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Flood Risk Assessment

**4 Barretts Row
Wendlebury
Bicester,
Oxon**



Client

Mr J Cordy

Report Ref – 14-1555.07.01 Rev - C

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1.0 Summary & Recommendations

This FRA is to support the proposed rear extension of No 4 Barretts Row and development of new residential property within the rear garden and finds the following –

SOURCE OF FLOODING	RISK
Fluvial Flooding	Low – The Environment Agency product 4 flood maps show that the development site is classified as Flood Zone 1 which is defined in NPPF as comprising land at low risk of flooding. Average existing levels for the development site are in the order of 63.350 – 64.690m AOD approx.
Fluvial Flooding Wendlebury Road	It should be noted that Wendlebury Road fronting the development site is Flood Zone 3 and has modelled flood levels of 62.99 – 63.07mAOD (these figures include an allowance for climate change), however, the development site levels are above this.
Overland Flow to the Site	Low – Analysis of the surface flooding maps does not indicate any flood water routing through the property from the land behind. To the north and south are residential properties that by their nature of their areas will not generate overland sheet flows. Analysis of the surface flooding maps does not show the site is encroached by flooding from the Wendlebury Road.
Rising Groundwater	Low – A ground investigation has not been undertaken for this site, however, review of geological maps for the area indicates clay strata which by its nature is not subject to fluctuations in ground water levels.
The Local Sewerage Network	Low – The sewerage network is owned and maintained by Thames Water. The risk of flooding by surcharging is considered low.
Reservoirs, Canals And Other Artificial Sources	Low – No artificial sources that present a risk to the site.

**1) Nature Of Development**

Development of a new residential property and hard standing adjacent to No 4 Barretts Row, Wendlebury, Oxon.

2) Proposed dwelling finished flood levels

It is recommended that, whilst the development site for the proposed dwelling is not in the flood zone, the finished floor level is set at 63.400mAOD which is approximately 400mm above the 1 in 100 year +CC flood level. This level provides an allowance for climate change and freeboard protection factor.

3) Emergency risk flood escape

Wendlebury Road is subject to flooding and the flood level data indicates depths in the region of 250mm fronting the development site. The site itself is above the flood level and therefore safe. Consideration is therefore in relation to emergency access.

The topography of Wendlebury Road and the area in general is relatively flat and level, therefore flood water velocities can be expected to be low to still.

Reference to table 4 of FD2320/TR2 (FRA guidance for new development) 'Hazard to People Classification' assuming a velocity of 0.3m/s for a depth of 250mm indicates a flood hazard rating of 0.69. This rating equates to a hazard to people classification of 'Very low hazard – Caution' It is not expected that debris would be a factor in this risk assessment. Therefore it is the conclusion of this report that whilst flooding of Wendlebury Road does occur and therefore constitutes a risk to emergency escape, the depths of flow and low flow velocity can be classified under FD2320/TR2 (FRA guidance for new development) to be 'very low hazard'.

4) Flood warning in relation to Wendlebury Road

As a precautionary measure it is recommended that the owner of No 4 Barretts Road 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

Mr J Cordy has commissioned Infrastruct CS Ltd to prepare a Flood Risk Assessment (FRA) to support a planning application for the development of a new residential property in the rear garden and also rear extension of the existing property of No 4 Barretts Row, Wendlebury, Oxon.

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

No4 Barretts Row is situated an existing semi-detached building that fronts on to the Wendlebury Road and is situated approximately centrally in the village. 4Km to the north east is Bicester the Oxford is 14km approx. to the south west.

