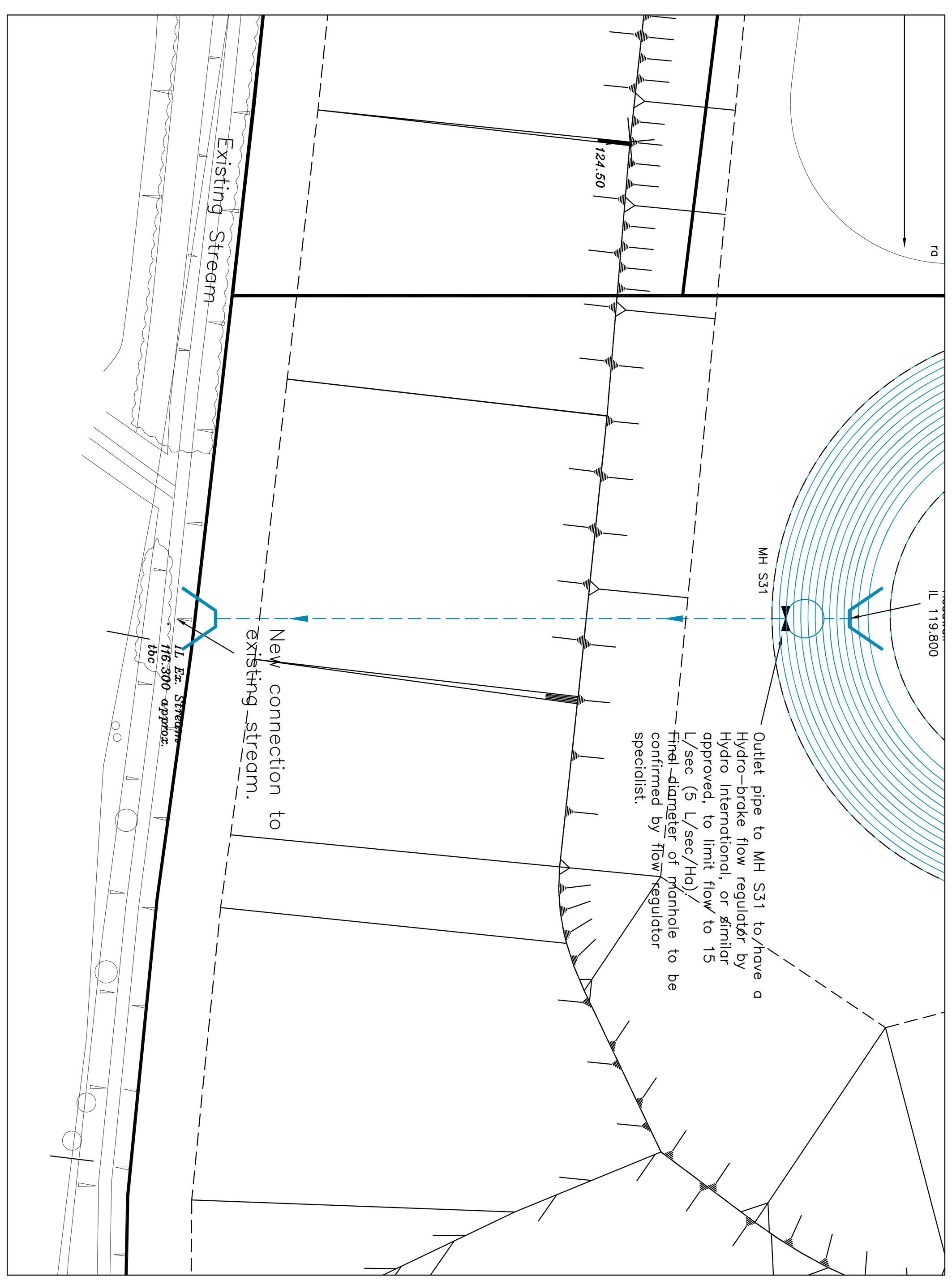
GAZELEY LAND TO THE REAR OF ASDA GEORGE BUILDING, LUTTERWORTH LEICESTERSHIRE, ADJACENT JUNCTION OF A5 AND A4303

CONTINUED ON DRAWING SS/018341-05





GAZELEY LAND TO THE REAR OF ASDA GEORGE BUILDING, LUTTERWORTH LEICESTERSHIRE, ADJACENT JUNCTION OF A5 AND A4303

REV	DATE	NAME	REVISION	REV' CHECK
P2	15.05.12	WDJ	TITLE SHEET UPDATED TO REVISED JOB INFORMATION.	NRB
P1	29.02.12	GM	FOUL AND SURFACE WATER DRAINAGE LAYOUTS GENERALLY UPDATED. EMERGENCY STORAGE AT FOUL PUMPING STATION INDICATED.	NRB

DRAWING STATUS

PRELIMINARY

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REAR OF ASDA GEORGE BLDG.
FOUL AND SURFACE WATER
DRAINAGE STRATEGY
SHEET 2 OF 2

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STRUCTURES
Consulting Civil, Structural & Geotechnical Engineers
Manchester Tele No: (+44) 0 161 486 1521
Watford Tele No: (+44) 0 1923 817537
Cambridge Tele No: (+44) 0 114 275 2200
London Tele No: (+44) 0 20 7870 9300
Bristol Tele No: (+44) 0 1275 840831
Southampton Tele No: (+44) 0 2380 265053
Capita Symonds (Structures) Ltd.
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2082106
www.capitasymonds.co.uk

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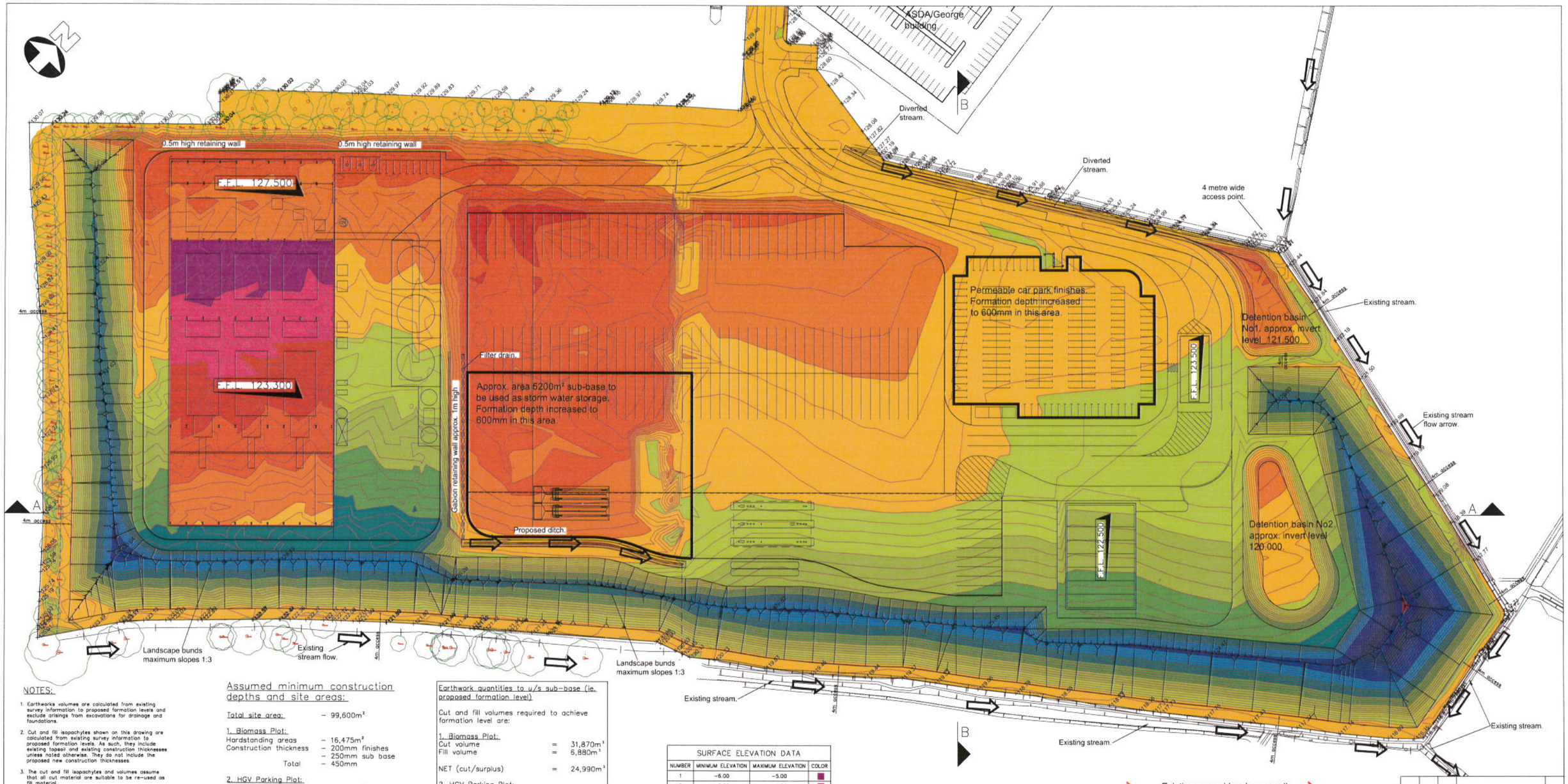
DRAWING No.
SS/018341-06/P2



NOTES:

1. Earthworks volumes are calculated from existing survey information to proposed formation levels and exclude arisings from excavations for drainage and foundations.
2. Cut and fill isopachytes shown on this drawing are calculated from existing survey information to proposed formation levels. As such, they include existing topsoil and existing construction thicknesses unless noted otherwise. They do not include the proposed new construction thicknesses.
3. The cut and fill isopachytes and volumes assume that all cut material are suitable to be re-used as fill material.
4. The topsoil thicknesses and volumes shown on this drawing are assumed and to be confirmed by investigation on site.
5. Additional testing of head deposits is required to certain areas of the site and a volume of material may need to be stabilised prior to reuse as fill material.
6. All earthworks are to be undertaken in conjunction with Capita Symonds' NBS Specification. Full method statement to be provided for approval by the Engineer prior to any work commencing on site.

THE FINDINGS ON THE DRAWING ARE SUBJECT TO A FULL DETAIL GEOTECHNICAL SITE INVESTIGATION REPORT AND ASSESSMENT.

Assumed minimum construction depths to new areas:

All Hardstanding Areas:	450mm
Top Soil Allowed for:	300mm site strip
Landscaped Areas:	300mm

THIS DRAWING IS FOR INFORMATION PURPOSES ONLY AND THE MAIN CONTRACTOR MUST CARRY OUT HIS OWN CUT AND FILL ANALYSIS TO SATISFY HIMSELF AS TO THE ACCURACY OF THE CUT AND FILL VOLUMES.

Drawings:
Topographical survey -
Architects layout plan - Chetwoods Architect's drawing 3287-51-15_Proposed site layout.

