FRINGFORD ROAD,
BICESTER

FLOOD RISK ASSESSMENT

CALA HOMES (MIDLANDS) LTD

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CONTENTS **Page**

1 Introduction

1.1 Scope

1.1.1 MJA Consulting has been commissioned by Cala Homes (Midland) Ltd to undertake a Flood Risk Assessment to accompany an outline planning application for a residential development.

1.1.2 Cala Homes is proposing to develop approximately 7.1 Ha of agricultural land for a residential development consisting of circa 200 units with associated roads, parking areas, soft landscaping and open space.
The site layout is shown in Appendix A.

1.1 Report Structure

1.2.1 The National Planning Policy Framework - *Department for Communities and Local Government (2012)* is the current guidance on development and flood risk in England and Wales.
The Flood Risk technical guidance for the National Planning Policy Framework requires a Flood Risk Assessment to be carried out to consider all potential forms of flooding including that from river, sea, estuarial, land drainage, groundwater, overland flow, surface water run-off, sewer systems, and artificial water bodies (lakes, reservoirs, canals etc).
A Flood Risk Assessment is required to consider the impact of all these potential forms flooding on both the development site and off site parties and land.

1.1.2 This report will take the structure of a 'Flood Risk Assessment' in accordance with the Environment Agency's Flood Risk Assessment Guidance, the National Planning Policy Framework and CIRIA Report 624 'Development and Flood Risk – Guidance for the Construction Industry.

1.1.3 The purposes of this report are:

- To confirm that the proposed development will not be subject to flood risk.
- To confirm that a satisfactory strategy for the disposal of surface and foul water from the proposed development is achievable.
- To confirm that this development will not increase the risk of flooding to any offsite parties and land.

2 Existing Site

2.1 Site Location and Description

2.1.1 The proposed development is located to the north of Bicester town on the edge of Caversfield on land to the west of Fringford Road.
The approximate National Grid Reference of the site is SP 58371 25036

2.1.2 The site covers an approximate area of 7.1 Ha and consists of existing farm buildings and undeveloped agricultural land and is bounded by Fringford Road to the east, an un-named road to the south and open farmland to the north. A small copse borders the eastern boundary with Caversfield House beyond.

