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Flood Risk Assessment & Drainage Strategy



Site reference

**The Red Lion
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Client

The Red Lion

Report Ref – 14-1570.07.01 Rev B

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1.0 Summary & Recommendations

This FRA is to support the proposed development of the existing pub and grounds and finds the following –

SOURCE OF FLOODING	RISK
<p>Fluvial Flooding</p>	<p>Low – The EA flood maps and levels for the development site show the majority of the site (98%+) is Flood Zone 1 which is defined in NPPF as comprising land at low risk of flooding. There is a small area immediately adjacent to the road that is flood zone 2. There are no habitable dwellings proposed in this area</p>
<p>Overland Flow to the Site</p>	<p>Low – To the west is the Wendlebury Road and associated un-named watercourse, known locally as Wendlbury Brook. Both of which are lower than the site . To the north and south are residential developments which by its nature will not generate 'sheet' overland flows. To the east is are Alchester Stables, whilst these are slightly higher than the site, any flows generated are anticipated to be low and will be arrested by the permeable paving before reaching any dwellings.</p>
<p>Rising Groundwater</p>	<p>Low – A ground investigation has not been undertaken for this site, however, a bore hole taken at 15 Rectory Close, Wendlebury indicated no ground water seepage over a 24 hour test period.</p>
<p>The Local Sewerage Network</p>	<p>Low – The sewerage network is owned and maintained by Thames Water. The risk of flooding by surcharging is considered low.</p> <p>Locally the surface water appears to drain to the un-named watercourse opposite, as this is lower than the site it is not considered a risk.</p>
<p>Reservoirs, Canals And Other Artificial Sources</p>	<p>Low – No artificial sources that present a risk to the site.</p>

**1) Nature Of Development**

The proposed development (Appendix A) consists of proposed extensions to the existing public house building, and new accommodation building within the existing gardens.

2) Proposed surface water drainage

The implementation of suitable SUDS sustainable drainage techniques and mitigation measures, will address any potential risks associated with surface water runoff generated from the development. These will be controlled and managed to a safe and suitable level to ensure downstream areas are not affected by flooding. Roof runoff and private hardstanding will be discharged into cellular soakaways or permeable paving. Drainage designed to accommodate the peak storm event for a 1 in 30 year storm.

The property owners should be issued with a maintenance manual that details the type and frequency of maintenance required for the sustainable techniques utilised .

3) Hardstanding drainage

The car park/hardstanding area will be constructed using permeable paving sized to accommodate the highway authority design requirements of a 1 in 30 year storm.

4) Proposed foul drainage

Foul drainage from the site will discharge via the existing connection from the public house.

5) Floor levels

The development site levels and floor levels are to be set 300mm above the interpolated EA flood level of 63.00mAOD. At a minimum of 63.300mAOD

6) Exceedance

In the event of design storm exceedance the levels are designed to direct flows to the proposed highway and into the un-named watercourse to the west of the development site.

7) Flood warning in relation to Wendlebury Road

As a precautionary measure it is recommended that the owner of The Red Lion signs up to the Environment agencies Flood line service for either telephone, mobile, email SMS text message which gives warning of potential flooding events. Environment Agency operates a flood watch scheme called Floodline 0845 988 1188 (24 hour service) or Type talk 0845 602 6340.





2.0 Level Of FRA Required

FRA LEVEL	Description of Report Content
Level 1 Screening study	<p>The level 1 FRA is intended to identify any flooding or surface water management issues related to the development site that may require further investigation, the study should be based on readily available existing information including:</p> <ul style="list-style-type: none">• SFRA• Environment Agency Flood Maps• Standing advice <p>The level of the FRA will determine the need for a Level 2 or 3 FRA</p>
Level 2 Screening study	<p>Where the level 1 FRA indicates that the site may lie in an area of risk of flooding or may increase flood risk elsewhere due to runoff, a Level 2 FRA should be carried out. This report will confirm sources of flooding which may affect the site and should include the following:</p> <ul style="list-style-type: none">• Appraisal of the flood risk posed to the site, the potential impact of the development on flood risk on and off the site.• An appraisal of the scope of possible measures to reduce the flood risk to acceptable levels. <p>This level may identify that sufficient quantitative information is already available to complete a FRA appropriate to the scale and nature of the development.</p>
Level 3 Detailed study	<p>Undertaken if the level 2 FRA concludes that further quantitative analysis is required in order to assess flood risk issues related to the development site.</p> <p>This level to include:</p> <ul style="list-style-type: none">• Quantitative appraisal of the flood risk to the development• Quantitative appraisal of the potential impact of development on the site under investigation on flood risk on and off the site.• Quantitative demonstration of the effectiveness of any proposed mitigation measures.



3.0 Introduction

3.1 Commission

The Red Lion have commissioned Infrastruct CS Ltd to prepare a Flood Risk Assessment (FRA) to support the proposed extensions to the existing building, and new accommodation building.

3.2 Guidance

This flood risk assessment has been compiled in accordance with the recommendations of the National Planning Policy Framework (NPPF).

3.3 Aims and Objectives

The purpose of this flood risk assessment is to assess the potential for flood risk caused as a result of, and to the proposed development. It will identify the flood risk zone, potential sources of flood risk, consider the proposed drainage and will be used to support the proposed planning application.

4.0 Site Details

4.1 Location

The development site is situated on arable land situated in the centre of the Oxfordshire village of Wendlebury. The site accessed is from the Barrets Row/Wendlebury Road.

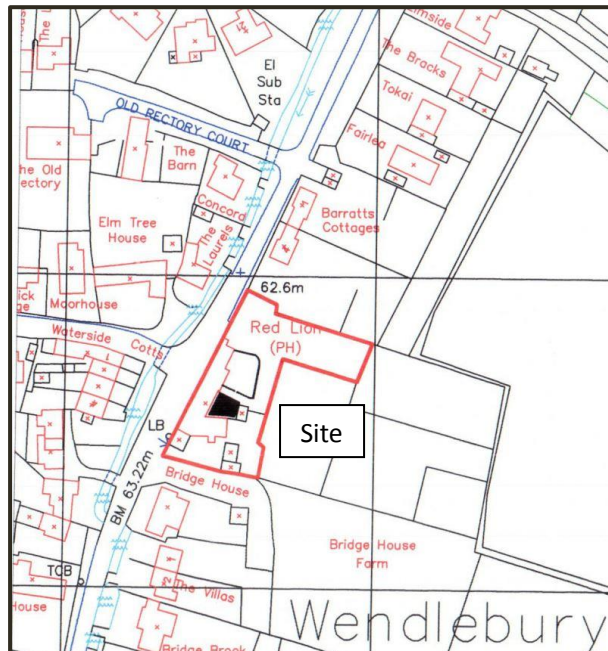


Fig 4.1 – Site Location Plan – reproduced under licence WL 1005534

4.2 Proposed development

The proposed development (Appendix A) is for the proposed extensions to the existing building, and new accommodation building.

4.3 Grid reference

The approximate ordnance survey national grid reference for the site is 456164E,219672N.

4.4 Topography and site description

A topographic survey (Appendix B) was undertaken in August 2014. The site is an existing pub and associated car park.

The development site is accessed off the Barrets Row/Wendlebury Road to the east of the development site.

The topography of the site is relatively flat with an overall fall of **2.83m** from the east to the west giving an approximate gradient of 1 in 20. To the west is an un-named watercourse, known locally as Wendlebury Brook. To the east is the farm land and to the north and south are residential properties and associated gardens.

4.5 Existing Surface Water Drainage description

There appears to be no formal drainage for the existing development, with roof drainage discharging directly to the road and parking before discharging into the un-named water course fronting the properties.



4.6 Local rivers and water courses

Immediately to the west and at a lower level is an un-named water course, known locally as Wendbury Brook. The difference in levels between the pub floor level and the river bed is just over 1.0m

4.7 Existing Foul Drainage description

The proposed extensions to the existing building, and new accommodation building are to utilise the existing foul water connections.

4.8 Vulnerability classification

The vulnerability classification is 'more vulnerable'. See Section 6.10 for vulnerability descriptions.

5.0 Flood Risk Policy

5.1 Environment Agency Flood Map - Fluvial Flooding

The Environment Agency Flood Zone maps and product 4 flood level information (appendix D) show the majority of the site (approx 98%) to be flood zone 1. There is a small area adjacent to the entrance that is flood zone 2.