Assumed minimum construction depths and site areas:

Total site area: – 99,600m²

1. Biomass Plot:
Hardstanding areas – 16,475m²
Construction thickness – 200mm finishes
– 250mm sub base
Total – 450mm

2. HGV Parking Plot:
Total area – 35,940m²
Hardstanding area – 26,705m²
Construction thickness – 200mm finishes
– 250mm sub base
Total – 450mm

Porous Car Park area – 4,035m²
Construction thickness – 100mm finishes
– 500mm sub base
Total – 600mm

Porous Service Yard area – 5,200m²
Construction thickness – 100mm finishes
– 500mm sub base
Total – 600mm

3. Access Road to Adoptable Standards:
Hardstanding area – 3,130m²
Construction thickness – 300mm asphalt finishes
– 225mm sub base
Total – 525mm

4. Landscaping:
Area – 44,055m²
Construction thickness – 200mm finishes
– 250mm sub base
Total – 450mm

Earthwork quantities to u/s sub-base (ie. proposed formation level)

Cut and fill volumes required to achieve formation level are:

1. Biomass Plot:
Cut volume = 31,870m³
Fill volume = 6,880m³
NET (cut/surplus) = 24,990m³

2. HGV Parking Plot:
Cut volume = 31,670m³
Fill volume = 8,470m³
NET (cut/surplus) = 23,200m³

3. Access Road:
Cut volume = 1,240m³
Fill volume = 0m³
NET (cut/surplus) = 1,240m³

4. Landscaping
Cut volume = 14,760m³
Fill volume = 64,100m³
NET (fill/required) = 49,340m³

TOTAL:
Cut volume = 79,540m³
Fill volume = 79,450m³
Total (cut/surplus) = 90m³

Topsoil Site Strip:
300mm Site strip where hardstanding areas are proposed only (i.e. no site strip on proposed landscaped areas).
Site Strip Volume = 16,650m³
Above volume of topsoil to be reused in landscaping areas around the site as below:
Required topsoil for landscaping = 13,200m³
Remaining Surplus Topsoil = 3,450m³

SURFACE ELEVATION DATA

NUMBER	MINIMUM ELEVATION	MAXIMUM ELEVATION	COLOR
1	-6.00	-5.00	
2	-5.00	-4.00	
3	-4.00	-3.00	
4	-3.00	-2.00	
5	-2.00	-1.00	
6	-1.00	0.00	
7	0.00	1.00	
8	1.00	2.00	
9	2.00	3.00	
10	3.00	4.00	
11	4.00	5.00	
12	5.00	6.00	

THE LEVELS AND VOLUMES ON THIS DRAWING ARE PRELIMINARY ONLY AND NOT TO BE USED FOR CONSTRUCTION PURPOSES.

REV.	DATE	NAME	REVISION	REV. CHECK
P1	15.25.12	WDJ	TITLE SHEET UPDATED TO REVISED JOB INFORMATION.	NRB

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REAR OF ASDA GEORGE BLDG.
EARTHWORKS ANALYSIS

CAPITA SYMONDS
STRUCTURES
Consulting Civil, Structural & Geotechnical Engineers
Manchester Watford Cambridge
London Bristol Southampton

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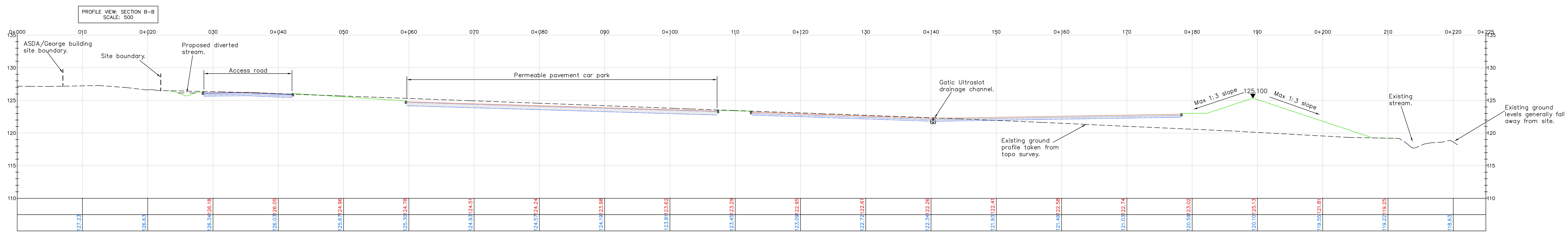
DRAWING No. SS/018341-411/P1

GAZELEY LAND TO THE REAR OF ASDA GEORGE BUILDING, LUTTERWORTH LEICESTERSHIRE, ADJACENT JUNCTION OF A5 AND A4303



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Drawings:
Topographical survey –
Architects layout plan – Chetwoods Architect's drawing 3287-51-15_Proposed site layout.

REV	DATE	NAME	REVISION	REV' CHECK
P1	15.05.12	WDJ	TITLE SHEET UPDATED TO REVISED JOB INFORMATION.	NRB

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REAR OF ASDA GEORGE BLDG.
EARTHWORKS ANALYSIS
SITE SECTIONS

CAPITA SYMONDS
STRUCTURES
Consulting Civil, Structural & Geotechnical Engineers
Manchester, Watford, Cambridge, London, Bristol, Southampton
Capita Symonds (Structures) Ltd. www.capitasymonds.co.uk
Reg. office 71 Victoria Street, Westminster, London SW1H 0XA • No: 2082106

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DRAWING No. SS/018341-412/P1

Appendix B Surface Water Drainage Calculations

Appendix B Contents

Summary of Results for 30 year Return Period

Half Drain Time : 787 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	124.507	0.507	0.0	3.8	3.8	188.3	O K
30 min Summer	124.656	0.656	0.0	4.2	4.2	243.7	O K
60 min Summer	124.805	0.805	0.0	4.7	4.7	298.8	O K
120 min Summer	124.944	0.944	0.0	5.1	5.1	350.5	O K
180 min Summer	125.014	1.014	0.0	5.3	5.3	376.4	O K
240 min Summer	125.054	1.054	0.0	5.4	5.4	391.1	O K
360 min Summer	125.093	1.093	0.0	5.5	5.5	405.7	O K
480 min Summer	125.104	1.104	0.0	5.5	5.5	410.0	O K
600 min Summer	125.102	1.102	0.0	5.5	5.5	409.1	O K
720 min Summer	125.097	1.097	0.0	5.5	5.5	407.4	O K
960 min Summer	125.083	1.083	0.0	5.5	5.5	402.0	O K
1440 min Summer	125.044	1.044	0.0	5.4	5.4	387.5	O K
2160 min Summer	124.977	0.977	0.0	5.2	5.2	362.7	O K
2880 min Summer	124.912	0.912	0.0	5.0	5.0	338.6	O K
4320 min Summer	124.795	0.795	0.0	4.7	4.7	295.3	O K
5760 min Summer	124.694	0.694	0.0	4.4	4.4	257.6	O K
7200 min Summer	124.606	0.606	0.0	4.1	4.1	225.0	O K
8640 min Summer	124.529	0.529	0.0	3.8	3.8	196.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	76.035	26
30 min Summer	49.499	41
60 min Summer	30.811	70
120 min Summer	18.615	128
180 min Summer	13.715	186
240 min Summer	10.995	246
360 min Summer	8.034	364
480 min Summer	6.428	480
600 min Summer	5.404	556
720 min Summer	4.687	610
960 min Summer	3.743	732
1440 min Summer	2.723	1000
2160 min Summer	1.979	1412
2880 min Summer	1.577	1824
4320 min Summer	1.143	2640
5760 min Summer	0.910	3416
7200 min Summer	0.762	4192
8640 min Summer	0.659	5008

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	124.460	0.460	0.0	3.8	3.8	170.8	O K
15 min Winter	124.569	0.569	0.0	4.0	4.0	211.2	O K
30 min Winter	124.736	0.736	0.0	4.5	4.5	273.4	O K
60 min Winter	124.904	0.904	0.0	5.0	5.0	335.6	O K
120 min Winter	125.064	1.064	0.0	5.4	5.4	394.9	O K
180 min Winter	125.145	1.145	0.0	5.6	5.6	425.2	O K
240 min Winter	125.193	1.193	0.0	5.7	5.7	443.0	O K
360 min Winter	125.244	1.244	0.0	5.8	5.8	462.0	O K
480 min Winter	125.265	1.265	0.0	5.9	5.9	469.6	O K
600 min Winter	125.268	1.268	0.0	5.9	5.9	470.7	O K
720 min Winter	125.261	1.261	0.0	5.9	5.9	468.1	O K
960 min Winter	125.240	1.240	0.0	5.8	5.8	460.2	O K
1440 min Winter	125.189	1.189	0.0	5.7	5.7	441.3	O K
2160 min Winter	125.093	1.093	0.0	5.5	5.5	405.7	O K
2880 min Winter	124.997	0.997	0.0	5.2	5.2	370.2	O K
4320 min Winter	124.827	0.827	0.0	4.8	4.8	307.1	O K
5760 min Winter	124.685	0.685	0.0	4.3	4.3	254.4	O K
7200 min Winter	124.565	0.565	0.0	3.9	3.9	209.7	O K
8640 min Winter	124.457	0.457	0.0	3.8	3.8	169.6	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.583	5752
15 min Winter	76.035	26
30 min Winter	49.499	40
60 min Winter	30.811	68
120 min Winter	18.615	126
180 min Winter	13.715	184
240 min Winter	10.995	242
360 min Winter	8.034	356
480 min Winter	6.428	468
600 min Winter	5.404	576
720 min Winter	4.687	678
960 min Winter	3.743	766
1440 min Winter	2.723	1074
2160 min Winter	1.979	1532
2880 min Winter	1.577	1968
4320 min Winter	1.143	2816
5760 min Winter	0.910	3640
7200 min Winter	0.762	4472
8640 min Winter	0.659	5280

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	124.339	0.339	0.0	3.8	3.8	125.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.583	6152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 1.348

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.449	4-8	0.449	8-12	0.450

Model Details

Storage is Online Cover Level (m) 127.500

Cellular Storage Structure

Invert Level (m) 124.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.66
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	562.5	562.5	1.300	562.5	685.8
0.100	562.5	572.0	1.400	562.5	695.3
0.200	562.5	581.5	1.500	562.5	704.8
0.300	562.5	591.0	1.600	562.5	714.3
0.400	562.5	600.4	1.700	562.5	723.8
0.500	562.5	609.9	1.800	562.5	733.3
0.600	562.5	619.4	1.900	0.0	738.0
0.700	562.5	628.9	2.000	0.0	738.0
0.800	562.5	638.4	2.100	0.0	738.0
0.900	562.5	647.9	2.200	0.0	738.0
1.000	562.5	657.4	2.300	0.0	738.0
1.100	562.5	666.9	2.400	0.0	738.0
1.200	562.5	676.3	2.500	0.0	738.0