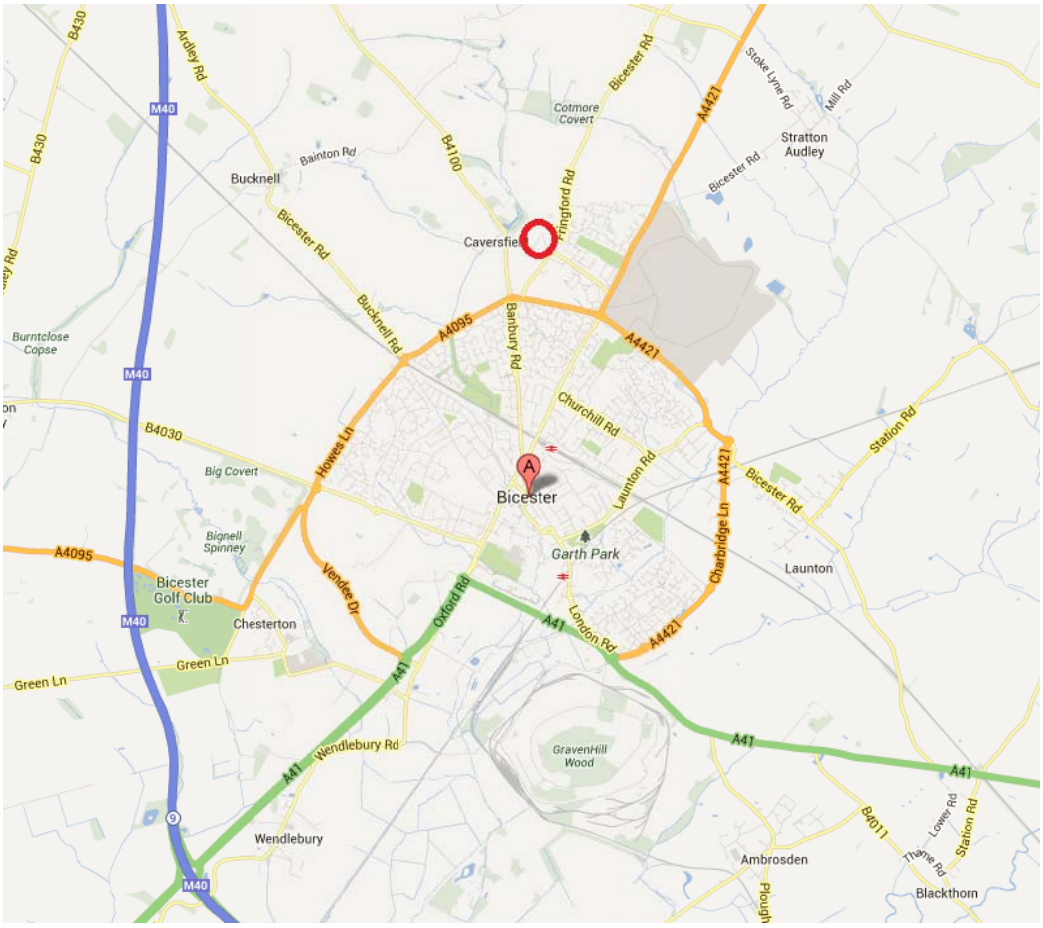


Figure 1: Site Location

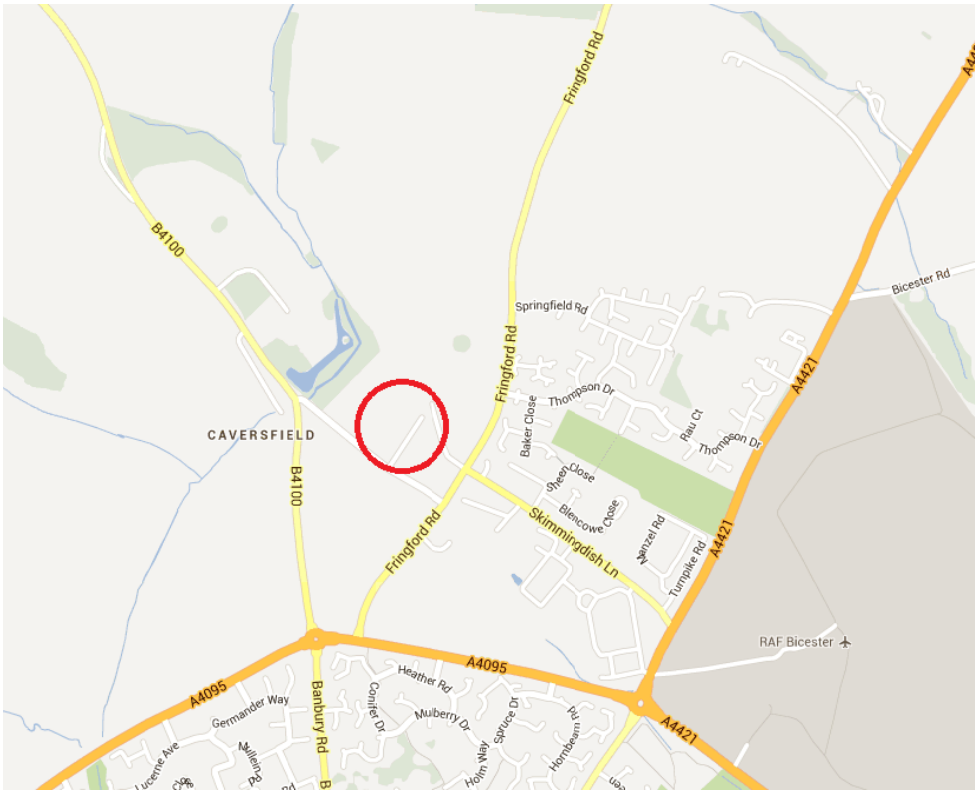


Figure 2: Site Location

Figure 3: Development Layout

3 Topography and Geological Information

3.1 Topography

3.1.1 The topography of the existing site is generally flat, ranging from 87.50mAOD in the east falling to 85.50mAOD in the west with the general site gradient being 1 in 175.
Refer to Appendix B for a Topographical Survey of the existing site.

3.2 Geology

3.2.1 The 1:50,000 scale British Geological Survey digital mapping of the area indicates that the solid geology beneath the site comprises the Cornbrash Formation of the Jurassic period. The formation is described as medium to fine grained limestone.

3.2.2 An intrusive ground investigation was carried out by Geo Environmental Group in March 2013, report ref GEG-12-265/PI_PII. The ground conditions encountered are described below and broadly confirmed the published geology.

3.2.3 Made Ground
Made Ground was encountered locally to a depth of up to 2.50m in the south western corner of the site in the area of a former small quarry (in the proposed POS). The Made Ground comprised soft slightly gravelly clay with occasional gravel and cobble-sized fragments of rope, china, wood etc. overlying loose clayey gravel-sized wood ash fragments with occasional brick, glass, china and plastic and loose sand and occasional gravel-sized brick and metal fragments.

The site was typically overlain by cohesive topsoil to depths ranging from 0.30m to 0.50m with the exception of the identified areas of Made Ground detailed above.

3.2.4 Cornbrash Formation
The underlying natural ground of the weathered Cornbrash Formation typically comprised loose to medium dense generally becoming medium dense to very dense slightly clayey, slightly sandy gravel and cobble-sized limestone fragments overlying very weak to weak limestone typically at depths ranging from 0.50m to 1.50m. Occasional cohesive layers were encountered near surface e.g. in SK8 where firm occasionally soft very gravelly clay was found from 0.50m to 0.80m, the gravel comprising limestone fragments.

The depth to bedrock was particularly shallow in the eastern corner of the site (SK1, SK9 and TP1-TP4) ranging in depth from 0.45m to 1.10m bgl.