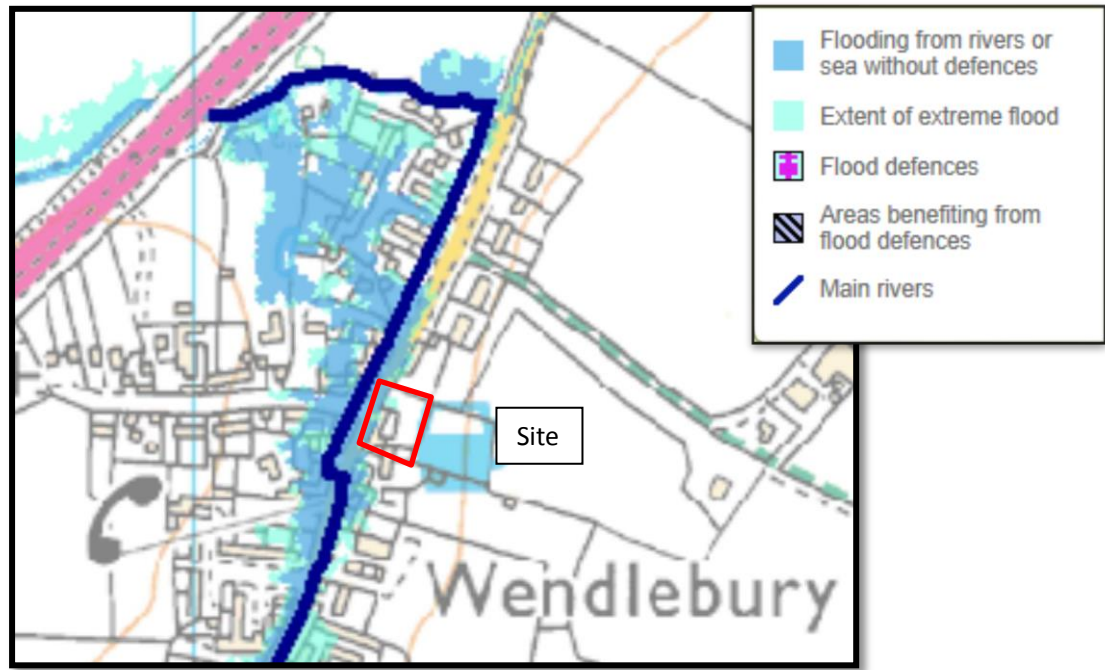


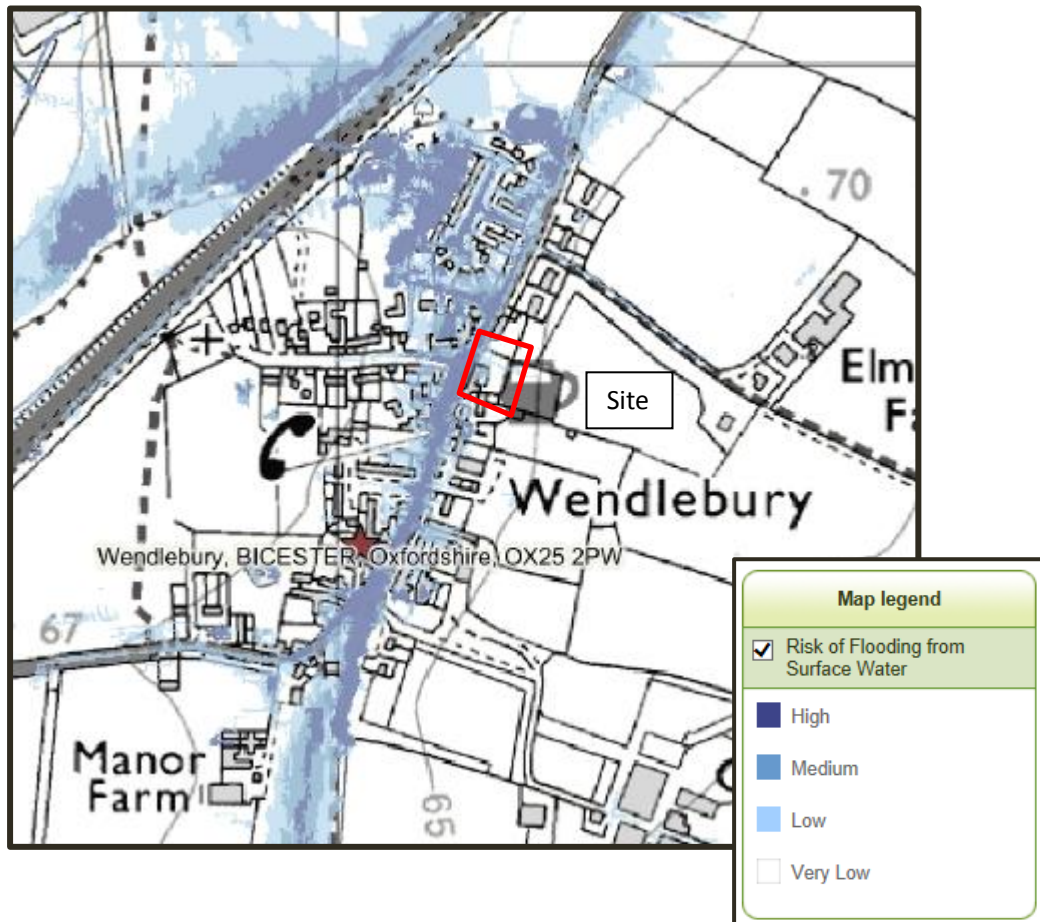
Fig 5.1 Environment Agency Flood Zone Map

5.2 Environment Agency Flood Map – Flood levels

Product 4 flood level information was requested from the Environment Agency. However this has not been modelled by them and accurate flood level information is not available. The Environment Agency has provided plans showing the 2008 flood event, Basic flood map and a Risk of surface water flooding map (appendix D) and inspection of the records when compared to the topographic survey gives an approximate flood level of 63.00m AOD. A review of the flood maps indicates roughly 98% of the site to be above the 1 in 100 year plus climate change allowance flood level of 63.00m AOD. No habitable development is shown in the flood zone 2 area. It should be noted that a minor part of the area shown for the kitchen extension is below the 63.00m level, however this is not linked to the fluvial flood map.

5.3 Environment Agency Flood Map – Surface water flooding

The Environment Agency surface water flooding map reproduced below shows localised flooding associated with the un-named watercourse and some localized flooding in Barrets Row/Wendlebury Road. There is some limited low level flooding in the entrance to the site which is an existing issue, which unfortunately cannot be remedied, due to the levels of the adjacent road.



5.5 National Planning Policy Framework -NPPF

The National Planning Policy Framework Development and Flood Risk however the accompanying practice guide gives guidance for development with respect to flooding. A sequential approach is adopted in order to encourage development away from areas that may or are susceptible to flooding. In doing so it categorises flood zones in the context of their probability of flooding.

5.6 Flood zone definition

National Planning Policy Framework Definition of Flood Zones

Flood zone	Fluvial	Tidal	Probability of flooding
1	< 1 in 1000 year (<0.1 %)	<1 in 1000 year (<0.1 %)	Low probability
2	Between < 1 in 1000 year (<0.1 %) and 1 in 100 year 1%	Between <1 in 1000 year (<0.1 %) and 1 in 200 year 0.5%	Medium Probability
3a	> 1 in 100 year 1% (>1.0%)	> 1 in 200 year (>0.5%)	High probability
3b	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Either > 1 in 20 (5%) or as agreed between the EA and the LPA	Functional flood plain

5.7 Other Flooding Mechanisms

In addition to the potential for assessing flooding from fluvial and tidal sources NPPF also requires that consideration is given to other mechanisms for flooding -

- Flooding from land – intense rainfall, often in short duration, that is unable to soak into the ground or enter drainage systems, can run rapidly off land and result in local flooding.
- Flooding from groundwater – occurs when water levels in the ground rise above the surface elevations.
- Flooding from sewers – In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water sewers known as combined sewers. Flooding can result causing surcharging when the sewer is overwhelmed by heavy rainfall
- Flooding from reservoirs, canals and other artificial sources – Non-natural or artificial sources of flooding can result from sources such as reservoirs, canals lakes etc., where water is held above natural ground levels.