Hydro-Brake® Outflow Control

Design Head (m) 1.800 Hydro-Brake® Type Md4 Invert Level (m) 124.000
Design Flow (l/s) 7.0 Diameter (mm) 82

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	5.7	3.000	9.1	7.000	13.9
0.200	3.7	1.400	6.2	3.500	9.8	7.500	14.3
0.300	3.2	1.600	6.6	4.000	10.5	8.000	14.8
0.400	3.4	1.800	7.0	4.500	11.1	8.500	15.3
0.500	3.7	2.000	7.4	5.000	11.7	9.000	15.7
0.600	4.1	2.200	7.8	5.500	12.3	9.500	16.2
0.800	4.7	2.400	8.1	6.000	12.8		
1.000	5.2	2.600	8.4	6.500	13.4		

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 828 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m^3)	Status
15 min Summer	124.793	0.793	0.0	4.7	4.7	294.6	O K
30 min Summer	125.036	1.036	0.0	5.3	5.3	384.8	O K
60 min Summer	125.280	1.280	0.0	5.9	5.9	475.3	O K
120 min Summer	125.510	1.510	0.0	6.4	6.4	560.7	O K
180 min Summer	125.627	1.627	0.0	6.7	6.7	603.9	O K
240 min Summer	125.693	1.693	0.0	6.8	6.8	628.6	O K
360 min Summer	125.766	1.766	0.0	7.0	7.0	655.8	O K
480 min Summer	125.798	1.798	0.0	7.0	7.0	667.7	O K
600 min Summer	125.806	1.806	0.0	7.0	7.0	670.4	O K
720 min Summer	125.799	1.799	0.0	7.0	7.0	667.7	O K
960 min Summer	125.778	1.778	0.0	7.0	7.0	660.1	O K
1440 min Summer	125.723	1.723	0.0	6.9	6.9	639.8	O K
2160 min Summer	125.627	1.627	0.0	6.7	6.7	604.0	O K
2880 min Summer	125.532	1.532	0.0	6.5	6.5	568.8	O K
4320 min Summer	125.366	1.366	0.0	6.1	6.1	507.1	O K
5760 min Summer	125.223	1.223	0.0	5.8	5.8	454.0	O K
7200 min Summer	125.099	1.099	0.0	5.5	5.5	408.0	O K
8640 min Summer	124.990	0.990	0.0	5.2	5.2	367.6	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	118.417	27
30 min Summer	77.747	41
60 min Summer	48.611	70
120 min Summer	29.354	130
180 min Summer	21.556	188
240 min Summer	17.210	246
360 min Summer	12.501	364
480 min Summer	9.962	482
600 min Summer	8.347	600
720 min Summer	7.221	688
960 min Summer	5.740	796
1440 min Summer	4.148	1044
2160 min Summer	2.992	1456
2880 min Summer	2.371	1876
4320 min Summer	1.705	2684
5760 min Summer	1.348	3472
7200 min Summer	1.123	4256
8640 min Summer	0.967	5024

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	124.894	0.894	0.0	5.0	5.0	331.8	O K
15 min Winter	124.890	0.890	0.0	4.9	4.9	330.3	O K
30 min Winter	125.162	1.162	0.0	5.6	5.6	431.6	O K
60 min Winter	125.438	1.438	0.0	6.3	6.3	533.7	O K
120 min Winter	125.700	1.700	0.0	6.8	6.8	631.0	O K
180 min Winter	125.844	1.844	0.0	7.1	7.1	681.0	O K
240 min Winter	127.518	3.518	0.0	9.8	9.8	705.7	FLOOD
360 min Winter	127.543	3.543	0.0	9.9	9.9	730.8	FLOOD
480 min Winter	127.553	3.553	0.0	9.9	9.9	741.1	FLOOD
600 min Winter	127.554	3.554	0.0	9.9	9.9	742.2	FLOOD
720 min Winter	127.550	3.550	0.0	9.9	9.9	738.1	FLOOD
960 min Winter	127.545	3.545	0.0	9.9	9.9	732.3	FLOOD
1440 min Winter	127.523	3.523	0.0	9.8	9.8	710.9	FLOOD
2160 min Winter	125.867	1.867	0.0	7.2	7.2	684.8	O K
2880 min Winter	125.712	1.712	0.0	6.9	6.9	635.6	O K
4320 min Winter	125.471	1.471	0.0	6.4	6.4	546.2	O K
5760 min Winter	125.268	1.268	0.0	5.9	5.9	470.9	O K
7200 min Winter	125.098	1.098	0.0	5.5	5.5	407.6	O K
8640 min Winter	124.953	0.953	0.0	5.1	5.1	353.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.852	5840
15 min Winter	118.417	26
30 min Winter	77.747	41
60 min Winter	48.611	70
120 min Winter	29.354	126
180 min Winter	21.556	184
240 min Winter	17.210	240
360 min Winter	12.501	354
480 min Winter	9.962	464
600 min Winter	8.347	570
720 min Winter	7.221	660
960 min Winter	5.740	748
1440 min Winter	4.148	1050
2160 min Winter	2.992	1568
2880 min Winter	2.371	2020
4320 min Winter	1.705	2896
5760 min Winter	1.348	3704
7200 min Winter	1.123	4536
8640 min Winter	0.967	5288

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	124.830	0.830	0.0	4.8	4.8	308.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.852	6064

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time / Area Diagram

Total Area (ha) 1.348

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.449	4-8	0.449	8-12	0.450

Model Details

Storage is Online Cover Level (m) 127.500

Cellular Storage Structure

Invert Level (m) 124.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.66
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	562.5	562.5	1.300	562.5	685.8
0.100	562.5	572.0	1.400	562.5	695.3
0.200	562.5	581.5	1.500	562.5	704.8
0.300	562.5	591.0	1.600	562.5	714.3
0.400	562.5	600.4	1.700	562.5	723.8
0.500	562.5	609.9	1.800	562.5	733.3
0.600	562.5	619.4	1.900	0.0	738.0
0.700	562.5	628.9	2.000	0.0	738.0
0.800	562.5	638.4	2.100	0.0	738.0
0.900	562.5	647.9	2.200	0.0	738.0
1.000	562.5	657.4	2.300	0.0	738.0
1.100	562.5	666.9	2.400	0.0	738.0
1.200	562.5	676.3	2.500	0.0	738.0

Hydro-Brake® Outflow Control

Design Head (m) 1.800 Hydro-Brake® Type Md4 Invert Level (m) 124.000
Design Flow (l/s) 7.0 Diameter (mm) 82

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	5.7	3.000	9.1	7.000	13.9
0.200	3.7	1.400	6.2	3.500	9.8	7.500	14.3
0.300	3.2	1.600	6.6	4.000	10.5	8.000	14.8
0.400	3.4	1.800	7.0	4.500	11.1	8.500	15.3
0.500	3.7	2.000	7.4	5.000	11.7	9.000	15.7
0.600	4.1	2.200	7.8	5.500	12.3	9.500	16.2
0.800	4.7	2.400	8.1	6.000	12.8		
1.000	5.2	2.600	8.4	6.500	13.4		

Summary of Results for 30 year Return Period

Half Drain Time : 908 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	120.142	0.442	0.0	2.8	2.8	135.0	O K
30 min Summer	120.273	0.573	0.0	2.8	2.8	175.1	O K
60 min Summer	120.406	0.706	0.0	2.9	2.9	215.6	O K
120 min Summer	120.534	0.834	0.0	3.2	3.2	254.7	O K
180 min Summer	120.602	0.902	0.0	3.4	3.4	275.2	O K
240 min Summer	120.642	0.942	0.0	3.4	3.4	287.7	O K
360 min Summer	120.688	0.988	0.0	3.5	3.5	301.6	O K
480 min Summer	120.709	1.009	0.0	3.6	3.6	307.9	O K
600 min Summer	120.715	1.015	0.0	3.6	3.6	309.8	O K
720 min Summer	120.715	1.015	0.0	3.6	3.6	309.9	O K
960 min Summer	120.712	1.012	0.0	3.6	3.6	308.9	O K
1440 min Summer	120.692	0.992	0.0	3.5	3.5	302.9	O K
2160 min Summer	120.645	0.945	0.0	3.4	3.4	288.5	O K
2880 min Summer	120.592	0.892	0.0	3.3	3.3	272.3	O K
4320 min Summer	120.489	0.789	0.0	3.1	3.1	240.8	O K
5760 min Summer	120.396	0.696	0.0	2.9	2.9	212.5	O K
7200 min Summer	120.311	0.611	0.0	2.8	2.8	186.6	O K
8640 min Summer	120.232	0.532	0.0	2.8	2.8	162.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	76.035	26
30 min Summer	49.499	41
60 min Summer	30.811	70
120 min Summer	18.615	128
180 min Summer	13.715	188
240 min Summer	10.995	246
360 min Summer	8.034	364
480 min Summer	6.428	482
600 min Summer	5.404	594
720 min Summer	4.687	638
960 min Summer	3.743	762
1440 min Summer	2.723	1018
2160 min Summer	1.979	1432
2880 min Summer	1.577	1848
4320 min Summer	1.143	2676
5760 min Summer	0.910	3464
7200 min Summer	0.762	4256
8640 min Summer	0.659	5016

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	120.156	0.456	0.0	2.8	2.8	139.1	O K
15 min Winter	120.196	0.496	0.0	2.8	2.8	151.5	O K
30 min Winter	120.343	0.643	0.0	2.8	2.8	196.4	O K
60 min Winter	120.492	0.792	0.0	3.1	3.1	241.8	O K
120 min Winter	120.637	0.937	0.0	3.4	3.4	286.1	O K
180 min Winter	120.714	1.014	0.0	3.6	3.6	309.5	O K
240 min Winter	120.761	1.061	0.0	3.7	3.7	324.0	O K
360 min Winter	120.816	1.116	0.0	3.8	3.8	340.8	O K
480 min Winter	120.844	1.144	0.0	3.8	3.8	349.2	O K
600 min Winter	120.855	1.155	0.0	3.8	3.8	352.7	O K
720 min Winter	120.857	1.157	0.0	3.8	3.8	353.2	O K
960 min Winter	120.845	1.145	0.0	3.8	3.8	349.6	O K
1440 min Winter	120.817	1.117	0.0	3.8	3.8	341.0	O K
2160 min Winter	120.748	1.048	0.0	3.6	3.6	320.0	O K
2880 min Winter	120.670	0.970	0.0	3.5	3.5	296.2	O K
4320 min Winter	120.520	0.820	0.0	3.2	3.2	250.3	O K
5760 min Winter	120.385	0.685	0.0	2.9	2.9	209.2	O K
7200 min Winter	120.260	0.560	0.0	2.8	2.8	170.9	O K
8640 min Winter	120.129	0.429	0.0	2.8	2.8	131.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.583	5752
15 min Winter	76.035	26
30 min Winter	49.499	41
60 min Winter	30.811	70
120 min Winter	18.615	126
180 min Winter	13.715	184
240 min Winter	10.995	242
360 min Winter	8.034	356
480 min Winter	6.428	470
600 min Winter	5.404	580
720 min Winter	4.687	686
960 min Winter	3.743	796
1440 min Winter	2.723	1088
2160 min Winter	1.979	1544
2880 min Winter	1.577	1996
4320 min Winter	1.143	2860
5760 min Winter	0.910	3696
7200 min Winter	0.762	4536
8640 min Winter	0.659	5272