3.2.5 Groundwater

Groundwater was typically high beneath the site, generally located towards the base of the weathered Cornbrash perched on bedrock.

3.3 Hydrogeology

Environment Agency data indicates that the solid geology beneath the site is designated as Secondary (A) Aquifer.

Secondary (A) Aquifers are defined as 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 classed as minor aquifers.

3.3 Soil Permeability

8 No. infiltration tests were undertaken in general accordance with BRE Digest 365. The infiltration tests undertaken indicated that the soil was relatively permeable, although the occurrence of shallow perched groundwater particularly during periods of high rainfall will necessitate the construction of soakaways at shallow depths.

The infiltration rates recorded in the weathered Cornbrash Formation varied between 2.23 x 10-5 m/sec and 8.89 x 10-6m/sec. The results indicate that shallow soakaway drainage is likely to be suitable.

3.4 Catchment Information

3.4.1 Watercourse / Rivers

The nearest watercourse to the development site is an unnamed secondary river located approximately 50m to the north west. This runs in a southerly direction through Bicester town before outfalling to the River Ray.

3.4.2 Water bodies

There is a lake adjacent to the west of the secondary river and a pond approximately 100m to the north of the site. There are no reservoirs or canals or other artificial sources of flooding within a 500m radius of the development area.

An existing highway ditch is located on the eastern boundary which takes runoff from the adjacent Fringford Road together with some overland flow during periods of high rainfall. The highway drain discharges to a public surface water sewer located within Fringford Road.

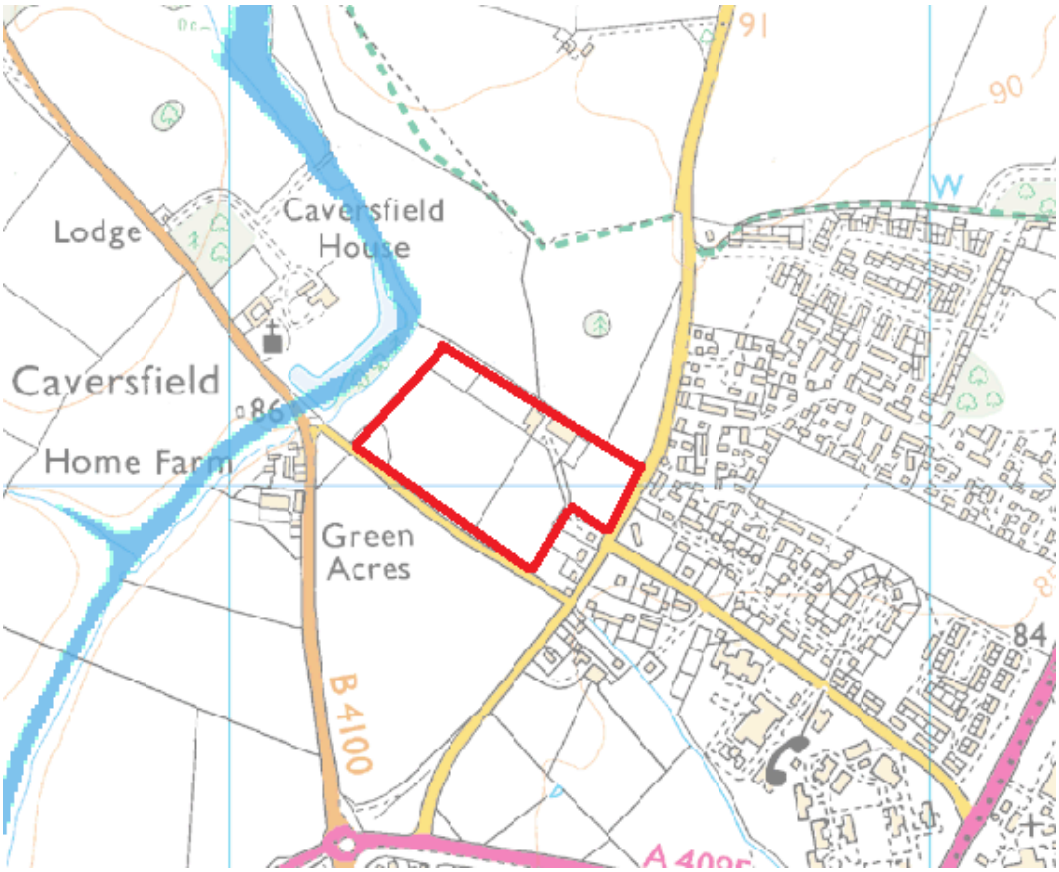
3.5 Existing Site drainage characteristics

3.5.1 The existing site is un-developed arable land, as such rainfall that lands on this site firstly infiltrates directly at source and into the underlying soils. When the ground becomes saturated and can no longer accept further rainfall, runoff in the form if overland (pluvial) flow will occur following the topography of the site, however the majority ponds on the site until it drains through the surface.