5.8 National Planning Policy Framework: Flood zones definition (table 1 of NPPF)

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defenses)

Zone 1 - Low Probability
Definition
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Appropriate uses
All uses of land are appropriate in this zone.
FRA requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.
Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques
Zone 2 - Medium Probability
Definition
This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Appropriate uses
Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in (Table 2 NPPF) are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in Table 2 are only appropriate in this zone if the Exception Test is passed.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.
Zone 3a - High Probability
Definition
This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Appropriate uses
The water-compatible and less vulnerable uses of land in (Table.2 NPPF) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in time of flood.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and relocate existing development to land with a lower probability of flooding.



Zone 3b - The Functional Floodplain
Definition
This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.
Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to: – remain operational and safe for users in times of flood; – result in no net loss of floodplain storage; – not impede water flows; and – not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.
FRA requirements
All development proposals in this zone should be accompanied by a FRA.
Policy aims
In this zone, developers and local authorities should seek opportunities to: reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and relocate existing development to land with a lower probability of flooding.

5.9 NPPF - Flood Risk Compatibility Classification

Essential Infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly Vulnerable

- Police stations, Ambulance stations and Fire stations and Command Centre's and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

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 waste.
- Sites used for holiday or short-let caravans and camping, **subject to a specific warning and evacuation plan.**

Less Vulnerable

- Police, ambulance and fire stations which are **not** required to be operational during flooding.



- Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do **not** need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel workings.
- Docks, marinas and wharves.
- Navigation facilities.
- MOD defense installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, **subject to a specific warning and evacuation plan.**

5.10 Flood Risk Vulnerability And Flood Zone Compatibility Table

Vulnerability classification flood zone	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
1	√	√	√	√	√
2	√	√	Exception test required	√	√
3a	Exception test required	√	x	Exception test required	√
3b	Exception test required	√	x	x	x

√ Development is appropriate x development is not appropriate



5.11 Strategic Flood Risk Assessment

Reference has been made Strategic Flood Risk Assessment for Oxfordshire Preliminary Flood Risk Assessment (PFRA). The FRA does not show the site to be at risk. However it does note that for sites in Wendlebury:

“There is generally limited scope for acceptable flood compensation schemes in the village. Located on low lying impervious ground, there may be limited land drainage and a presumption against the use of soak aways unless there is justification through robust design.”

6.0 Flood Risk To The Development

6.1 Flooding From Fluvial Sources

The EA flood maps and levels for the development site show the majority of the site (98%+) is Flood Zone 1 which is defined in NPPF as comprising land at low risk of flooding. There is a small area to the entrance which is flood zone 2. There is also a small area shown to be below the estimated 1 in 100 year level adjacent to the new kitchens. As this has a gully connection, there is a chance of this area flooding. Levels within the parking area should be reduced to accommodate any loss of flood plain.

It is therefore the consideration of this FRA that the site is not at risk from fluvial flooding.

6.2 Flooding From Overland Flow To The Site

To the west is the Wendlebury Road and associated un-named watercourse, both of which are lower than the site. To the north and south are residential developments which by its nature will not generate 'sheet' overland flows. To the east is Alchester Stables, whilst these are slightly higher than the site, any flows generated are anticipated to be low and will be arrested by the permeable paving before reaching any dwellings.

It is therefore the consideration of this FRA that the site has at low risk of flooding from overland flows.

6.3 Flooding From Rising Groundwater

A ground investigation has not been undertaken for this site, however, a bore hole taken locally, at 15 Wendlebury Road, indicated no ground water seepage over a 24 hour test period. (See appendix C). Other anecdotal evidence indicates a ground water level of approximately 2.5m below ground level.

It is therefore the consideration of this FRA that the site has a low risk of flooding from rising groundwater levels.

6.4 Flooding From The Local Sewerage Network

The sewerage network is owned and maintained by Thames Water. The risk of flooding by surcharging is considered low.

Locally the surface water appears to drain to the un-named watercourse opposite, as this is lower than the site it is not considered a risk.

It is therefore the consideration of this FRA that the site has a low risk of flooding by surcharging of the local sewer network.

6.5 Flooding From Reservoirs, Canals and Other Artificial Sources

Review of location plans for the development site show there to be no signs of manmade water sources within the immediate vicinity that would present a potential source of flooding.

It is therefore the consideration of this FRA that the site has a low risk of flooding by reservoirs, canals or other artificial sources.



7.0 Flood Warning and Dry Route of Escape

7.1 Flood warning in relation to Wendlebury Road

As a precautionary measure it is recommended that the owner of The Red Lion signs up to the Environment agencies Flood line service for either telephone, mobile, email SMS text message which gives warning of potential flooding events. Environment Agency operates a flood watch scheme called Floodline **0845 988 1188** (24 hour service) or Type talk 0845 602 6340.

7.2 Dry Access, Egress and Escape

The new accommodation block is situated centrally on the plot. Due to the steeply sloping nature of the site, this will be 1.0m above the road to the front and 600mm above the most extreme flood level.

The only official access to the site is via the road to the front, which lies within flood zone 3 and 20% AEP. Due to the risk of flooding to the adjacent road and the flood flow, it is not recommended that this route is used for dry access in an extreme flood. However with the Emergency planning noted in section 8.0 of this report and the accommodation block being 600mm higher than the extreme flood it can be shown that the accommodation block would provide a safe haven should such a flood occur.

The flood level given by the EA for the 20%AEP storm event is 62.78 (See appendix D). At this level, flood floods within Wendlebury road will be 250mm deep. Whilst it is not recommended for residents to enter any flood waters, especially none deeper than 100mm. The emergency services utilising the appropriate vehicles should be able access the site should an emergency occur, prior to the flood subsiding.

8.0 Emergency Planning

8.1 Awareness

Whilst the development is identified by the EA as subject to potential flooding for storms greater than the 1 in 100 plus climate change storm event.

There are several sources of information available on flooding events within the area; these being the Environment Agency in conjunction with the Met Office and local radio and television stations. Both will issue and broadcast warnings.

The Agency operates a flood watch scheme called Floodline. This service is free and can be accessed by calling Floodline on **0845 988 1188** or Typetalk on 0845 602 6340. Floodline can also be accessed by the internet by logging onto <http://www.environment-agency.gov.uk>.

In many places the Agency can warn interested parties by either telephone, mobile, email, SMS text message or fax of a potential flood up to six hours in advance.

8.2 Equipment

The preparation of a flood kit is essential for instances when evacuation is required. This kit will also be useful for general emergency situations and should be stored for general emergency situations and be easily accessible if flooding occurs. These items should include:

- A torch
- Blankets or a sleeping bag, warm clothing and waterproofs
- A first-aid kit, including a supply of any essential medication
- A list of useful telephone numbers
- A supply of bottled water
- A stock of non-perishable food items
- A portable radio and supply of batteries
- Children's essentials (milk, baby food, sterilised bottles and spoons, nappies, wipes, nappy bags, clothing, comforter, teddy.
- Food and accommodation (cages) for pets (If allowed within the hotel)
- Wellington boots or similar waterproof boots
- Check your insurance cover – ensure it covers flood damage
- Know how to turn off the gas, electricity and water mains supplies
- Think about what items you would want to move to safety during a flood

8.3 Flood Watch

On receipt of the Flood Watch warning from the Environment Agency, or from other sources, e.g. TV, Radio, local contacts.

Flooding is possible, and the situation could worsen.

Flood watch means – “Flooding of low lying land is expected. Be aware, Be prepared, Watch out.

When a flood watch warning is issued residents should:

- Be aware of water levels and whether the river is rising or falling
- Reconsider travel plans
- Listen and watch for weather and flood warnings on local radio and television stations
- Contact Floodline on **0845 988 1188**



- Check that the flood kit has been prepared
- Copy vital hard copy and electronic records and store them in a safe place. This includes financial and insurance records
- Keep a store of plastic bags (grocery bags are fine) to place around the legs of furniture when you receive a flood warning

At this stage residents should ensure that their neighbours are aware of the Flood Watch alert in case they are not subscribed or did not receive the alert.

8.6 Severe Flood Warning

A flood evacuation should be implemented as a matter of urgency when a Severe Flood Warning is issued. Severe Flood Warning means severe flooding is now expected. There is extreme danger to life and property and people are advised to act immediately, i.e. evacuate.