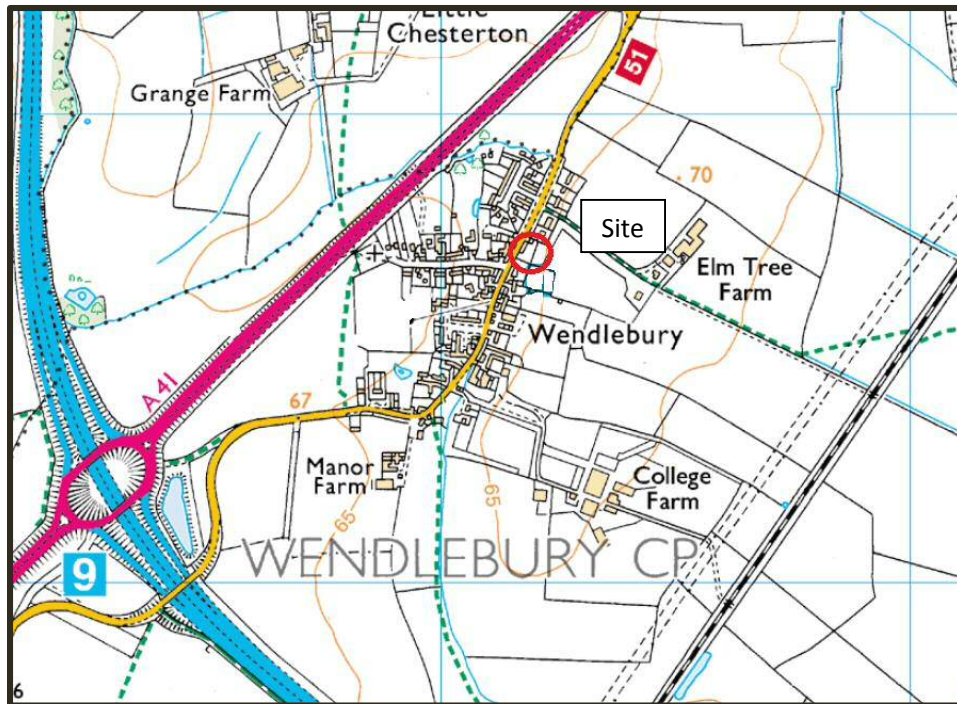


Fig 4.1 – Site Location Plan – reproduced under licence WL 1005534

4.2 Proposed development

The proposed development (Appendix A) consists of new residential dwelling and hard-standing to the side and rear of No 4 Barretts Row, Wendlebury.

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 and shows the development site to be predominantly garden with a fall from back to front in the order of 1.0m.

The southern and rear boundaries are wooded with hedging. No 4 Barretts Row fronts the site and to the side is an existing double garage with concrete forecourt and gravel hardstanding.

4.5 Existing Surface Water Drainage description

There is no evidence of a formal surface water drainage system serving the existing property. drainage for the existing development. It is assumed the rwp downpipes either discharge into soakaways or via a piped outfall into the water course located on the opposite side of the highway.



4.6 Local rivers and water courses

On the opposite western side of the Wendlebury Road fronting the property is a watercourse known as Wendlebury Brook and classified as 'main river' by the environment Agency. Modelled flood levels for the watercourse have been obtained from the Environment Agency (Appendix D)

4.7 Vulnerability classification

The vulnerability classification is 'more vulnerable'. See Section 5.10 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 the site to be flood zone 1. The map shows there to be flooding of the Wendlebury Road fronting the site but this flooding does not extend into the development site.