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	120.010	0.310	0.0	2.8	2.8	94.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.583	5752

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 0.964

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.321	4-8	0.321	8-12	0.322

Model Details

Storage is Online Cover Level (m) 122.360

Cellular Storage Structure

Invert Level (m) 119.700 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.66
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	462.5	462.5	1.300	462.5	574.3
0.100	462.5	471.1	1.400	462.5	582.9
0.200	462.5	479.7	1.500	462.5	591.5
0.300	462.5	488.3	1.600	462.5	600.1
0.400	462.5	496.9	1.700	462.5	608.7
0.500	462.5	505.5	1.800	462.5	617.3
0.600	462.5	514.1	1.900	0.0	621.6
0.700	462.5	522.7	2.000	0.0	621.6
0.800	462.5	531.3	2.100	0.0	621.6
0.900	462.5	539.9	2.200	0.0	621.6
1.000	462.5	548.5	2.300	0.0	621.6
1.100	462.5	557.1	2.400	0.0	621.6
1.200	462.5	565.7	2.500	0.0	621.6

Hydro-Brake® Outflow Control

Design Head (m) 1.800 Diameter (mm) 81
Design Flow (l/s) 5.0 Invert Level (m) 119.800
Hydro-Brake® Type Md6 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	1.200	4.1	3.000	6.5	7.000	9.9
0.200	2.8	1.400	4.4	3.500	7.0	7.500	10.3
0.300	2.6	1.600	4.7	4.000	7.5	8.000	10.6
0.400	2.6	1.800	5.0	4.500	7.9	8.500	10.9
0.500	2.7	2.000	5.3	5.000	8.4	9.000	11.2
0.600	2.9	2.200	5.6	5.500	8.8	9.500	11.5
0.800	3.4	2.400	5.8	6.000	9.2		
1.000	3.7	2.600	6.0	6.500	9.5		

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1004 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15	min Summer	120.392	0.692	0.0	2.9	2.9	211.2	O K
30	min Summer	120.605	0.905	0.0	3.4	3.4	276.2	O K
60	min Summer	120.821	1.121	0.0	3.8	3.8	342.1	O K
120	min Summer	121.027	1.327	0.0	4.1	4.1	405.1	O K
180	min Summer	121.134	1.434	0.0	4.3	4.3	437.8	O K
240	min Summer	121.198	1.498	0.0	4.4	4.4	457.3	O K
360	min Summer	121.272	1.572	0.0	4.5	4.5	480.0	O K
480	min Summer	121.311	1.611	0.0	4.6	4.6	491.6	O K
600	min Summer	121.327	1.627	0.0	4.6	4.6	496.5	O K
720	min Summer	121.328	1.628	0.0	4.6	4.6	497.1	O K
960	min Summer	121.318	1.618	0.0	4.6	4.6	493.8	O K
1440	min Summer	121.285	1.585	0.0	4.6	4.6	483.9	O K
2160	min Summer	121.219	1.519	0.0	4.5	4.5	463.6	O K
2880	min Summer	121.144	1.444	0.0	4.3	4.3	440.8	O K
4320	min Summer	121.003	1.303	0.0	4.1	4.1	397.9	O K
5760	min Summer	120.879	1.179	0.0	3.9	3.9	360.0	O K
7200	min Summer	120.770	1.070	0.0	3.7	3.7	326.6	O K
8640	min Summer	120.672	0.972	0.0	3.5	3.5	296.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	118.417	27
30 min Summer	77.747	41
60 min Summer	48.611	70
120 min Summer	29.354	130
180 min Summer	21.556	188
240 min Summer	17.210	248
360 min Summer	12.501	366
480 min Summer	9.962	484
600 min Summer	8.347	602
720 min Summer	7.221	720
960 min Summer	5.740	826
1440 min Summer	4.148	1074
2160 min Summer	2.992	1476
2880 min Summer	2.371	1884
4320 min Summer	1.705	2724
5760 min Summer	1.348	3520
7200 min Summer	1.123	4328
8640 min Summer	0.967	5104

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	120.585	0.885	0.0	3.3	3.3	270.2	O K
15 min Winter	120.476	0.776	0.0	3.1	3.1	236.8	O K
30 min Winter	120.714	1.014	0.0	3.6	3.6	309.7	O K
60 min Winter	120.957	1.257	0.0	4.0	4.0	383.7	O K
120 min Winter	121.191	1.491	0.0	4.4	4.4	455.1	O K
180 min Winter	121.313	1.613	0.0	4.6	4.6	492.5	O K
240 min Winter	121.388	1.688	0.0	4.7	4.7	515.2	O K
360 min Winter	121.477	1.777	0.0	4.8	4.8	542.4	O K
480 min Winter	121.530	1.830	0.0	4.9	4.9	557.3	O K
600 min Winter	121.596	1.896	0.0	5.0	5.0	564.7	O K
720 min Winter	122.361	2.661	0.0	6.0	6.0	565.7	FLOOD
960 min Winter	121.590	1.890	0.0	5.0	5.0	564.6	O K
1440 min Winter	121.502	1.802	0.0	4.9	4.9	550.2	O K
2160 min Winter	121.414	1.714	0.0	4.8	4.8	523.1	O K
2880 min Winter	121.310	1.610	0.0	4.6	4.6	491.6	O K
4320 min Winter	121.109	1.409	0.0	4.3	4.3	430.0	O K
5760 min Winter	120.932	1.232	0.0	4.0	4.0	376.0	O K
7200 min Winter	120.780	1.080	0.0	3.7	3.7	329.6	O K
8640 min Winter	120.648	0.948	0.0	3.4	3.4	289.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.852	5856
15 min Winter	118.417	26
30 min Winter	77.747	41
60 min Winter	48.611	70
120 min Winter	29.354	128
180 min Winter	21.556	184
240 min Winter	17.210	242
360 min Winter	12.501	358
480 min Winter	9.962	472
600 min Winter	8.347	586
720 min Winter	7.221	684
960 min Winter	5.740	904
1440 min Winter	4.148	1128
2160 min Winter	2.992	1588
2880 min Winter	2.371	2048
4320 min Winter	1.705	2908
5760 min Winter	1.348	3752
7200 min Winter	1.123	4608
8640 min Winter	0.967	5376

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	120.531	0.831	0.0	3.2	3.2	253.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.852	6248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time / Area Diagram

Total Area (ha) 0.964

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.321	4-8	0.321	8-12	0.322

Model Details

Storage is Online Cover Level (m) 122.360

Cellular Storage Structure

Invert Level (m) 119.700 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.66
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	462.5	462.5	1.300	462.5	574.3
0.100	462.5	471.1	1.400	462.5	582.9
0.200	462.5	479.7	1.500	462.5	591.5
0.300	462.5	488.3	1.600	462.5	600.1
0.400	462.5	496.9	1.700	462.5	608.7
0.500	462.5	505.5	1.800	462.5	617.3
0.600	462.5	514.1	1.900	0.0	621.6
0.700	462.5	522.7	2.000	0.0	621.6
0.800	462.5	531.3	2.100	0.0	621.6
0.900	462.5	539.9	2.200	0.0	621.6
1.000	462.5	548.5	2.300	0.0	621.6
1.100	462.5	557.1	2.400	0.0	621.6
1.200	462.5	565.7	2.500	0.0	621.6

Hydro-Brake® Outflow Control

Design Head (m) 1.800 Diameter (mm) 81
Design Flow (l/s) 5.0 Invert Level (m) 119.800
Hydro-Brake® Type Md6 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	1.200	4.1	3.000	6.5	7.000	9.9
0.200	2.8	1.400	4.4	3.500	7.0	7.500	10.3
0.300	2.6	1.600	4.7	4.000	7.5	8.000	10.6
0.400	2.6	1.800	5.0	4.500	7.9	8.500	10.9
0.500	2.7	2.000	5.3	5.000	8.4	9.000	11.2
0.600	2.9	2.200	5.6	5.500	8.8	9.500	11.5
0.800	3.4	2.400	5.8	6.000	9.2		
1.000	3.7	2.600	6.0	6.500	9.5		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m^3)	Status
15 min Summer	120.406	0.406	12.3	408.9	O K
30 min Summer	120.514	0.514	12.3	528.0	O K
60 min Summer	120.614	0.614	12.3	643.7	O K
120 min Summer	120.701	0.701	12.3	746.2	O K
180 min Summer	120.739	0.739	12.3	792.3	O K
240 min Summer	120.756	0.756	12.3	813.9	O K
360 min Summer	120.766	0.766	12.3	825.4	O K
480 min Summer	120.758	0.758	12.3	815.5	O K
600 min Summer	120.741	0.741	12.3	795.2	O K
720 min Summer	120.725	0.725	12.3	775.6	O K
960 min Summer	120.698	0.698	12.3	743.3	O K
1440 min Summer	120.653	0.653	12.3	688.9	O K
2160 min Summer	120.587	0.587	12.3	612.4	O K
2880 min Summer	120.523	0.523	12.3	538.1	O K
4320 min Summer	120.394	0.394	12.3	395.5	O K
5760 min Summer	120.272	0.272	12.3	266.9	O K
7200 min Summer	120.174	0.174	12.3	167.5	O K
8640 min Summer	120.105	0.105	12.3	99.7	O K
10080 min Summer	120.060	0.060	12.0	55.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	76.035	26
30 min Summer	49.499	41
60 min Summer	30.811	70
120 min Summer	18.615	128
180 min Summer	13.715	186
240 min Summer	10.995	246
360 min Summer	8.034	364
480 min Summer	6.428	480
600 min Summer	5.404	558
720 min Summer	4.687	614
960 min Summer	3.743	740
1440 min Summer	2.723	1002
2160 min Summer	1.979	1412
2880 min Summer	1.577	1820
4320 min Summer	1.143	2600
5760 min Summer	0.910	3336
7200 min Summer	0.762	3968
8640 min Summer	0.659	4664
10080 min Summer	0.583	5256