The Agency aim to provide at least 2 hours warning between the Flood Warning alert being issued and the commencement of flooding. The Agency recommends that residents should evacuate when a Flood Warning or Severe Flood Warning status is issued.

If flood levels continue to rise, residents are advised to evacuate before safe access is lost. At this level driving through flood water may become hazardous and residents must evacuate beforehand.

Residents/hotel staff should monitor the flood progression and evacuate, on foot, as soon as possible. Should the flood levels be higher than 100mm, residents should utilize the safe haven (Hotel block) until such time that the flood waters subside.

8.7 All Clear

All clear means that flood watches or warning are no longer in force in this area.

- Keep listening to weather reports
- Only return to evacuated buildings if you are told it is safe
- Beware sharp objects and pollution in flood water.

Residents should contact the local authority to check that it is safe to return to their property. Residents should be aware that if floodwaters have entered the property it will need to be cleaned, disinfected and repaired and fully dried out prior to reoccupation. Check that the building is safe before entering, and if there are any doubts professional opinion should be sought. If there is any doubt that appliances may be water damaged they must be checked before switching the power or gas back on. Contact your insurance company as soon as possible to get their approval before arranging any clean-up or repairs.



9.0 Recommendations and Conclusion

In line with the recommendations of the National Planning Policy Framework, the development site lies within land classified as flood zone 2 and 3, which is considered appropriate for a development subject to the requirements of the exception test being passed. This report has assessed all the possible means of flooding to and from the development site and demonstrated that all of the requirements of the exception test can be met.

As such this report concludes that the site is suitable for development in line with the current architectural proposals.

9.1 Finished Flood Levels

The finished floor levels for the proposed extension must be set to ensure the property is located above the 1 in 100yr flood level to reduce the likelihood of flood water damaging the property. The whilst there was no product 4 information available, The EA did provide some flood maps for the area. Reading these in conjunction with the topographic survey gave us a flood level of 63.000m and in line with EA recommendations the minimum flood level should be set 600mm above this.

As such a minimum finished floor level for the development site should be 63.600m AOD.

9.2 Flood Resistant measures

As part of the works associated with the new dwellings it is the recommendation of the report that consideration should be given to flood resistant measures. These are mechanisms which can be implemented by the occupier to provide additional defenses against flood water ingress. Systems such as flood barriers to external door openings can prove an effective measure but must be used in conjunction with suitable ground floor construction techniques to prevent water entering the dwelling from the under floor void. As these works are associated with the construction of the residential dwelling it would be advisable to site sockets and fuse boxes away from floor level. More information and recommendations can be gained from the CIRIA document 'Improving the flood performance of new buildings'.