4 Flood Risk Assessment

4.1 Flood Zone Map

Figure 4: Extract from Environment Agency Flood Zone Map



Main Rivers

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- From the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year.
- From a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

Light blue shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

4.2 The Environment Agency's indicative Flood Map shows the site to be located within Flood Zones 1.

Zone 1 is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding from a river or stream in any year by the Environment Agency.

4.3 The flood risk technical Guidance to the National Planning Policy Framework Table 2: Flood Risk Vulnerability classification, classifies residential developments as 'More Vulnerable'.

NPPF Table 2 of technical Guidance: Flood Risk Vulnerability classification

More vulnerable
• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste6. • Sites used for holiday or short-let caravans

NPPF Table 3: Flood Risk Vulnerability and Flood Zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

4.4 Table 2 & 3 of the NPPF would indicate that a residential development 'more vulnerable' can be located within Flood Zone 1 and is considered appropriate under the National Planning Policy Framework.

4.5 History of Flooding

The site has no official recorded history of flooding from groundwater, rivers / tidal (fluvial), artificial sources and flooding or from overloaded sewer networks.

4.6 Sequential Test

4.6.1 The National Planning Policy Framework Guidance states that Planning Authorities should complete a risk based 'Sequential Test' at all stages of the planning process, to steer new development to areas with the lowest probability of flooding.

4.6.2 Under the requirements of the 'sequential test' and as the proposed development is already located within flood zone 1 (lowest risk), there are no more suitable, developable and deliverable alternative sites, better located from a flood risk perspective, which would accommodate the proposed development.

5 Impact of Development on Flood Risk

5.1 This section identifies sources of potential flood risk to the site.
The sources of flooding that could potentially affect the site include flooding from groundwater, rivers (fluvial), overland runoff (pluvial), artificial sources and flooding from overloaded existing and proposed sewer networks.

Flood Source	Presence Y/N	Description
Pluvial	N	Rainfall drains drain's through the sub soil
Fluvial	N	Site lies within flood zone 1
Tidal	N/A	
Groundwater	Y	During the ground investigations pockets of perched water were found
Existing Sewers	Y	No existing public sewers on site however existing infrastructure is within adjacent roads.
Development Drainage	Y	Additional flow to wider catchment.
Potable Water	N	No existing public water mains sewers on site however existing infrastructure is within adjacent roads.

5.2 History of Flooding

The site is assessed as being in flood zone 1 and has no official history of flooding from groundwater, rivers / tidal (fluvial), artificial sources and flooding or from overloaded sewer networks.

The main source of data for flood risk and recorded incidents is Cherwell District Councils Strategic Flood Risk Assessment (SFRA). Within this SFRA consultation was carried out with all relevant authorities and organisations including the Environment Agency, Thames Water and the Parish Council to identify known and/or perceived problem areas with respect to flooding.

Within proximity of the proposed development site, the SFRA concluded that there are no current or potential issues of flooding from all sources including groundwater, rivers and streams(fluvial), overland runoff (pluvial), artificial sources and flooding from overloaded existing or proposed sewer networks.

5.3 Existing Watercourses

The watercourse 50m to the north of the site does not cause a flood risk and has been assessed by the Environment Agency.

5.4 Waterbodies

The lake adjacent to the west of the secondary river and the pond approximately 100m to the north of the site do not cause a flood risk to the site.

5.5 Groundwater

No evidence or instances of groundwater flooding have been recorded.

The proposed plans for the site do not include basements and the height of proposed finished floor levels will preclude groundwater flooding from being an issue.

As highlighted in the ground investigation some areas of the site suffer from a perched water table and will drain at a slower rate than other areas. Where required certain areas of the site may be raised to increase the dissolution layer between the underside of any permeable structure and the water table.

The material used to raise the site should be a free-draining open graded aggregate, i.e. Type 3 granular sub-base or similar.

The topography of the site would suggest that any overland and/or lateral groundwater flow within the site will be in an easterly direction towards the infiltration/attenuation basin adjacent to the Fringford Road boundary.

5.6 Existing Sewers

No recorded incidents of flooding from public sewers within a 500m radius of the site.

5.7 Potable Water

There are no potable water mains within the boundary of the site.

5.8 Proposed Site Drainage

Artificial drainage systems and infrastructure within, or in close proximity to, the site may present a risk of flooding through the capacity of the systems being exceeded or the structural, hydraulic, mechanical or operational failure of the system occurring.

In the context of the proposed site there are likely to be installed as part of the development, the following systems which may present a flood risk:

- Piped gravity foul/ surface water sewers and a foul rising main.
- SUDS systems for the collection and conveyance of surface water runoff within the site boundary.

5.9 The surface water runoff generated on the site as a result of the development will be managed using appropriate SUDS techniques up to the 1 in 100 +30% storm event. This will ensure that the peak rate of surface water leaving the developed site

5.10 Pluvial (Overland Flow)

5.10.1 Overland flow results from rainfall that is unable to infiltrate into the ground due to soil saturation and/or a high water table, runs off hard impermeable surfaces or surcharges from manholes/SuDS structures during intense storm events which exceed sewer design capacity or due to structural/operational failure.