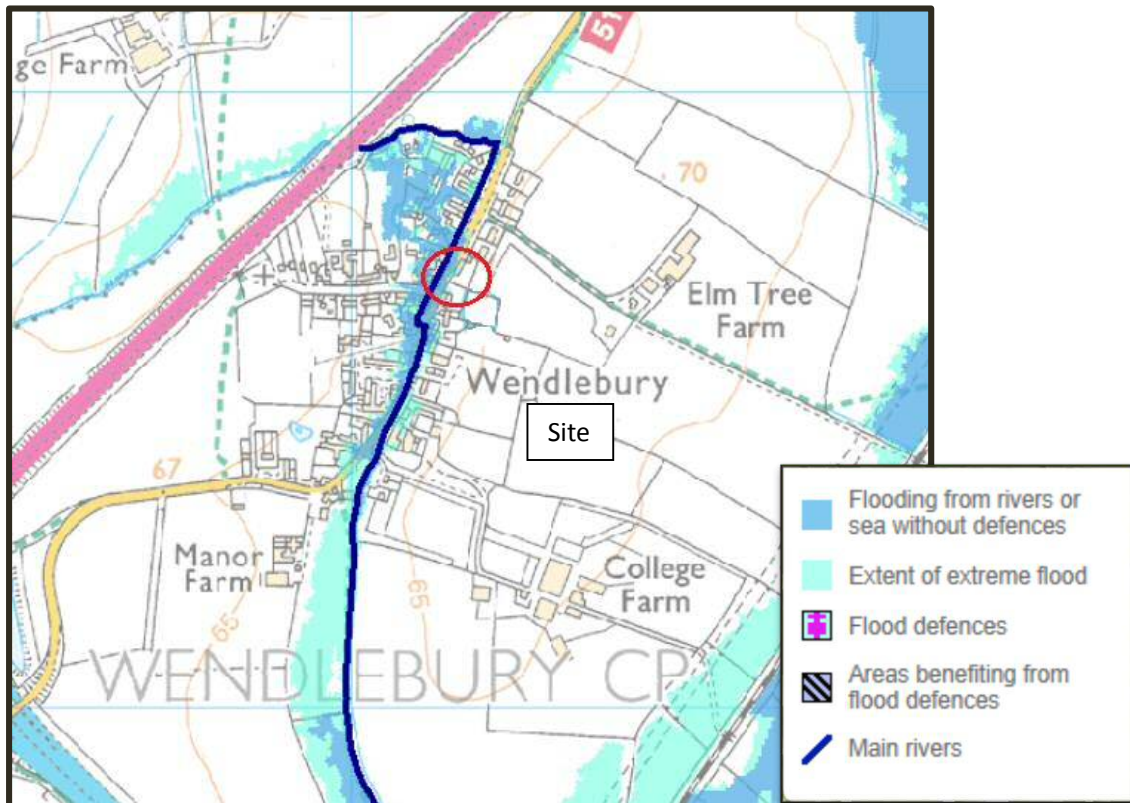


Fig 5.1 Environment Agency Flood Zone Map

5.2 Environment Agency Flood Map – Flood levels

The Environment Agency product 4 flood maps show that the development site is classified as Flood Zone 1 which is defined in NPPF as comprising land at low risk of flooding. Average existing levels for the development site are in the order of 63.350 – 64.690m AOD approx.

These compare with the Product 4 flood level information received from the Environment Agency (appendix D) that give modelled flood levels of 62.99 – 63.07m AOD for Wendlebury Road fronting the development site.

Therefore the development site levels are above the flood level in the vicinity.

5.3 Environment Agency Flood Map – Surface water flooding

The Environment Agency surface water flooding map reproduced below shows localised flooding associated with Wendlebury Brook to the front of the development site.



5.4 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.



5.5 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

5.6 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.



5.7 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.

5.8 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.**

5.9 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



5.10 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 Product 4 data flood maps and modelled flood levels for the development site show the site is classified as Flood Zone 1 which is defined in NPPF as comprising land at low risk of flooding. Wendlebury Road fronting the site does flood and is classified as Flood Zone 3, however, this flooding does not extend into the site.

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

Analysis of the surface flooding maps does not indicate any flood water routing through the property from the land behind. To the north and south are residential properties that by their nature of their areas will not generate overland sheet flows.

Analysis of the surface flooding maps does not show the site is encroached by flooding from the Wendlebury Road

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, review of geological maps for the area indicates clay strata which by its nature is not subject to fluctuations in ground water levels.

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.

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 Route of Escape

7.1 Finished Flood Levels

It is recommended that, whilst the development site for the proposed dwelling is not in the flood zone, the finished floor level is set at 63.400mAOD which is approximately 400mm above the 1 in 100 year +CC flood level. This level provides an allowance for climate change and freeboard protection factor.