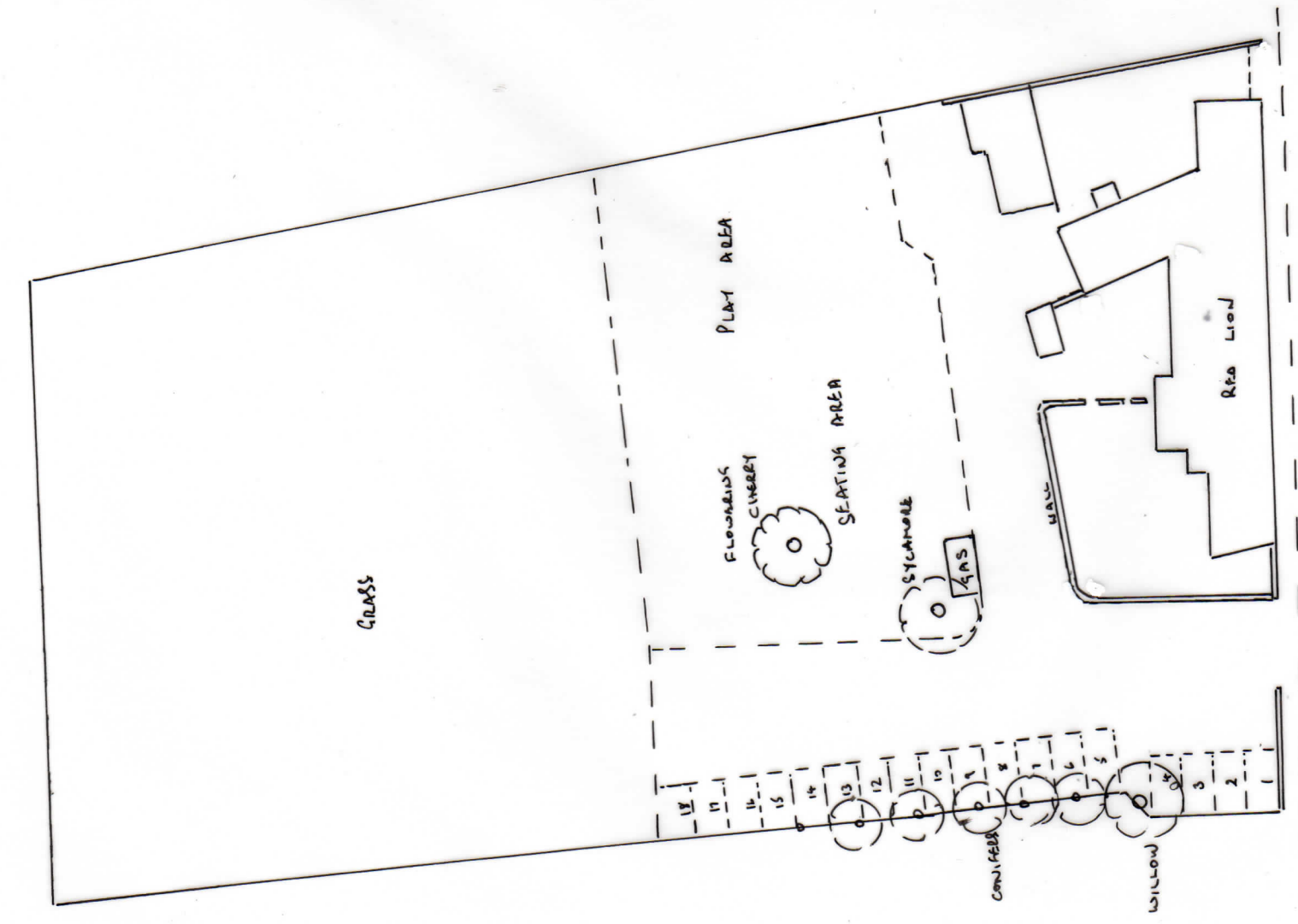


References & Bibliography

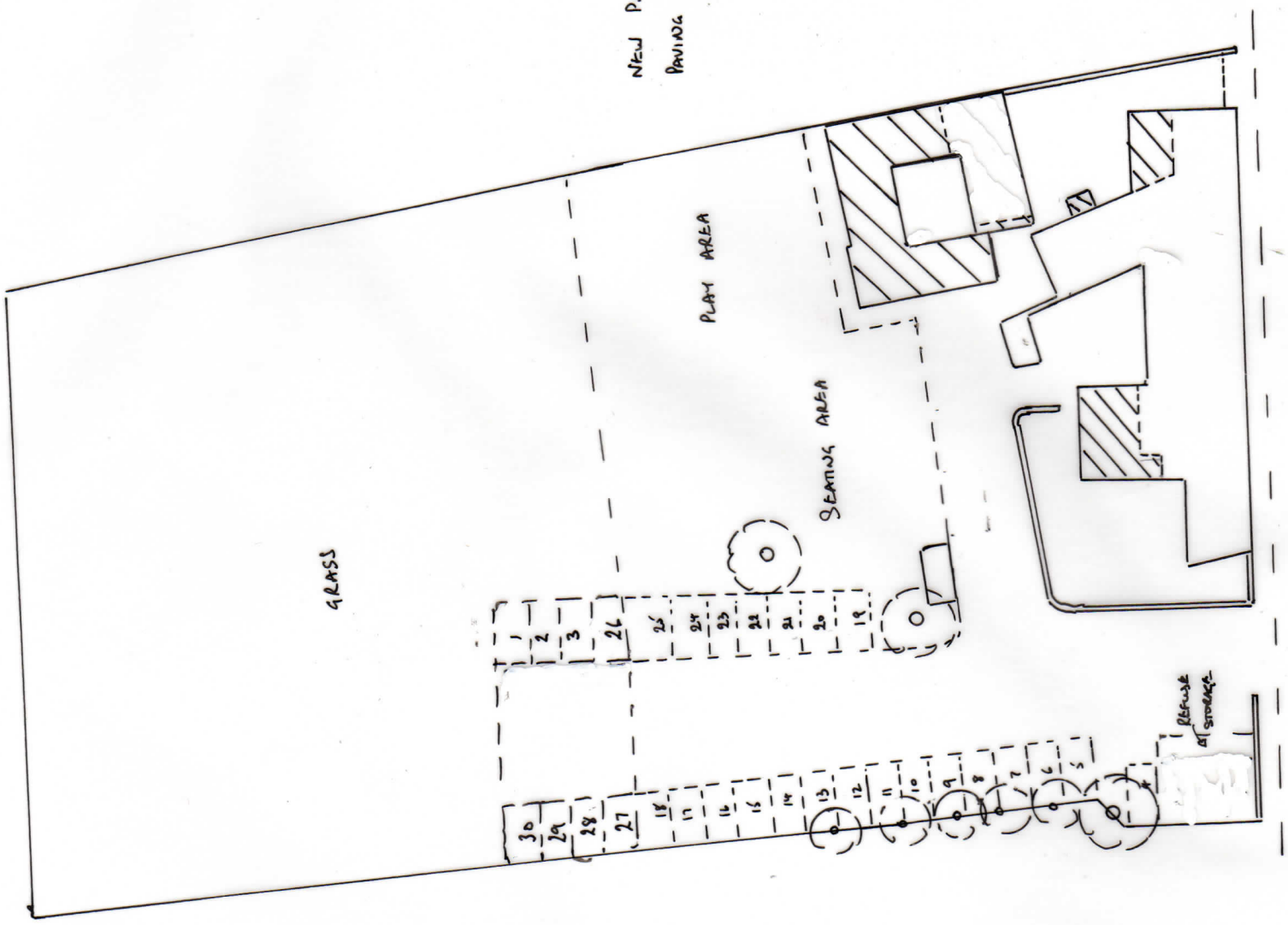
- National Planning Policy Framework (this replaces Planning Policy Statement 25: Development and Flood Risk Practice Guide).
- Code For Sustainable Homes - Department of Communities and Local Government. Revised February 2012.
- Environment Agency indicative flood maps <http://maps.environment-agency.gov.uk>
- Environment Agency indicative ground water source protection zone maps <http://maps.environment-agency.gov.uk>
- Environment Agency indicative Aquifer designation maps <http://maps.environment-agency.gov.uk>
- CIRIA 2007, The Sustainable drainage Systems (SUDS) Manual C697
- Sewers for adoption 6th Edition and interim guidance prior to the introduction of sewers for adoption 7th edition WRC
- Strategic Flood Risk Assessment for Oxfordshire Preliminary Flood Risk Assessment (PFRA).



Appendix A – Proposed development



EXT



PROP

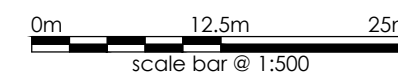
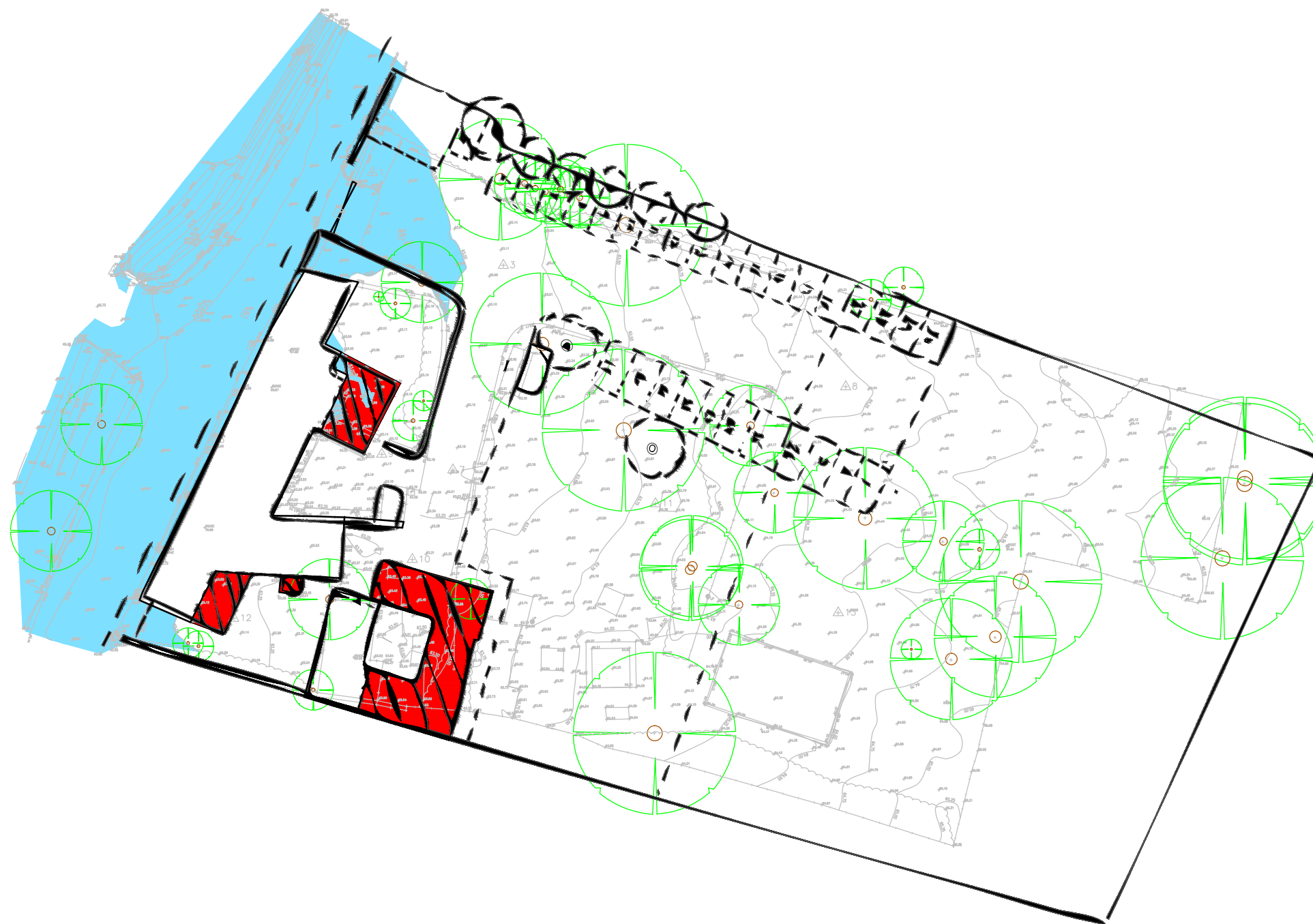


PARKING	Scale	1:500	
THE RED LION, MAIN STREET	Date	June	2014
WENDLEBURY	Ref:	9/41/14	
Beverley Bates,	Check all measurements on		
Iverley Lodge, Main Road,	site before commencing works		
Kilsby, Rugby. 01788822486			



Key

	EA Flood Level - 63.000 Flood level interpreted from EA Flood Maps
	Proposed Extension



TITLE
Extent of Flood Plain
The Red Lion
Wendlebury
Bicester

DRAWING NUMBER
14-1570-01 Rev P01

CLIENT
THE RED LION

- NOTES
- All dimensions and levels are in metres unless otherwise noted
 - This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
 - This drawings has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
 - This drawing contains coloured lines / information that may not be clear if reproduced in black and white.