5.10.2 To mitigate the risk of overland flooding the design levels of hard paved and landscaped areas as part of the proposed design of the development will contain and safely direct any exceedance flood flows to areas of the site as to cause minimum flood risk and disruption to properties and residents both within the proposed development and downstream of the site.

5.10.3 This development will provide a safe dry access and egress route for all residents during an exceptional flood event.

6 Existing and Proposed Site Runoff

6.1 This section aims to calculate the estimated peak runoff rates and volumes of surface water leaving the site, for the pre and post development conditions.
These discharge rates can then be used for the preliminary design of the surface water drainage strategy for the proposed development.

6.2 Catchment Areas

6.2.1 The existing and proposed permeable and impermeable areas are listed in the table below. The proposed impermeable area is based on the existing topographical survey.

	Permeable	Impermeable	Total
Existing Site Area	6.5 Ha	0.6 Ha	7.1 Ha
Proposed Site Area	3.9 Ha	3.2 Ha	7.1 Ha

6.2.2 This development represents an overall increase of 2.6 Ha in impermeable area post development.

6.3 Existing Surface Water Runoff Rate

6.3.1 An assessment of the estimated current runoff rate has been carried out using the Institute of Hydrology Report 124 methodology using Micro Drainage software, interpolated for sites under 50ha for the permeable areas and the Rational method' Q = 2.78 CIA for the impermeable areas.

6.3.2 IH124 mean annual flood flow rate equation:
$QBAR_{<50ha} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

Catchment: 6.5ha

1 in 1 year	2.2 l/sec
1 in 30 year	5.9 l/sec
1 in 100 year	8.3 l/sec
QBar	**2.6 l/sec**

A suitable method for the estimation of peak flow from impermeable areas is the 'Rational method' Q = 2.78 CIA.

Where:

Q = flow (l/s)

I = rainfall intensity (mm/hr), return period & equal to time of concentration

A = Impermeable area drained (ha)

C = runoff coefficient, assumed to be 1.0

Impermeable Catchment: 0.6ha

1 in 1 year	25.4 l/sec
1 in 30 year	61.4 l/sec
1 in 100 year	81.4 l/sec
OBar	**32.0 l/sec**

6.3.3 An assessment of total peak flows from the existing site is as follows:

	Impermeable Area	Permeable Area	Totals
1 in 1 year	25.4 l/sec	2.2 l/sec	27.6 l/sec
1 in 30 year	61.4 l/sec	5.9 l/sec	67.3 l/sec
1 in 100 year	81.4 l/sec	8.3 l/sec	89.7 l/sec
QBar	**32.0 l/sec**	**2.6 l/sec**	**34.6 l/sec**

6.3.4 The above runoff assessment is based on all runoff discharging off the site. However, from the ground investigations it is known that the majority of runoff discharges through the sub strata via infiltration.

6.4 Proposed Development Surface Water Runoff Rate

6.4.1 The estimated peak runoff rate from the proposed site is based on 100% runoff from impermeable areas and 0% runoff from permeable areas, in accordance with CIRIA C697 The SUDS Manual & Preliminary rainfall runoff management for Developments (EA/DEFRA W5-074/A).

6.4.2 A suitable method for the estimation of peak flow is the *Rational method,* *Q = 2.78 CIA*.

Where:

Q = flow (l/s)
I = rainfall intensity (mm/hr), return period equal to time of concentration (to include a 30% increase for predicted climate change)
A = Impermeable area drained (ha)
C = runoff coefficient, assumed to be 1.0

Catchment: 3.2ha

1 in 1 year	**135.2 l/sec**
1 in 30 year	**327.4 l/sec**
1 in 100 year	**434.1 l/sec**

6.4..3 It can be seen that as a result of this development and the increase in impermeable areas, the peak rate at which surface water could potentially runoff the site if not effectively managed, will be much greater than in its current state.

6.4.4 To mitigate this increase additional runoff due to development should be disposed of by way of infiltration, or if this is not feasible due to soil type, discharged from the site at flow rates below 2l/s/ha.

7 Development Surface Water Drainage

7.1 The National Planning Policy Framework requires that new developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to control drainage and runoff to ensure there are no increases in overland flow as a result of the development.

7.2 The Building Regulations Document H (2002) details a hierarchy of potential methods of disposing of surface water from a site:

- An adequate soakaway or some other adequate infiltration system, or where that is not practicable,
- A watercourse, or where that is not practicable,
- A sewer

7.3 Following a review of the site geological investigations the soil conditions should have a suitable permeability to enable infiltration to ensure the entire surface water runoff from the development for all storm events up to and including the 1:100year +30% climate change.

To prevent overland flooding or to prevent runoff leaving the site a high level overflow will be linked to the existing highway drainage system in Fringford Road.

7.4 The proposed surface water strategy is to utilise the infiltration within the sub strata where possible. The drainage strategy can be summarised as follows: Runoff from roofs will discharge to individual shallow soakaway systems, runoff from drives will discharge via permeable paving or swales and runoff from the roads will discharge via either swales, gullies or permeable paving.