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	120.453	0.453	12.3	460.4	O K
30 min Winter	120.573	0.573	12.3	595.1	O K
60 min Winter	120.685	0.685	12.3	727.6	O K
120 min Winter	120.784	0.784	12.3	848.2	O K
180 min Winter	120.830	0.830	12.6	905.6	O K
240 min Winter	120.854	0.854	12.7	935.5	O K
360 min Winter	120.873	0.873	12.8	959.4	O K
480 min Winter	120.872	0.872	12.8	959.2	O K
600 min Winter	120.862	0.862	12.7	945.7	O K
720 min Winter	120.845	0.845	12.6	924.8	O K
960 min Winter	120.808	0.808	12.4	877.4	O K
1440 min Winter	120.747	0.747	12.3	802.6	O K
2160 min Winter	120.653	0.653	12.3	689.8	O K
2880 min Winter	120.556	0.556	12.3	575.9	O K
4320 min Winter	120.355	0.355	12.3	353.6	O K
5760 min Winter	120.174	0.174	12.3	166.7	O K
7200 min Winter	120.066	0.066	12.1	62.2	O K
8640 min Winter	120.016	0.016	11.2	15.1	O K
10080 min Winter	120.000	0.000	10.3	0.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	76.035	26
30 min Winter	49.499	40
60 min Winter	30.811	68
120 min Winter	18.615	126
180 min Winter	13.715	184
240 min Winter	10.995	242
360 min Winter	8.034	356
480 min Winter	6.428	468
600 min Winter	5.404	576
720 min Winter	4.687	680
960 min Winter	3.743	778
1440 min Winter	2.723	1082
2160 min Winter	1.979	1540
2880 min Winter	1.577	1972
4320 min Winter	1.143	2772
5760 min Winter	0.910	3408
7200 min Winter	0.762	3968
8640 min Winter	0.659	4576
10080 min Winter	0.583	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 2.995

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.000	4-8	1.000	8-12	0.995

Model Details

Storage is Online Cover Level (m) 122.000

Tank or Pond Structure

Invert Level (m) 120.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	925.0	0.700	1205.0	1.400	1485.0	2.100	0.0
0.100	965.0	0.800	1245.0	1.500	1525.0	2.200	0.0
0.200	1005.0	0.900	1285.0	1.600	1565.0	2.300	0.0
0.300	1045.0	1.000	1325.0	1.700	1605.0	2.400	0.0
0.400	1085.0	1.100	1365.0	1.800	1645.0	2.500	0.0
0.500	1125.0	1.200	1405.0	1.900	1685.0		
0.600	1165.0	1.300	1445.0	2.000	1725.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.500 Diameter (mm) 146
Design Flow (l/s) 15.0 Invert Level (m) 119.800
Hydro-Brake® Type Md6 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	13.4	3.000	21.1	7.000	32.2
0.200	10.6	1.400	14.4	3.500	22.8	7.500	33.3
0.300	12.2	1.600	15.4	4.000	24.3	8.000	34.4
0.400	12.1	1.800	16.3	4.500	25.8	8.500	35.5
0.500	11.6	2.000	17.2	5.000	27.2	9.000	36.5
0.600	11.3	2.200	18.0	5.500	28.5	9.500	37.5
0.800	11.6	2.400	18.8	6.000	29.8		
1.000	12.4	2.600	19.6	6.500	31.0		

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	120.617	0.617	12.3	646.5	O K
30 min Summer	120.781	0.781	12.3	844.2	O K
60 min Summer	120.936	0.936	13.1	1040.5	O K
120 min Summer	121.072	1.072	13.8	1221.8	O K
180 min Summer	121.137	1.137	14.1	1309.9	O K
240 min Summer	121.171	1.171	14.3	1357.3	O K
360 min Summer	121.204	1.204	14.4	1403.5	O K
480 min Summer	121.213	1.213	14.5	1416.7	O K
600 min Summer	121.209	1.209	14.5	1410.2	O K
720 min Summer	121.195	1.195	14.4	1391.3	O K
960 min Summer	121.161	1.161	14.2	1342.9	O K
1440 min Summer	121.099	1.099	13.9	1257.7	O K
2160 min Summer	121.026	1.026	13.5	1159.9	O K
2880 min Summer	120.961	0.961	13.2	1073.0	O K
4320 min Summer	120.836	0.836	12.6	913.2	O K
5760 min Summer	120.718	0.718	12.3	766.9	O K
7200 min Summer	120.604	0.604	12.3	631.5	O K
8640 min Summer	120.493	0.493	12.3	504.3	O K
10080 min Summer	120.384	0.384	12.3	384.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	118.417	26
30 min Summer	77.747	41
60 min Summer	48.611	70
120 min Summer	29.354	130
180 min Summer	21.556	188
240 min Summer	17.210	248
360 min Summer	12.501	366
480 min Summer	9.962	484
600 min Summer	8.347	602
720 min Summer	7.221	720
960 min Summer	5.740	830
1440 min Summer	4.148	1082
2160 min Summer	2.992	1480
2880 min Summer	2.371	1904
4320 min Summer	1.705	2724
5760 min Summer	1.348	3520
7200 min Summer	1.123	4320
8640 min Summer	0.967	5096
10080 min Summer	0.852	5760

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	120.684	0.684	12.3	726.4	O K
30 min Winter	120.865	0.865	12.7	949.2	O K
60 min Winter	121.035	1.035	13.6	1172.0	O K
120 min Winter	121.188	1.188	14.4	1381.1	O K
180 min Winter	121.262	1.262	14.7	1485.7	O K
240 min Winter	121.303	1.303	14.9	1544.9	O K
360 min Winter	121.347	1.347	15.1	1608.4	O K
480 min Winter	121.365	1.365	15.2	1634.9	O K
600 min Winter	121.368	1.368	15.2	1639.3	O K
720 min Winter	121.362	1.362	15.2	1630.3	O K
960 min Winter	121.333	1.333	15.1	1588.4	O K
1440 min Winter	121.259	1.259	14.7	1482.3	O K
2160 min Winter	121.163	1.163	14.2	1346.0	O K
2880 min Winter	121.072	1.072	13.8	1221.8	O K
4320 min Winter	120.894	0.894	12.9	986.2	O K
5760 min Winter	120.721	0.721	12.3	770.5	O K
7200 min Winter	120.549	0.549	12.3	567.7	O K
8640 min Winter	120.367	0.367	12.3	366.2	O K
10080 min Winter	120.196	0.196	12.3	189.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	118.417	26
30 min Winter	77.747	41
60 min Winter	48.611	70
120 min Winter	29.354	128
180 min Winter	21.556	184
240 min Winter	17.210	242
360 min Winter	12.501	358
480 min Winter	9.962	472
600 min Winter	8.347	586
720 min Winter	7.221	696
960 min Winter	5.740	910
1440 min Winter	4.148	1138
2160 min Winter	2.992	1604
2880 min Winter	2.371	2052
4320 min Winter	1.705	2944
5760 min Winter	1.348	3800
7200 min Winter	1.123	4608
8640 min Winter	0.967	5288
10080 min Winter	0.852	5848

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time / Area Diagram

Total Area (ha) 2.995

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.000	4-8	1.000	8-12	0.995

Model Details

Storage is Online Cover Level (m) 122.000

Tank or Pond Structure

Invert Level (m) 120.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	925.0	0.700	1205.0	1.400	1485.0	2.100	0.0
0.100	965.0	0.800	1245.0	1.500	1525.0	2.200	0.0
0.200	1005.0	0.900	1285.0	1.600	1565.0	2.300	0.0
0.300	1045.0	1.000	1325.0	1.700	1605.0	2.400	0.0
0.400	1085.0	1.100	1365.0	1.800	1645.0	2.500	0.0
0.500	1125.0	1.200	1405.0	1.900	1685.0		
0.600	1165.0	1.300	1445.0	2.000	1725.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.500 Diameter (mm) 146
Design Flow (l/s) 15.0 Invert Level (m) 119.800
Hydro-Brake® Type Md6 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	13.4	3.000	21.1	7.000	32.2
0.200	10.6	1.400	14.4	3.500	22.8	7.500	33.3
0.300	12.2	1.600	15.4	4.000	24.3	8.000	34.4
0.400	12.1	1.800	16.3	4.500	25.8	8.500	35.5
0.500	11.6	2.000	17.2	5.000	27.2	9.000	36.5
0.600	11.3	2.200	18.0	5.500	28.5	9.500	37.5
0.800	11.6	2.400	18.8	6.000	29.8		
1.000	12.4	2.600	19.6	6.500	31.0		

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	121.636	0.636	130.9	0.0	130.9	307.4	O K
30 min Summer	121.745	0.745	144.9	0.0	144.9	372.4	O K
60 min Summer	121.790	0.790	150.3	0.0	150.3	400.3	O K
120 min Summer	121.774	0.774	148.4	0.0	148.4	390.1	O K
180 min Summer	121.728	0.728	142.9	0.0	142.9	362.0	O K
240 min Summer	121.679	0.679	136.6	0.0	136.6	332.5	O K
360 min Summer	121.591	0.591	124.8	0.0	124.8	281.9	O K
480 min Summer	121.523	0.523	114.8	0.0	114.8	244.0	O K
600 min Summer	121.472	0.472	106.6	0.0	106.6	216.5	O K
720 min Summer	121.435	0.435	98.4	0.0	98.4	197.4	O K
960 min Summer	121.385	0.385	84.7	0.0	84.7	171.4	O K
1440 min Summer	121.328	0.328	65.9	0.0	65.9	143.2	O K
2160 min Summer	121.273	0.273	50.0	0.0	50.0	117.0	O K
2880 min Summer	121.242	0.242	40.8	0.0	40.8	102.7	O K
4320 min Summer	121.198	0.198	30.6	0.0	30.6	82.5	O K
5760 min Summer	121.173	0.173	24.8	0.0	24.8	71.6	O K
7200 min Summer	121.160	0.160	21.2	0.0	21.2	65.9	O K
8640 min Summer	121.151	0.151	18.5	0.0	18.5	62.0	O K
10080 min Summer	121.144	0.144	16.5	0.0	16.5	59.0	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	40.058	0.0	24
30 min Summer	25.963	0.0	34
60 min Summer	16.200	0.0	50
120 min Summer	9.897	0.0	84
180 min Summer	7.378	0.0	116
240 min Summer	5.982	0.0	148
360 min Summer	4.435	0.0	208
480 min Summer	3.581	0.0	268
600 min Summer	3.033	0.0	326
720 min Summer	2.647	0.0	386
960 min Summer	2.136	0.0	504
1440 min Summer	1.579	0.0	746
2160 min Summer	1.167	0.0	1108
2880 min Summer	0.941	0.0	1472
4320 min Summer	0.695	0.0	2204
5760 min Summer	0.561	0.0	2936
7200 min Summer	0.475	0.0	3648
8640 min Summer	0.414	0.0	4400
10080 min Summer	0.370	0.0	5040