Rev	Drawn	Check	Comments	Date
P01	RJW	RJW		29/08/14
P02	RJW	RJW	Anecdotal '2001 flood information removed'	15/09/14

DATE
29/08/2014

DESIGNED BY
RJW

SCALE
1:500 @ A3

STATUS

FOR INFORMATION



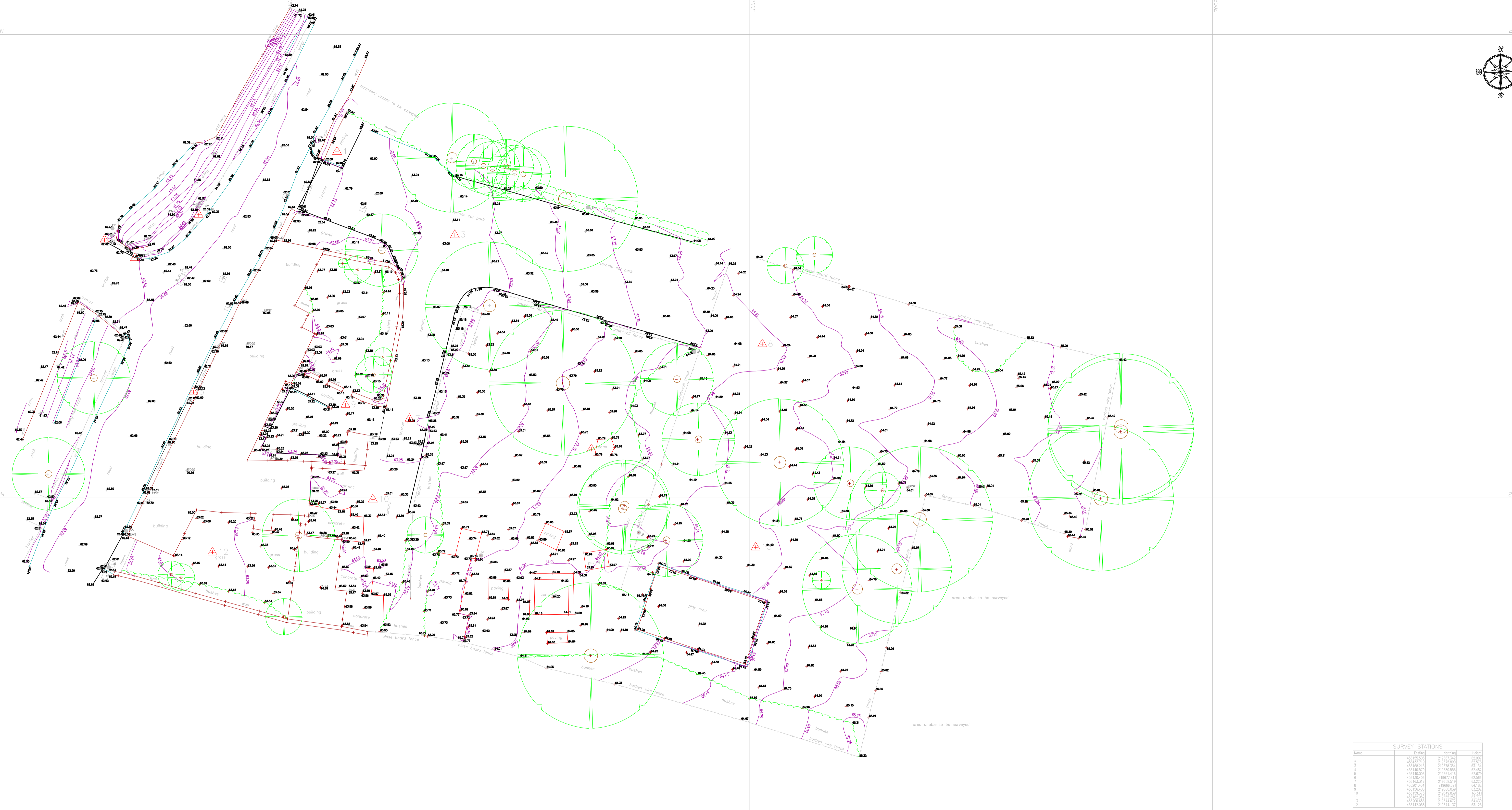
Infrastruct CS Ltd

INFRASTRUCT CS LTD
Consulting Civil and Structural Engineers

26A High Street, Eynsham, Oxford, OX29 4HB
Tel: 01865 880909
Email: info@infrastructcs.co.uk
Web: www.infrastructcs.co.uk



Appendix B – Topographic Survey



SURVEY STATIONS			
Name	Easting	Northing	Height
1	456125.521	219607.342	62.907
2	456133.719	219607.800	62.911
3	456162.211	219608.204	63.134
4	456140.006	219601.416	62.879
5	456130.048	219607.811	62.908
6	456163.177	219608.019	63.220
7	456201.044	219608.261	64.181
8	456154.408	219608.039	63.032
9	456168.370	219608.039	63.034
10	456182.952	219605.252	63.777
11	456200.621	219644.872	64.432
12	456142.008	219644.117	63.125

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 TEL: Office 01234 376859 Mobile 07980540125
 e-mail: shyresrural@talktalk.net

JOB TITLE: **RED LICE WENDLEBURY**
 survey to OS grid and datum using gps

CLIENT:
 DATA SHOWN ON THIS PLAN PREPARED TO CLIENT SPECIFICATIONS

GRANANCE SURVEY DIGITAL COPYRIGHT LICENCE No:10046487

DATE: 29/08/14	DRAWING NUMBER:	REVISION
SCALE: 1:200	SRL.109.14	
DRAWN BY: taff		

survey data correct at date of survey only.
 symbols representing tree spread and trunk dimensions are indicative only
 all service detail must be considered approximate and its full location must be
 verified by details obtained from the relevant provider and/or authority
 digital copies of this plan can only be considered accurate if
 supplied directly by Shyres Rural Ltd.
 do not scale from plots



Appendix C – Borehole Logs from No 15 RECTORY CLOSE WENDLEBURY

T R I A L P I T O N E		
Depth -m	Strata Description	
	MADE GROUND	
Ground level - 0.34	Soft, brown, occasionally yellow sandy, silty, occasionally gravelly, calcareous CLAY with included clasts of yellow/red chert and sub-angular, creamy oolitic limestone up to 1 cm in diameter. Occasional traces of black carbonaceous material. Traces of red brick and white plastic.	
0.34 - 0.61	Soft, brown sandy, rarely gravelly, calcareous CLAY with included fragments of glass and oolitic limestone up to 2 cm in diameter. Occasional traces of black carbonaceous material.	
0.61 - 0.78	Soft to firm, yellow/brown, creamy yellow sandy, gravelly, calcareous CLAY with included fragments of creamy white limestone up to 4 cm in diameter and subrounded flints up to 1 cm in diameter. Occasional included bone fragments, red brick and metal nails and hinges.	
Date . August, 1986	T R I A L P I T L O G TYRONE	Report No. S.748



TRIAL PIT ONE

- 2 -

0.78 - 0.86 Soft, black/brown, carbonaceous CLAY with included fragments of bituminous coal and creamy/white limestone, occasional inclusions of red brick, nails and broken white tile.

0.86 - 1.15 OXFORD CLAY Soft to firm, orange brown yellow, sandy, calcareous CLAY with included fragments of angular creamy brown limestone up to 2 cm in diameter. Occasional traces of black carbonaceous material and flints.

Remarks.

1. Trial pit excavated by hand on 18.08.1986.
2. Trial pit dimensions 0.60 x 1.35 x 1.15m deep.
3. No groundwater seepage evident after standing open for twenty four hours.
4. In situ shear strength values - kN/m²

Depth -m	Values			Average
0.86	26	34	36	32
0.97	24	28	30	27
1.15	30	20	26	25

Date . August, 1986	TRIAL PIT LOG	Report No . S.748
------------------------	---------------	----------------------