7.5 Infiltration is a SuDS technique that enables storm water to be dealt with at source rather than discharging into an offsite sewer network or watercourse. This method of disposal improves the quality of the storm water runoff, whilst maintaining the existing natural drainage regime, maintaining the predevelopment rates of runoff rate and volume. Infiltration is also an important process of maintaining groundwater recharge.

7.6 **Roof Runoff**

Roof runoff will be collected by a conventional system of guttering and downpipes where it will be discharged to individual shallow soakaways. Where permeable paved drives are utilised then a direct connection to the permeable sub base will be made.

Water Butts are to be provided per plot where feasible on a rainwater downpipe to collect roof runoff for re-use.

7.7 **Driveways and Parking courts**

- **Macadam / Impermeable Block Pavers**

All driveways and parking courts will be constructed using a permeable sub base. Runoff will drain directly through the surface if a block paving system is used. Where a Macadam surface is used runoff will drain runoff either via gullies and/or linear channels which will discharge to the sub base.

7.8 **Main Development Roads**

- **Macadam**
- **Impermeable Block Pavers**

It is envisaged that the main distributer road will be constructed using a sealed macadam surface. Runoff from this will be collected via gullies or beanie block type kerbs and discharged to a swales system. Where infiltration is suitable the swales will discharge via infiltration. In areas where infiltration is not suitable the swale will act a as a carried drain an discharge to the main attenuation/infiltration pond.

Cul-de-sac's, and minor access roads will be constructed using a permeable paving system which will discharge runoff to the sub strata.

The use of permeable block paving systems and swales will provide a level of treatment and improve the runoff water quality through the filtration of hydrocarbons and others pollutants within the filter media sub-base.

7.9 Infiltration / Attenuation Basin:

The infiltration / attenuation basin will be designed to accommodate the surface runoff from the whole of the development for up to and including the 100 year + 30% climate change events. This is to provide a factor of safety to the development should any features fail.

7.10 All SUDs features will be sized to manage the 1 in 100year storm event, plus an extra allowance of 30% for the potential predicted increase in peak rainfall up to 2115.

8 Foul water drainage strategy

8.1 The foul water discharge from each property will drain via gravity through the private house drainage before out falling to a new foul sewer system within the development. The foul system will gravitate to the south eastern corner to a dedicated foul pumping station.

8.2 Pumped foul flows will then discharge to a point on the existing Thames Water Network. Thames Water Utilities are currently undertaking a flow study to ascertain the point of connection.

8.3 The predicted peak foul discharge rate based on the Sewers for Adoption 6th figure (4000 l/dwelling/day & PF of 6) based on an average blended occupancy of 3 persons per unit for the proposed:

- 200 No. units will be **9.62 l/sec**

8.4 The piped system and pumping station will be designed in accordance with the requirements of Sewers for Adoption 7th Edition and offered to Thames Water for adoption.

9 Summary & Conclusion

9.1 The Environment Agency's indicative Flood Map shows the proposed development site to be located within Flood Zone 1 (Lowest Risk).
This is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding from a river or stream in any year by the Environment Agency and is not within an area subject to either flooding or extreme flooding events.

9.2 With reference to available data and the Cherwell District Council – Strategic Flood Risk Assessment, no sources of flooding were identified on the site including that from groundwater, rivers and watercourses (fluvial), overland runoff (pluvial), artificial sources (canals and reservoirs) and flooding from surcharging within existing and proposed sewer networks.

9.3 The ground investigation results indicate that shallow soakaway drainage is likely to be suitable to enable infiltration to ensure the entire surface water runoff from the development for all storm events up to and including the 1:100year +30% climate change.

9.4 The proposed surface water strategy is to utilise the infiltration within the sub strata where possible. The drainage strategy can be summarised as follows: Runoff from roofs will discharge to individual shallow soakaway systems, runoff from drives will discharge via permeable paving or swales and runoff from the roads will discharge via swales, gullies or permeable paving.

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9.6 All SUDs features will be sized to manage the 1 in 100year storm event, plus an extra allowance of 30% for the potential predicted increase in peak rainfall up to 2115.

Appendix A
Proposed Site Plan

A2

ECOLOGICAL CORRIDOR

LOCALISED VIEWS OF NORTHERN FIELD

VIEWS TO NORTHERN FIELD FROM POS

POS

SWALE

LEAP

20m

15m

EXISTING ELECTRICITY POLE WITH CABLE STAYS

ROUTE OF UNDERGROUND CABLE

FRINGFORD ROAD

ATTENUATION AREA

VEHICULAR ACCESS ON TO FRINGFORD ROAD

INDICATIVE PEDESTRIAN FOOTWAY AND CROSSING TO CONNECT WITH EXISTING LINKS

SOUTH LODGE

VILLAGE SHOP / HALL WITH PARKING

THE OLD VICARAGE

SKIMMINGDISH LANE

UNNAMED ROAD

POTENTIAL PUMP STATION LOCATION

N

0 50m 100m

(1:1000)