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	121.701	0.701	139.4	0.0	139.4	345.6	O K
30 min Winter	121.819	0.819	153.7	0.0	153.7	418.4	O K
60 min Winter	121.859	0.859	158.2	0.0	158.2	443.7	O K
120 min Winter	121.809	0.809	152.5	0.0	152.5	412.3	O K
180 min Winter	121.732	0.732	143.3	0.0	143.3	364.1	O K
240 min Winter	121.657	0.657	133.8	0.0	133.8	319.8	O K
360 min Winter	121.537	0.537	116.9	0.0	116.9	251.7	O K
480 min Winter	121.457	0.457	103.7	0.0	103.7	208.5	O K
600 min Winter	121.408	0.408	91.2	0.0	91.2	183.1	O K
720 min Winter	121.374	0.374	81.4	0.0	81.4	165.8	O K
960 min Winter	121.331	0.331	67.0	0.0	67.0	144.7	O K
1440 min Winter	121.273	0.273	50.0	0.0	50.0	116.9	O K
2160 min Winter	121.227	0.227	37.1	0.0	37.1	95.7	O K
2880 min Winter	121.195	0.195	30.1	0.0	30.1	81.5	O K
4320 min Winter	121.164	0.164	22.3	0.0	22.3	67.7	O K
5760 min Winter	121.150	0.150	18.1	0.0	18.1	61.4	O K
7200 min Winter	121.140	0.140	15.3	0.0	15.3	57.3	O K
8640 min Winter	121.130	0.130	13.3	0.0	13.3	52.9	O K
10080 min Winter	121.122	0.122	11.9	0.0	11.9	49.4	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	40.058	0.0	25
30 min Winter	25.963	0.0	34
60 min Winter	16.200	0.0	54
120 min Winter	9.897	0.0	88
180 min Winter	7.378	0.0	122
240 min Winter	5.982	0.0	154
360 min Winter	4.435	0.0	214
480 min Winter	3.581	0.0	272
600 min Winter	3.033	0.0	330
720 min Winter	2.647	0.0	390
960 min Winter	2.136	0.0	508
1440 min Winter	1.579	0.0	750
2160 min Winter	1.167	0.0	1116
2880 min Winter	0.941	0.0	1476
4320 min Winter	0.695	0.0	2168
5760 min Winter	0.561	0.0	2944
7200 min Winter	0.475	0.0	3632
8640 min Winter	0.414	0.0	4408
10080 min Winter	0.370	0.0	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 5.445

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.361	4-8	1.361	8-12	1.361	12-16	1.362

Model Details

Storage is Online Cover Level (m) 123.500

Tank or Pond Structure

Invert Level (m) 121.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	388.0	0.700	598.0	1.400	808.0	2.100	1018.0
0.100	418.0	0.800	628.0	1.500	838.0	2.200	1048.0
0.200	448.0	0.900	658.0	1.600	868.0	2.300	1078.0
0.300	478.0	1.000	688.0	1.700	898.0	2.400	1108.0
0.400	508.0	1.100	718.0	1.800	928.0	2.500	1138.0
0.500	538.0	1.200	748.0	1.900	958.0		
0.600	568.0	1.300	778.0	2.000	988.0		

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:)	100.0	Coefficient of Contraction	0.600
Length (m)	6.000	pstream Invert Level (m)	121.000
Roughness k (mm)	0.600		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 123.000

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	122.108	1.108	183.8	0.0	183.8	613.8	O K
30 min Summer	122.301	1.301	201.6	0.0	201.6	759.0	O K
60 min Summer	122.389	1.389	209.1	0.0	209.1	828.5	O K
120 min Summer	122.372	1.372	207.7	0.0	207.7	815.0	O K
180 min Summer	122.305	1.305	201.9	0.0	201.9	761.9	O K
240 min Summer	122.227	1.227	195.0	0.0	195.0	702.1	O K
360 min Summer	122.083	1.083	181.5	0.0	181.5	596.2	O K
480 min Summer	121.962	0.962	169.3	0.0	169.3	511.9	O K
600 min Summer	121.861	0.861	158.4	0.0	158.4	445.1	O K
720 min Summer	121.776	0.776	148.7	0.0	148.7	391.7	O K
960 min Summer	121.646	0.646	132.3	0.0	132.3	313.5	O K
1440 min Summer	121.487	0.487	109.1	0.0	109.1	224.7	O K
2160 min Summer	121.386	0.386	85.0	0.0	85.0	172.0	O K
2880 min Summer	121.337	0.337	69.2	0.0	69.2	147.6	O K
4320 min Summer	121.275	0.275	50.6	0.0	50.6	117.8	O K
5760 min Summer	121.241	0.241	40.3	0.0	40.3	102.1	O K
7200 min Summer	121.212	0.212	33.8	0.0	33.8	89.1	O K
8640 min Summer	121.192	0.192	29.3	0.0	29.3	79.8	O K
10080 min Summer	121.177	0.177	26.0	0.0	26.0	73.2	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	76.035	0.0	25
30 min Summer	49.499	0.0	35
60 min Summer	30.811	0.0	54
120 min Summer	18.615	0.0	88
180 min Summer	13.715	0.0	120
240 min Summer	10.995	0.0	154
360 min Summer	8.034	0.0	216
480 min Summer	6.428	0.0	278
600 min Summer	5.404	0.0	338
720 min Summer	4.687	0.0	398
960 min Summer	3.743	0.0	518
1440 min Summer	2.723	0.0	752
2160 min Summer	1.979	0.0	1108
2880 min Summer	1.577	0.0	1472
4320 min Summer	1.143	0.0	2204
5760 min Summer	0.910	0.0	2936
7200 min Summer	0.762	0.0	3672
8640 min Summer	0.659	0.0	4400
10080 min Summer	0.583	0.0	5096

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	122.215	1.215	193.8	0.0	193.8	692.6	O K
30 min Winter	122.426	1.426	212.2	0.0	212.2	858.4	O K
60 min Winter	122.519	1.519	219.8	0.0	219.8	935.9	O K
120 min Winter	122.471	1.471	215.9	0.0	215.9	895.7	O K
180 min Winter	122.365	1.365	207.1	0.0	207.1	809.0	O K
240 min Winter	122.249	1.249	197.0	0.0	197.0	719.0	O K
360 min Winter	122.044	1.044	177.6	0.0	177.6	568.5	O K
480 min Winter	121.880	0.880	160.5	0.0	160.5	457.8	O K
600 min Winter	121.752	0.752	145.8	0.0	145.8	376.7	O K
720 min Winter	121.652	0.652	133.1	0.0	133.1	316.7	O K
960 min Winter	121.512	0.512	113.1	0.0	113.1	238.2	O K
1440 min Winter	121.390	0.390	86.1	0.0	86.1	173.9	O K
2160 min Winter	121.321	0.321	63.4	0.0	63.4	140.0	O K
2880 min Winter	121.274	0.274	50.5	0.0	50.5	117.7	O K
4320 min Winter	121.225	0.225	36.7	0.0	36.7	94.9	O K
5760 min Winter	121.191	0.191	29.2	0.0	29.2	79.8	O K
7200 min Winter	121.172	0.172	24.5	0.0	24.5	71.0	O K
8640 min Winter	121.160	0.160	21.2	0.0	21.2	65.9	O K
10080 min Winter	121.152	0.152	18.8	0.0	18.8	62.5	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	76.035	0.0	26
30 min Winter	49.499	0.0	36
60 min Winter	30.811	0.0	56
120 min Winter	18.615	0.0	92
180 min Winter	13.715	0.0	128
240 min Winter	10.995	0.0	162
360 min Winter	8.034	0.0	228
480 min Winter	6.428	0.0	290
600 min Winter	5.404	0.0	350
720 min Winter	4.687	0.0	408
960 min Winter	3.743	0.0	522
1440 min Winter	2.723	0.0	752
2160 min Winter	1.979	0.0	1108
2880 min Winter	1.577	0.0	1472
4320 min Winter	1.143	0.0	2204
5760 min Winter	0.910	0.0	2936
7200 min Winter	0.762	0.0	3616
8640 min Winter	0.659	0.0	4400
10080 min Winter	0.583	0.0	5064

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 5.445

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.361	4-8	1.361	8-12	1.361	12-16	1.362

Model Details

Storage is Online Cover Level (m) 123.500

Tank or Pond Structure

Invert Level (m) 121.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	388.0	0.700	598.0	1.400	808.0	2.100	1018.0
0.100	418.0	0.800	628.0	1.500	838.0	2.200	1048.0
0.200	448.0	0.900	658.0	1.600	868.0	2.300	1078.0
0.300	478.0	1.000	688.0	1.700	898.0	2.400	1108.0
0.400	508.0	1.100	718.0	1.800	928.0	2.500	1138.0
0.500	538.0	1.200	748.0	1.900	958.0		
0.600	568.0	1.300	778.0	2.000	988.0		

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:)	100.0	Coefficient of Contraction	0.600
Length (m)	6.000	pstream Invert Level (m)	121.000
Roughness k (mm)	0.600		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 123.000

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	122.588	1.588	225.3	0.0	225.3	994.6	O K
30 min Summer	122.873	1.873	246.6	0.0	246.6	1252.6	O K
60 min Summer	123.013	2.013	256.4	49.1	305.5	1388.7	O K
120 min Summer	123.015	2.015	256.5	61.0	317.6	1390.9	O K
180 min Summer	122.957	1.957	252.5	0.0	252.5	1333.7	O K
240 min Summer	122.866	1.866	246.1	0.0	246.1	1245.9	O K
360 min Summer	122.688	1.688	233.0	0.0	233.0	1082.0	O K
480 min Summer	122.530	1.530	220.7	0.0	220.7	945.0	O K
600 min Summer	122.392	1.392	209.4	0.0	209.4	830.8	O K
720 min Summer	122.271	1.271	198.9	0.0	198.9	735.7	O K
960 min Summer	122.073	1.073	180.5	0.0	180.5	589.0	O K
1440 min Summer	121.799	0.799	151.4	0.0	151.4	406.1	O K
2160 min Summer	121.568	0.568	121.4	0.0	121.4	268.7	O K
2880 min Summer	121.451	0.451	102.4	0.0	102.4	205.7	O K
4320 min Summer	121.355	0.355	75.5	0.0	75.5	156.7	O K
5760 min Summer	121.313	0.313	60.0	0.0	60.0	135.9	O K
7200 min Summer	121.272	0.272	49.9	0.0	49.9	116.8	O K
8640 min Summer	121.250	0.250	43.1	0.0	43.1	106.2	O K
10080 min Summer	121.231	0.231	37.9	0.0	37.9	97.4	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	118.417	0.0	26
30 min Summer	77.747	0.0	36
60 min Summer	48.611	16.7	54
120 min Summer	29.354	22.0	88
180 min Summer	21.556	0.0	124
240 min Summer	17.210	0.0	158
360 min Summer	12.501	0.0	224
480 min Summer	9.962	0.0	288
600 min Summer	8.347	0.0	350
720 min Summer	7.221	0.0	410
960 min Summer	5.740	0.0	530
1440 min Summer	4.148	0.0	766
2160 min Summer	2.992	0.0	1120
2880 min Summer	2.371	0.0	1476
4320 min Summer	1.705	0.0	2204
5760 min Summer	1.348	0.0	2928
7200 min Summer	1.123	0.0	3672
8640 min Summer	0.967	0.0	4392
10080 min Summer	0.852	0.0	5136