This proposed floor level compares with the existing garden levels in the area of the development of between 63.256 - 63.696mAOD and as such the floor level is easily achieved.

7.2 Flood warning in relation to Wendlebury Road

As a precautionary measure it is recommended that the owner 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.

7.3 Dry Access, Egress and Escape

The only official access to the site that does not require access to third party land is via Wendlebury road to the front of the site, which lies within flood zone 3. The flood evacuation plan Infrastruct CS Ltd drg no 15-1555-02-P01 (Appendix D) shows the proposed escape route during flood events.

An extended topographic survey (appendix B) was undertaken to demonstrate the existing levels off site along Wendlebury Road towards the East. These levels were used as a reference against the Environment Agency flood levels so that an assessment of flood depths could be ascertained.

The proposed flood escape route is directed to the east of proposed development towards the dry section of Wendlebury Road. Part of the escape route is subject to shallow flood levels (flood event considered 1 in 100 plus 20% climate change). The topography of Wendlebury Road and the area in general is relatively flat and level, therefore flood water velocities can be expected to be low to still. The depths of flood water vary but are approximately 340mm at their deepest. Table 4 'Hazard To People' (Appendix E) classification rates a 400mm depth of flooding with 0.1m/s velocity to have a hazard rating of 1.24. This is classified as having an element of danger for children, the eldest and infirm. It is not considered a danger to general public and emergency services. The use of decking across the front of no 4 is intended to reduce the depth of flood water that has to passed through. The emergency services using the appropriate vehicles should be able to access the site should an emergency occur. With the Emergency planning noted in section 8.0 of this report and the proposed development being 400mm higher than the extreme flood it can be shown that the dwelling would provide a safe haven should such a flood occur.



8.0 Emergency Planning

8.1 Awareness

Wendlebury Road fronting 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 should monitor the flood progression and evacuate, on foot, as soon as possible.

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 1, which is considered appropriate for the type of development proposed.

1) Proposed dwelling finished flood levels

It is recommended that, whilst the development site for the proposed dwelling is not in the flood zone, the finished floor level is set at 63.400mAOD which is approximately 400mm above the 1 in 100 year +CC flood level. This level provides an allowance for climate change and freeboard protection factor.

2) Flood warning in relation to Wendlebury Road

As a precautionary measure it is recommended that the owner of No 4 Barretts Road 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.

3) Evacuation/Escape route

The recommended escape route is to the east of the development along Wendlebury Road. Whilst this does involve negotiating shallow flood water depths they are classified such low risk with an element of danger for children, the eldest and infirm. It is not considered a danger to general public and emergency services and therefore this report considers that safe evacuation/escape is achievable particularly if the recommendations of item 2) are complied with.

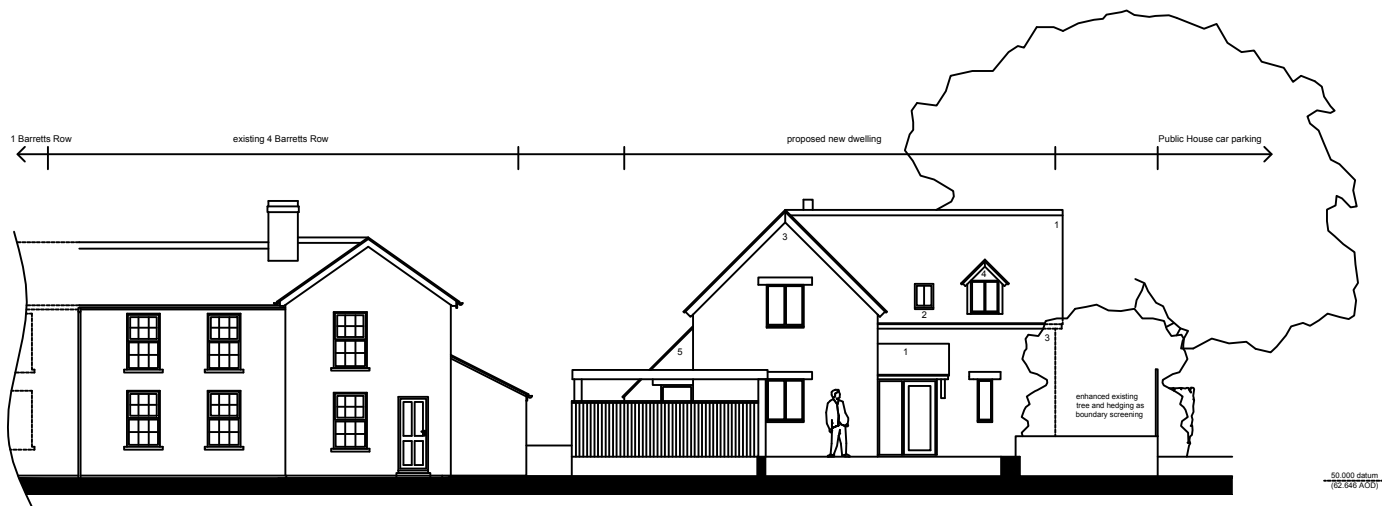
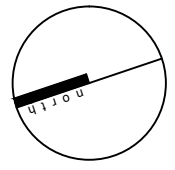