NOTES

REV	DESCRIPTION	DATE	AUTHOR	CHK'D
A	Masterplan revision	10/04/13	BA	GR
B	Masterplan amendments	11/04/13	BA	GR
C	Masterplan amendments	04/06/13	BA	GR
D	Surrounding context changed, masterplan updated	20/06/13	BA	GR
E	Pedestrian footway and crossing added on Fringford Road	24/06/13	BA	TB

KEY

- Site boundary.
- Residential development
- Feature buildings & groupings
- Village Shop / Hall
- Development Blocks
- Green Space
- Permeable Paving
- Surrounding Trees and Hedges
- Existing trees
- Proposed trees
- Existing Hedges
- Proposed Hedges
- Vehicular access point
- Primary vehicular routes
- Underground Cable
- SUDS
- Footpath through development
- No build zone
- Pedestrian crossing (Indicative location)

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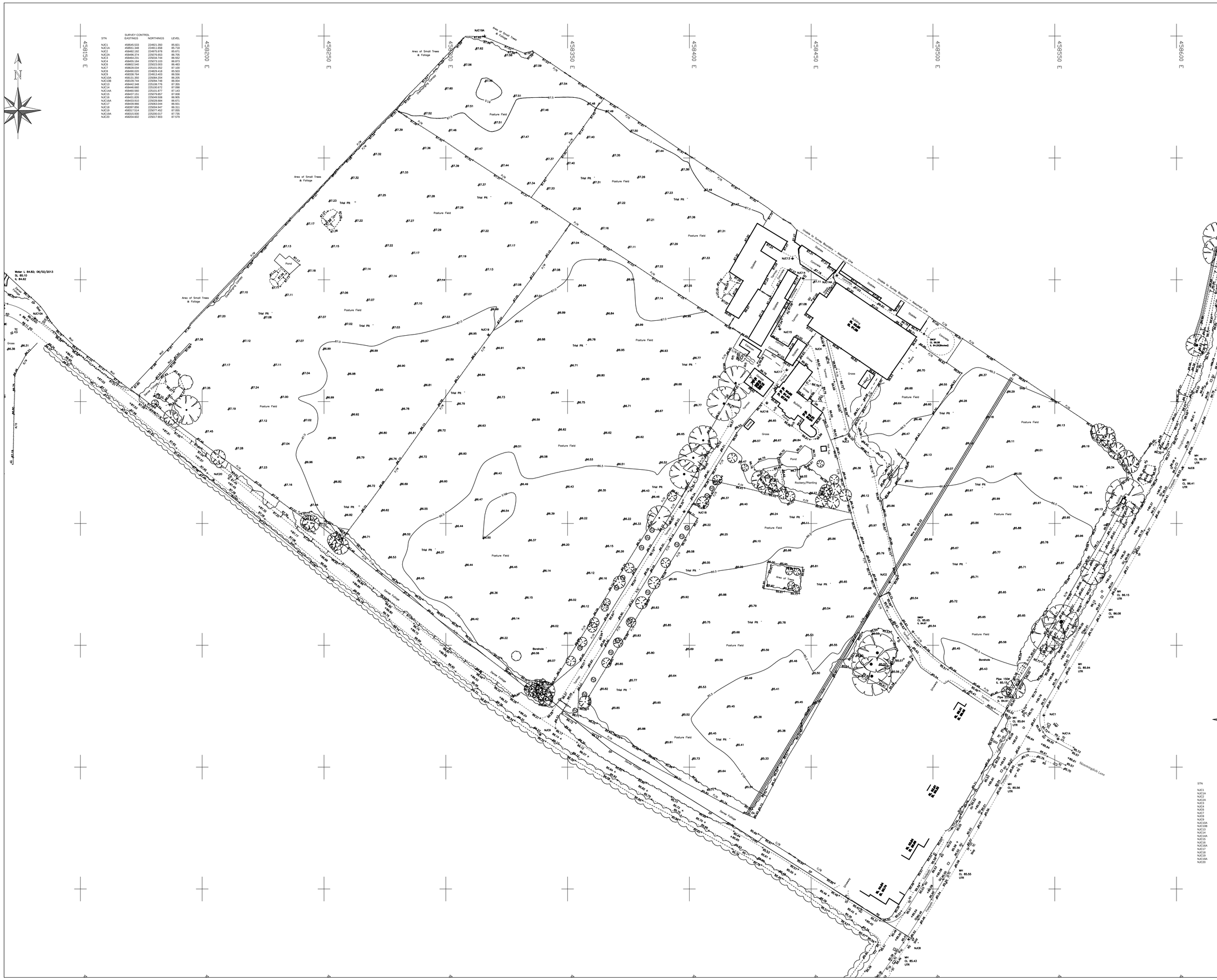
PROJECT
Fringford Road
Bicester
For: CALA Homes

DRAWING
Concept Masterplan - 01

SCALE	DATE	AUTHOR	CHK'D
1:1000 @ A2	27/02/13	GR/ba	TB

JOB NO.	DRAWING NO.	REV
CALA130117	CMP-01	E

Appendix B
Topographical Site Plan



Survey Notes

1: This Survey is related OS Grid Base (OSGB36 02).