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	122.735	1.735	236.5	0.0	236.5	1124.4	O K
30 min Winter	123.025	2.025	257.2	132.7	389.9	1400.6	O K
60 min Winter	123.056	2.056	259.3	448.6	707.9	1431.4	O K
120 min Winter	123.044	2.044	258.6	317.2	575.8	1419.9	O K
180 min Winter	123.025	2.025	257.2	132.7	389.9	1400.9	O K
240 min Winter	122.956	1.956	252.5	0.0	252.5	1332.9	O K
360 min Winter	122.701	1.701	233.9	0.0	233.9	1093.8	O K
480 min Winter	122.480	1.480	216.7	0.0	216.7	903.0	O K
600 min Winter	122.293	1.293	200.9	0.0	200.9	752.6	O K
720 min Winter	122.136	1.136	186.5	0.0	186.5	634.2	O K
960 min Winter	121.894	0.894	162.1	0.0	162.1	466.9	O K
1440 min Winter	121.605	0.605	126.7	0.0	126.7	289.5	O K
2160 min Winter	121.423	0.423	95.2	0.0	95.2	190.8	O K
2880 min Winter	121.356	0.356	75.9	0.0	75.9	157.4	O K
4320 min Winter	121.288	0.288	54.7	0.0	54.7	124.3	O K
5760 min Winter	121.251	0.251	43.4	0.0	43.4	106.6	O K
7200 min Winter	121.222	0.222	36.1	0.0	36.1	93.8	O K
8640 min Winter	121.200	0.200	31.1	0.0	31.1	83.5	O K
10080 min Winter	121.183	0.183	27.4	0.0	27.4	76.1	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	118.417	0.0	26
30 min Winter	77.747	31.5	35
60 min Winter	48.611	216.6	50
120 min Winter	29.354	201.5	84
180 min Winter	21.556	86.0	124
240 min Winter	17.210	0.0	170
360 min Winter	12.501	0.0	238
480 min Winter	9.962	0.0	302
600 min Winter	8.347	0.0	364
720 min Winter	7.221	0.0	424
960 min Winter	5.740	0.0	542
1440 min Winter	4.148	0.0	774
2160 min Winter	2.992	0.0	1112
2880 min Winter	2.371	0.0	1472
4320 min Winter	1.705	0.0	2204
5760 min Winter	1.348	0.0	2936
7200 min Winter	1.123	0.0	3672
8640 min Winter	0.967	0.0	4400
10080 min Winter	0.852	0.0	5032

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time / Area Diagram

Total Area (ha) 5.445

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.361	4-8	1.361	8-12	1.361	12-16	1.362

Model Details

Storage is Online Cover Level (m) 123.500

Tank or Pond Structure

Invert Level (m) 121.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	388.0	0.700	598.0	1.400	808.0	2.100	1018.0
0.100	418.0	0.800	628.0	1.500	838.0	2.200	1048.0
0.200	448.0	0.900	658.0	1.600	868.0	2.300	1078.0
0.300	478.0	1.000	688.0	1.700	898.0	2.400	1108.0
0.400	508.0	1.100	718.0	1.800	928.0	2.500	1138.0
0.500	538.0	1.200	748.0	1.900	958.0		
0.600	568.0	1.300	778.0	2.000	988.0		

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:)	100.0	Coefficient of Contraction	0.600
Length (m)	6.000	pstream Invert Level (m)	121.000
Roughness k (mm)	0.600		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 20.000 Invert Level (m) 123.000

Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Thursday, Mar 1 2012

Magna Park: Swale (1:2 Return Period)

Trapezoidal

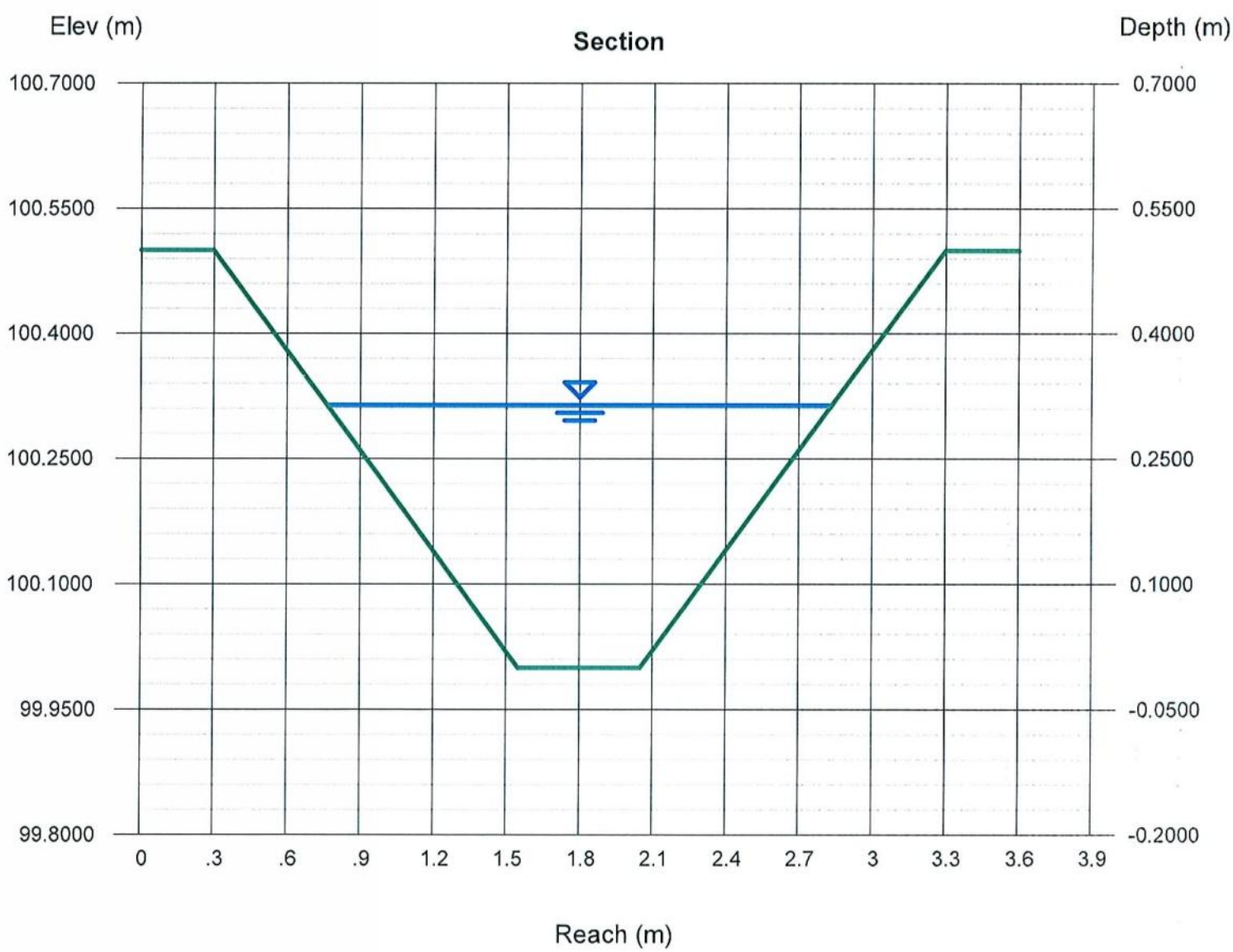
Bottom Width (m)	= 0.5000
Side Slopes (z:1)	= 2.5000, 2.5000
Total Depth (m)	= 0.5000
Invert Elev (m)	= 100.0000
Slope (%)	= 2.4390
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cms)	= 0.5800

Highlighted

Depth (m)	= 0.3139
Q (cms)	= 0.5800
Area (sqm)	= 0.4034
Velocity (m/s)	= 1.4379
Wetted Perim (m)	= 2.1906
Crit Depth, Yc (m)	= 0.3231
Top Width (m)	= 2.0697
EGL (m)	= 0.4194



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Thursday, Mar 1 2012

Magna Park: Swale (1:30 Return Period)

Trapezoidal

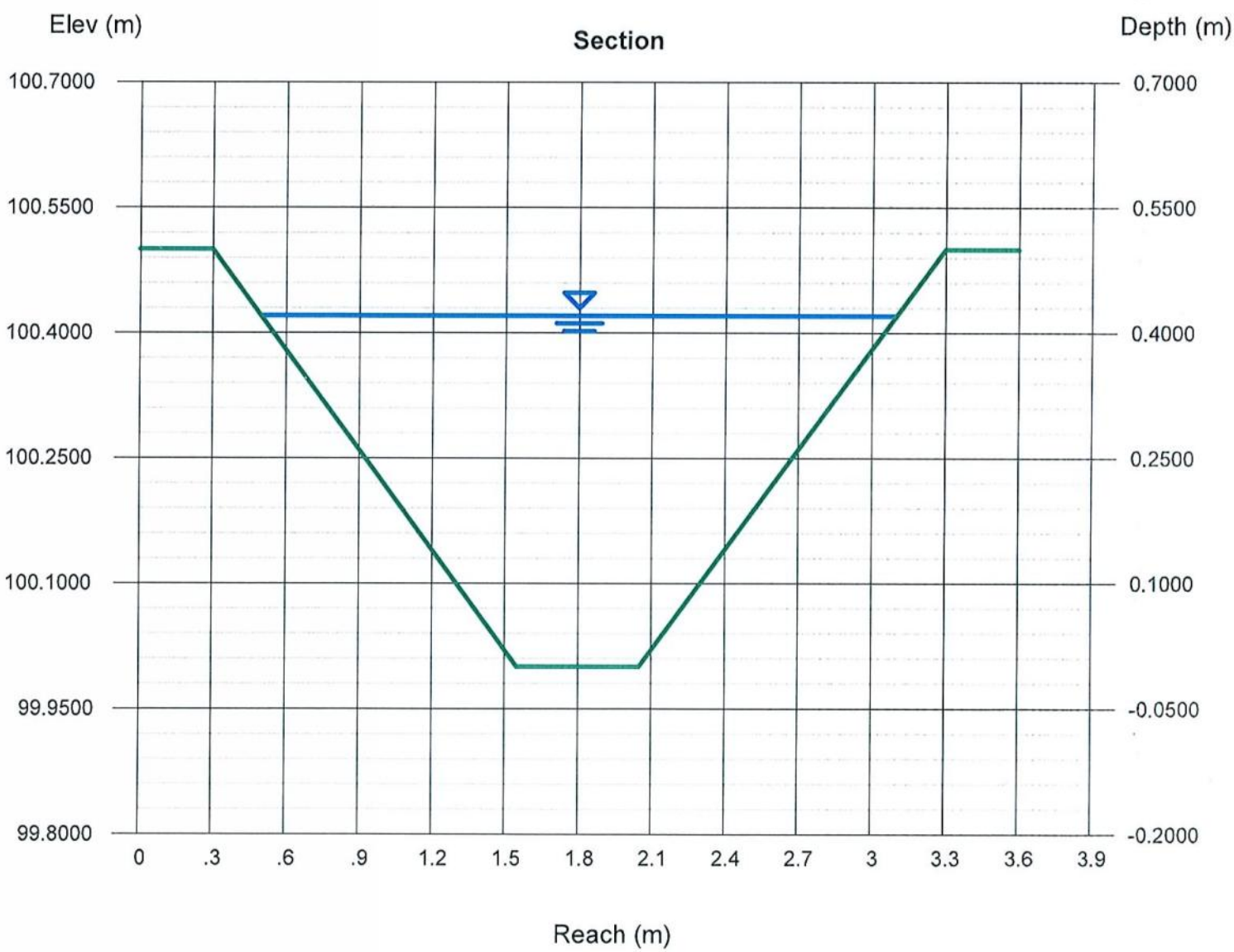
Bottom Width (m)	= 0.5000
Side Slopes (z:1)	= 2.5000, 2.5000
Total Depth (m)	= 0.5000
Invert Elev (m)	= 100.0000
Slope (%)	= 2.4390
N-Value	= 0.035