Appendix D – Environment Agency flood data

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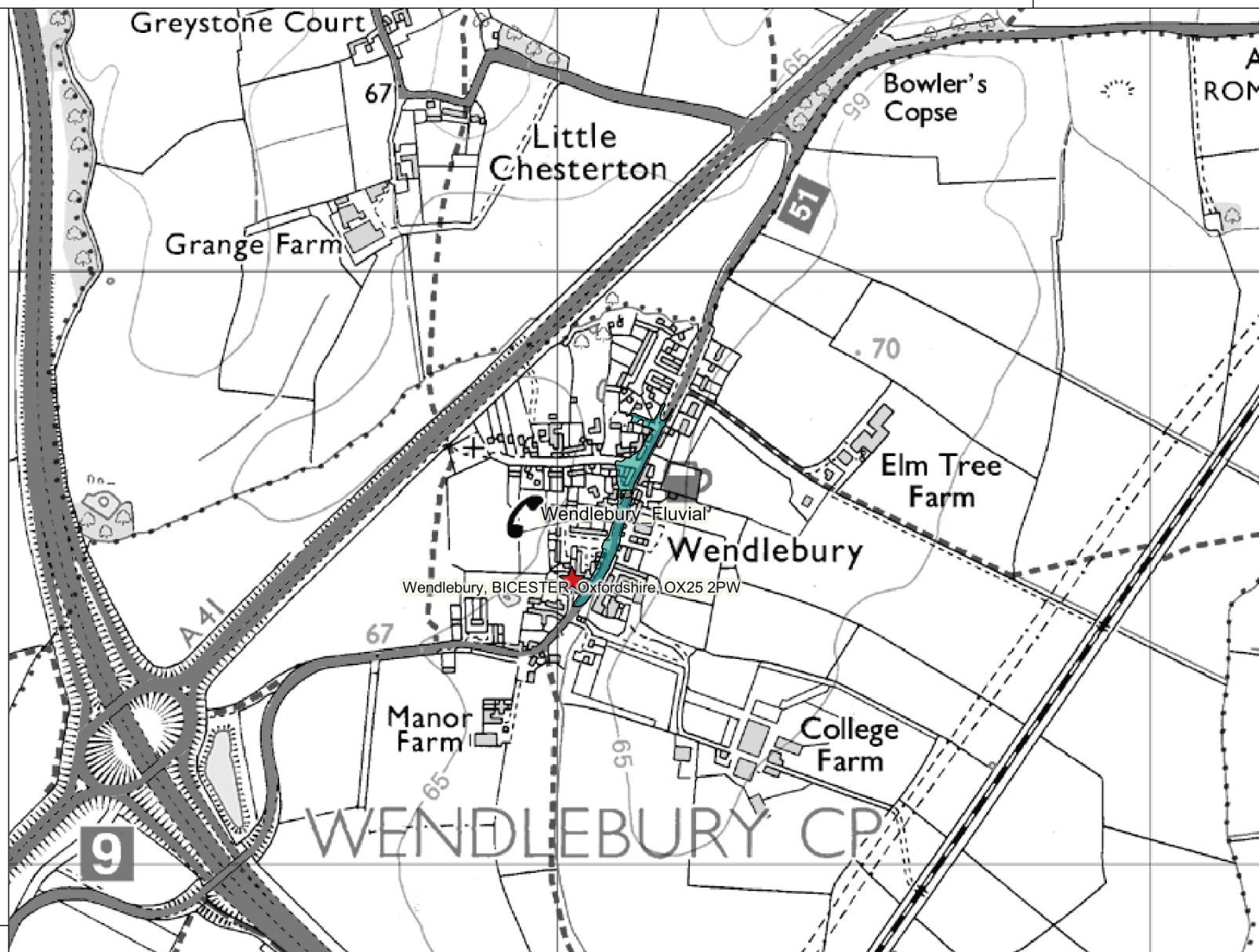
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WT17105 Wendlebury 2008 Flood Event



Legend
■ Flood Event Outlines



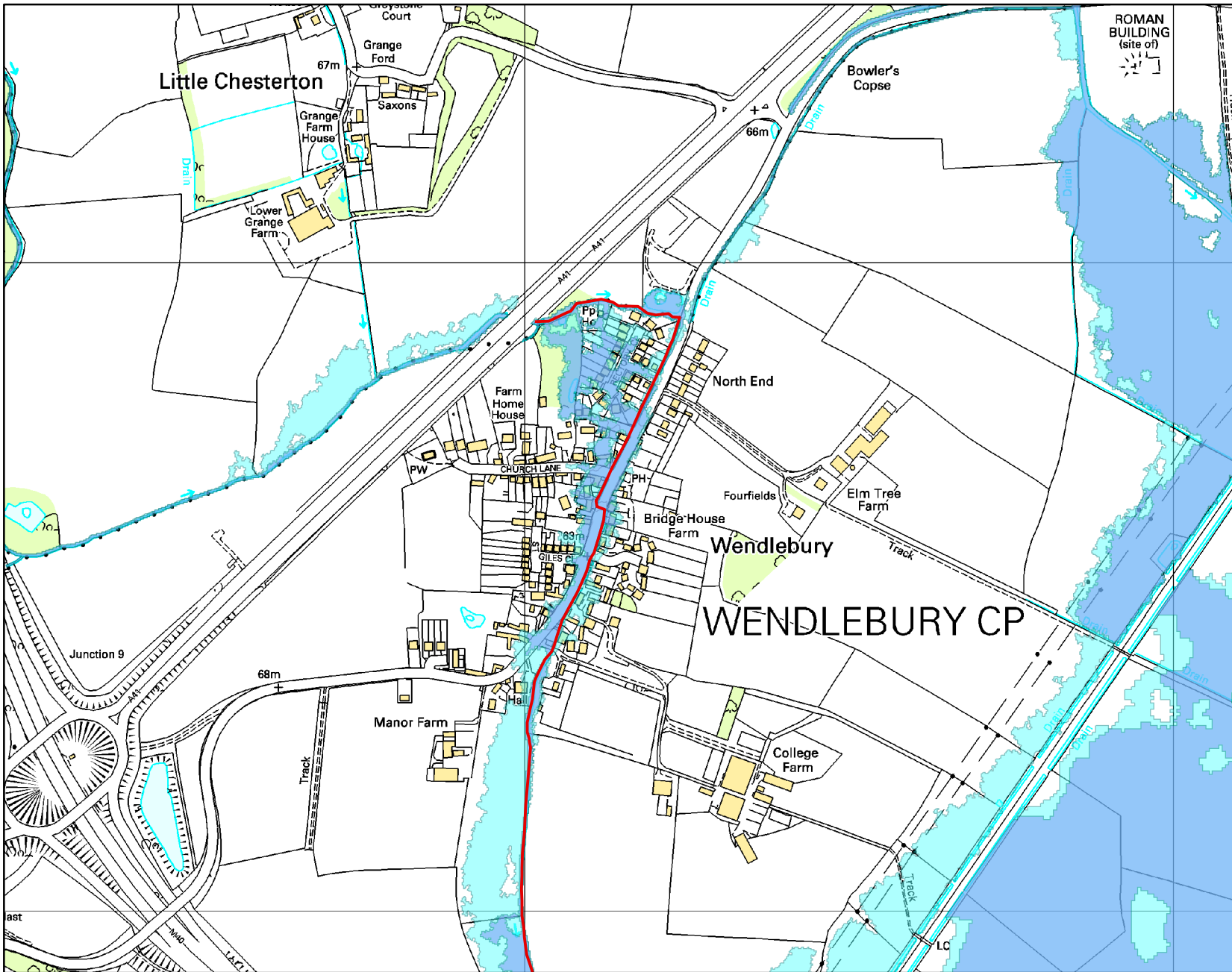
0 95 190 285 m.



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Basic Map centred on Red Lion Pub, Wendlebury