2: All Levels are related to OS Datum (OSGB36 02).

3: The information Shown on this drawing is surveyed to the accuracy of the base scale shown.

4: Man entry to sewers has not been undertaken. Depths and pipe sizes are measured / estimated from the ground. This should be checked with Local Authority records or on site prior to the commencement of any works.

5: Boundaries shown are physical features and may not represent legally conveyed ownership.

6: Where adjacent buildings have been surveyed remotely all walls may not be shown due to obstructions along lines of sight.

7: This plan should only be used for its original purpose. NJC Surveys LTD accepts no responsibility for this plan if it is supplied to any party other than the original client.

Survey Key

Street Furniture Symbols & Abbreviations

- BB Bollards Beacon
- BH Borehole
- BL Bollard
- BS Bus Stop
- Dr Drain
- EP Electric Pole
- FL Flood Light
- FS Flag staff
- GP Gate Post
- GU Gully
- GV Gas Valve
- IC Inspection Cover
- LB Litter Bin
- LP Lamp Post
- MH Manhole
- NP Name Plate
- PH Fire Hydrant
- WO Wash Out
- WM Water Meter
- TV Cable Television
- Mkr Marker Post
- MP Mile Post
- PB Pillar Box
- Pi Pipe
- PM Parking Meter
- PO Post
- RE Rodding Eye
- RP Reflector Post
- RS Road Sign
- ST Stop Tap
- SI Sign
- Su Stump
- SV Stop Valve
- TP Telegraph Pole
- TR Trees Pole
- TC Telecommunication
- WT Water Tap
- KO Kerb Outlet
- AV Air Valve
- TCB Tel Call Box
- TP Trial Pit
- STN Survey Control Station

Fence Types & Abbreviations

- CHP Chestnut Paling
- CB Close Boarded
- CL Chain Link
- Conc Concrete Panel
- CI Corrugated iron
- CBr Crash Barrier
- El Electric
- HM Hit and Miss
- Hed Hoarding
- Int Interwoven
- IR Iron Railings
- OL Open Link
- Pal Palling
- PAL Picket (Wooden)
- PWire Post & Barbed Wire
- PrC Post & Chain
- PrR Post & Rail
- PrW Post & Wire
- PrM Post & Wire Mesh
- TrR Toy Rail

Feature Lines

- Hedge
- Fence
- Gate
- Stile
- Footpath
- Kerbline
- Verge/Edge of Track or Change Of Surface
- FW Sewer Lines
- SW
- Ditch / Embankment etc
- Overhead Power Line
- Individual Tree-Sized
- Building Structure
- Wall Wall
- RWall Retaining Wall

REV	DATE	DESCRIPTION	BY	APP.

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Topographical Surveys • Building Surveys • GPS Surveys • Setting Out
Dimensional Control • Monitoring Surveys • Ground Modelling • Volumetric Calculations

Client

CALA Homes

Drawing Title

Fringford Road,
Bicester

Topographical
Survey

Drawn	Checked	Authorised
LD/PJW	NJC	NJC
Date	Scale	Sheet size
08/02/2013	1/500	A0
Drg. No.		Revision
S1043/02		

Appendix C
Drainage Strategy Plan

A2

Permeable paved road. Block paving or similar

Soakaways to rear gardens

VIEWS TO NORTHERN FIELD FROM POS

VIEWS OF NORTHERN FIELD

ECOLOGICAL CORRIDOR

Non Permeable paved road with roadside swale & filter trench

POS

Soakaways to rear gardens

EXISTING

Permeable paved road. Block paving or similar

WITH CABLE STAYS

ROUTE OF UNDERGROUND CABLE

SWALE

POS

Soakaways to rear gardens

LEAP

POS

SWALE

Permeable paved road. Block paving or similar

Non Permeable paved road with roadside swale & filter trench

UNNAMED ROAD

ATTENUATION AREA

POS

VEHICULAR ACCESS ON TO FRINGFORD ROAD

INDICATIVE PEDESTRIAN FOOTWAY AND CROSSING TO CONNECT WITH EXISTING LINKS

SOUTH LODGE

VILLAGE SHOP / HALL WITH PARKING

Storm water infiltration/attenuation pond area with high level overflow to highway drainage system

Existing Foul Sewer

Existing Storm Sewer

Adoptable Foul Pumping Station

VICARAGE

POTENTIAL PUMP STATION LOCATION

Permeable paved road. Block paving or similar

N

0 50m 100m

(1:1000)

REV. No.	DATE	DESCRIPTION	INITIALS

Client: CALA Homes (Midlands) Limited

Project: Fringford Road, Bicester, Oxon

Title: Drainage Strategy

Scale:

Date: April '13

Checked:

Drawn: AMc

Drawing No.: 4804:P:900

Rev:

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