Calculations

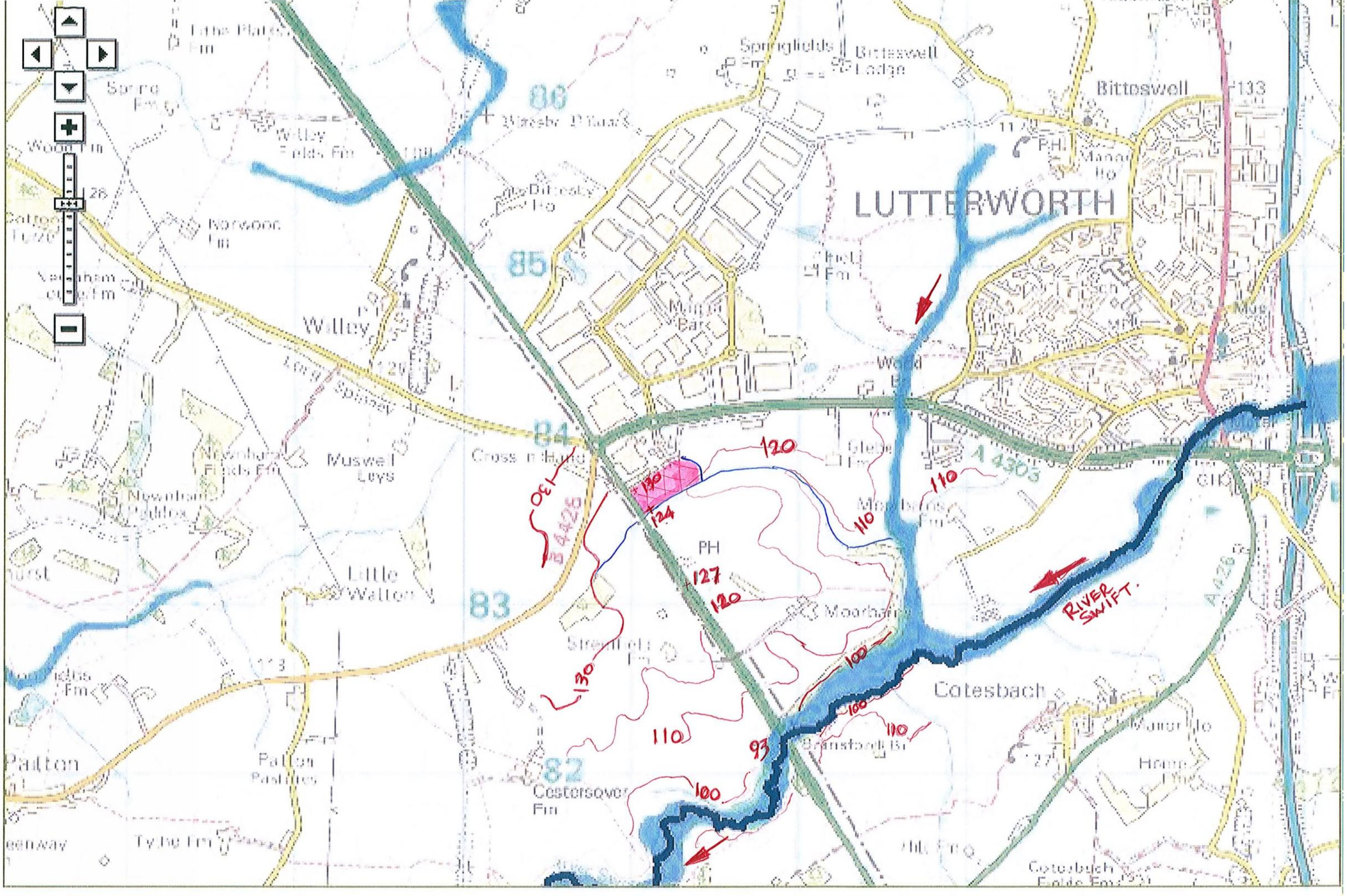
Compute by:	Known Q
Known Q (cms)	= 1.1000

Highlighted

Depth (m)	= 0.4206
Q (cms)	= 1.1000
Area (sqm)	= 0.6526
Velocity (m/s)	= 1.6855
Wetted Perim (m)	= 2.7651
Crit Depth, Yc (m)	= 0.4359
Top Width (m)	= 2.6031
EGL (m)	= 0.5655



Appendix C Annotated Environment Agency Flood Zone Map



LE17 4XH

Appendix D Recent Environment Agency Correspondence

Mr Nathaneal Stock
Harborough District Council
Development Control
Council Offices Adam & Eve Street
Market Harborough
Leicestershire
LE16 7AG

Our ref: LT/2012/114159/02-L01
Your ref: 11/01757/FUL

Date: 18 April 2012

Dear Mr Stock

CHANGE OF USE OF LAND TO PROVIDE HGV AND CAR PARKING; FORMATION OF HARDSTANDING; ERECTION OF VEHICLE MANAGEMENT UNIT BUILDING, ADMINISTRATION BUILDING, FUEL ISLAND AND VEHICLE WASHING FACILITY; ASSOCIATED LANDSCAPING
PLOT 7300, WATLING STREET, MAGNA PARK, LUTTERWORTH

UPDATED FRA.

Please note that the Agency is aware that the current application has now been withdrawn. However, to assist the applicant and LPA, this response is written as if the application were still live.

Environment Agency position
The revised proposal for the disposal of surface water run-off from plot 7300 and the adjacent upstream sites, (as detailed within the revised Flood Risk Assessment and drawings) addresses the issues raised within our letter dated 8 February 2012, Ref: LT/2012/114159/01-L01, and we are therefore able to remove our objection on flood risk grounds.

The proposed development will only be acceptable if the following measure(s) as detailed in the Flood Risk Assessment submitted with this application are implemented and secured by way of a planning condition on any planning permission.

Condition
The development permitted by this planning permission shall only be carried out in accordance with the approved Flood Risk Assessment (FRA) the Flood Risk Assessment (FRA) Rev C dated 1 March 2012, Ref: SS018341-NRB-JP-011-243-R, and Drawing Nos. SS/018341-05/P1, -06/P1 and -411, undertaken by Capita Symonds and the following mitigation measures detailed within the FRA:

1. Sections 4.4.1, 4.7.6, 4.7.7 and 5.3 - Limiting the surface water run-off generated by all rainfall events up to the 100 year plus 20% (for climate change) critical rain storm so that it will not exceed the run-off from the undeveloped site and not increase the risk of flooding off-site.

2. Sections 4.6.1 and 4.7.7 - Provision of approximately 4000m^2 of permeable paving to the new car park.

3. Sections 3.2.2 to 3.2.4 and 4.7.4 - Confirmation of the diversion of the existing on site watercourse which serves the upstream developments, including limiting the surface water run-off generated by these and conveyed by the existing and proposed diverted watercourse.

Reason
To prevent flooding by ensuring the satisfactory storage of/disposal of surface water from the site. To reduce the impact of flooding on the proposed development and future occupants. To reduce the risk of flooding to the proposed development and future occupants. To protect and enhance water quality with the Swift catchment.

Condition
Development shall not begin until a surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydrogeological context of the development, has been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.

The scheme shall include:

- Limiting the surface water run-off generated by all rainfall events up to the 100 year plus 20% (for climate change) critical rain storm so that it will not exceed the run-off from the undeveloped site and not increase the risk of flooding off-site.
- Provision of surface water run-off attenuation storage to accommodate the difference between the allowable discharge rate/s and all rainfall events up to the 100 year plus 20% (for climate change) critical rain storm.
- Detailed design (plans, cross sections and calculations) in support of any surface water drainage scheme, including details on any attenuation system, and the outfall arrangements.
- Details of how the scheme shall be maintained and managed after completion

Reason
To prevent the increased risk of flooding, to improve and protect water quality, improve habitat and amenity, and ensure future maintenance of the surface water drainage system.

Condition
The development hereby permitted shall not be commenced until such time as a scheme to minimise silt and polluting run-off during the construction phase has been submitted to, and approved in writing by, the local planning authority. The scheme shall be implemented as approved.

Reason
The development could create turbid and polluted run-off, which could enter the tributary of the River Swift.

Cont/d..

If the drainage for the refuelling area can not enter the foul system then a full retention interceptor should be installed as a minimum.

Drawing reference SS/018341-05/P1 states that a class one forecourt separator will be installed with automatic closure device and a high level audible alarm for the fuel islands. It is highly recommended that an additional spill control measure is put in place for when road tankers deliver, such as a dump tank designed to take the maximum volume of one tanker chamber.

Petrol interceptors are proposed for the rest of the development and will have automatic shut-off valves and alarm systems. All interceptors should be sized appropriately and have on-going maintenance. The applicant should refer to our Pollution Prevention Guideline PPG3 (The use and design of oil separators…) in this regard.

Drawing reference SS/018341-05/P1 stipulates that the vehicle wash area is to be discharged into the foul sewer. The foul sewage arising from the proposed development is to be serviced by pump stations before discharge into the public foul sewer. Agreement with the sewer undertaker should be sought. Robust routine maintenance and emergency response provision should be put in place.

Any waste used or generated during the construction phase should be handled in accordance with the Environmental Permitting (England and Wales) Regulations, 2010 and the duty of care.

I have sent a copy of this letter to the agent and Capita Symonds.

Yours sincerely

Mr Nick Wakefield
Planning Liaison Officer

Direct dial 0115 846 3635
Direct fax 0115 846 2681
Direct e-mail nick.wakefield@environment-agency.gov.uk

cc Gazeley UK Ltd

End

CAPITA

Capita Property and Infrastructure Limited
Oak House
Reeds Crescent
Watford
Hertfordshire
WD24 4QP

Tel +44 (0)1923 817537

www.capita.co.uk