Created 08/08/2014 - REF: WT17105



Kilometres

0 0.1 0.2



Legend

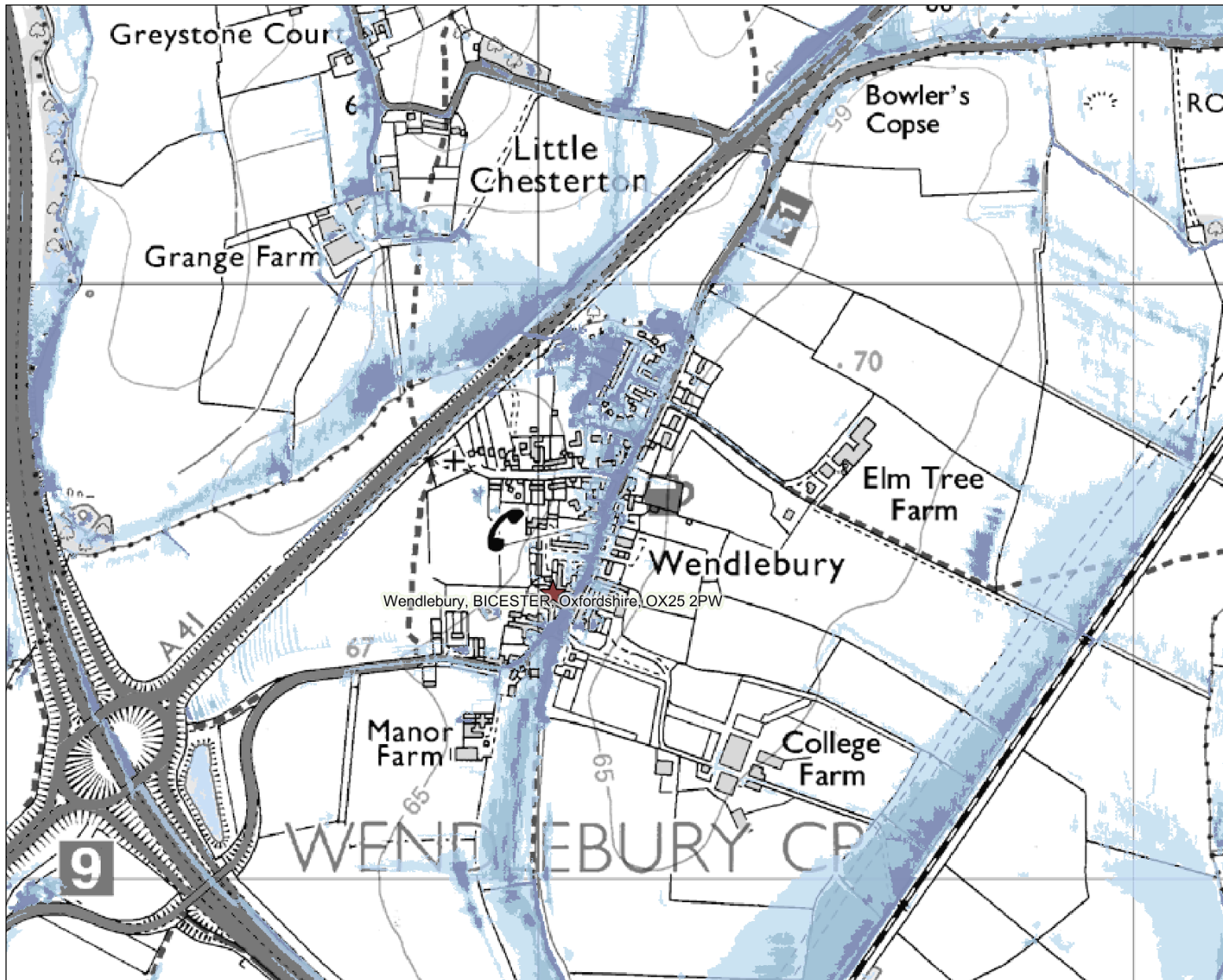
- Main River
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Risk of flooding from Surface Water



Scale 1:10,001



Likelihood of flooding from Surface Water

- High
- Medium
- Low
- Very Low

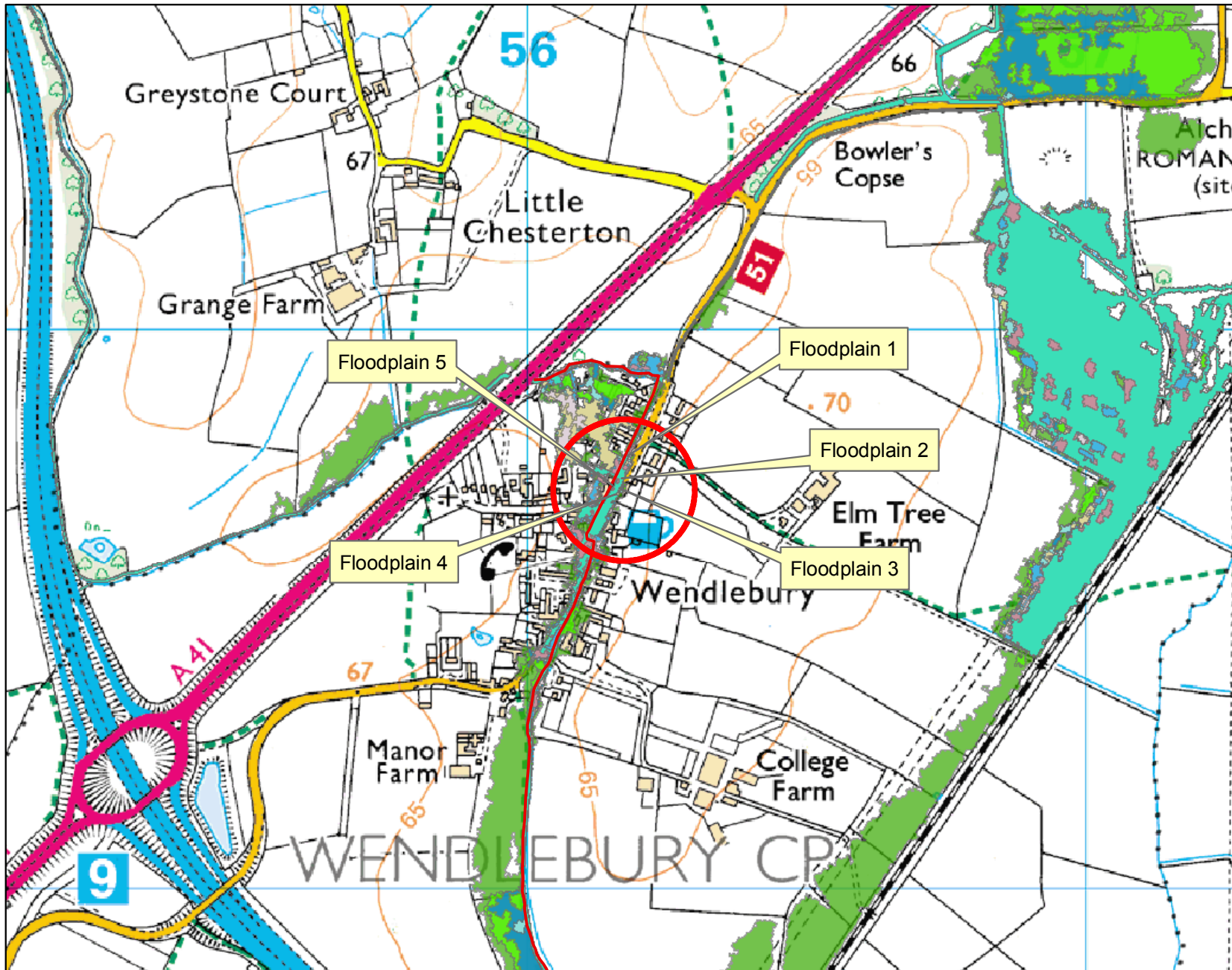
Likelihood of flooding from Surface Water

- High: Greater than or equal to 1 in 30 (3.3%) chance in any given year
- Medium: Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low: Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low: Less than 1 in 1,000 (0.1%) chance in any given year

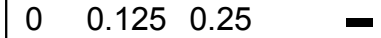
This information is shown on the Risk of Flooding from Surface Water map on our website.

Model Map centred on 4 Barretts Row, Wendlebury OX25 2PH

Created on 04/09/2014 REF: OX_0896_01



Kilometres



Legend

- Main River
- 20% AEP Flood Outline
- 10% AEP Flood Outline
- 5% AEP Flood Outline
- 3.3% AEP Flood Outline
- 2% AEP Flood Outline
- 1.3% AEP Flood Outline
- 1% AEP Flood Outline
- 1%+CC AEP Flood Outline
- 0.1% AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occurring in any given year

1%CC = 1% Climate Change extent
This is the 1% AEP event with an allowance for climate change (+20% on river flows)

Modelled floodplain flood levels

OX_0896_01

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

2D grid cell reference	Model	Easting	Northing	flood levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP with climate change allowance (+20% on river flows)	0.1% AEP
Floodplain 1	Wendlebury Brook 2014	456,181	219,771	62.91	62.97	63.03	63.07	63.14
Floodplain 2	Wendlebury Brook 2014	456,173	219,730	62.83	62.91	63.00	63.04	63.11
Floodplain 3	Wendlebury Brook 2014	456,167	219,712	0.00	62.89	62.97	63.01	63.08
Floodplain 4	Wendlebury Brook 2014	456,160	219,702	62.78	62.87	62.95	62.99	63.07
Floodplain 5	Wendlebury Brook 2014	456,156	219,718	0.00	62.89	62.98	63.02	63.08

This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Appendix E – Photos



Frontage of Pub – Including bridge and Wendbury Brook opposite



Rain Water Down Pipe discharging to road



Wendlebury Brook plus existing car park entrance