References & Bibliography

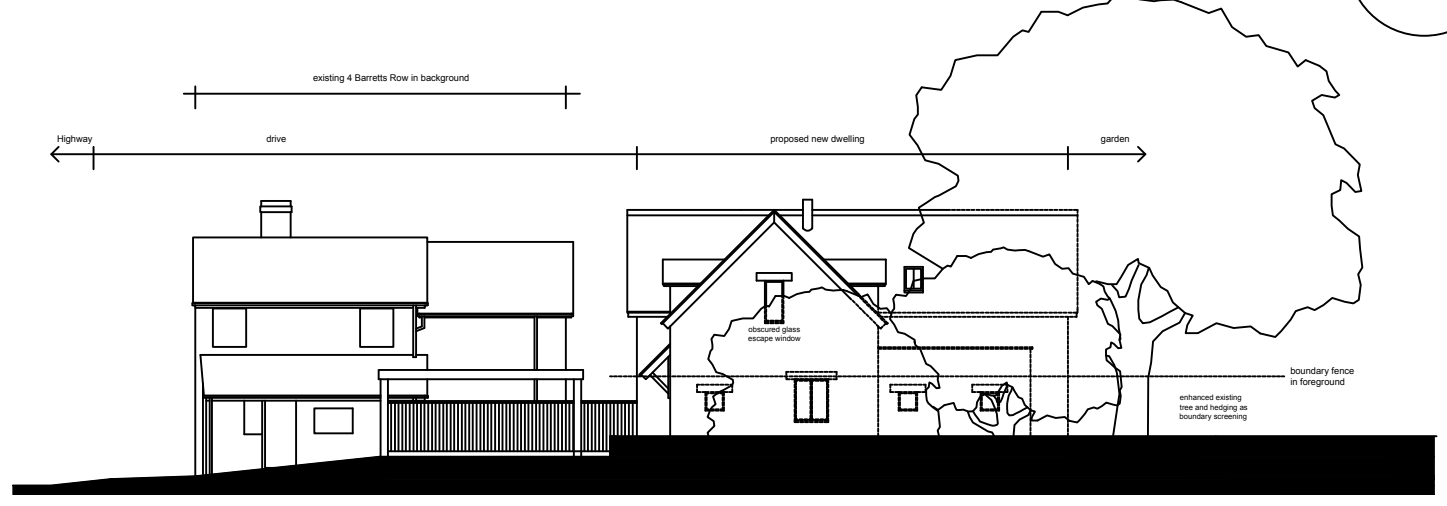
- National Planning Policy Framework (this replaces Planning Policy Statement 25: Development and Flood Risk Practice Guide).
- Code For Sustainable Homes - Department of Communities and Local Government. Revised February 2012.
- Environment Agency indicative flood maps <http://maps.environment-agency.gov.uk>
- 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

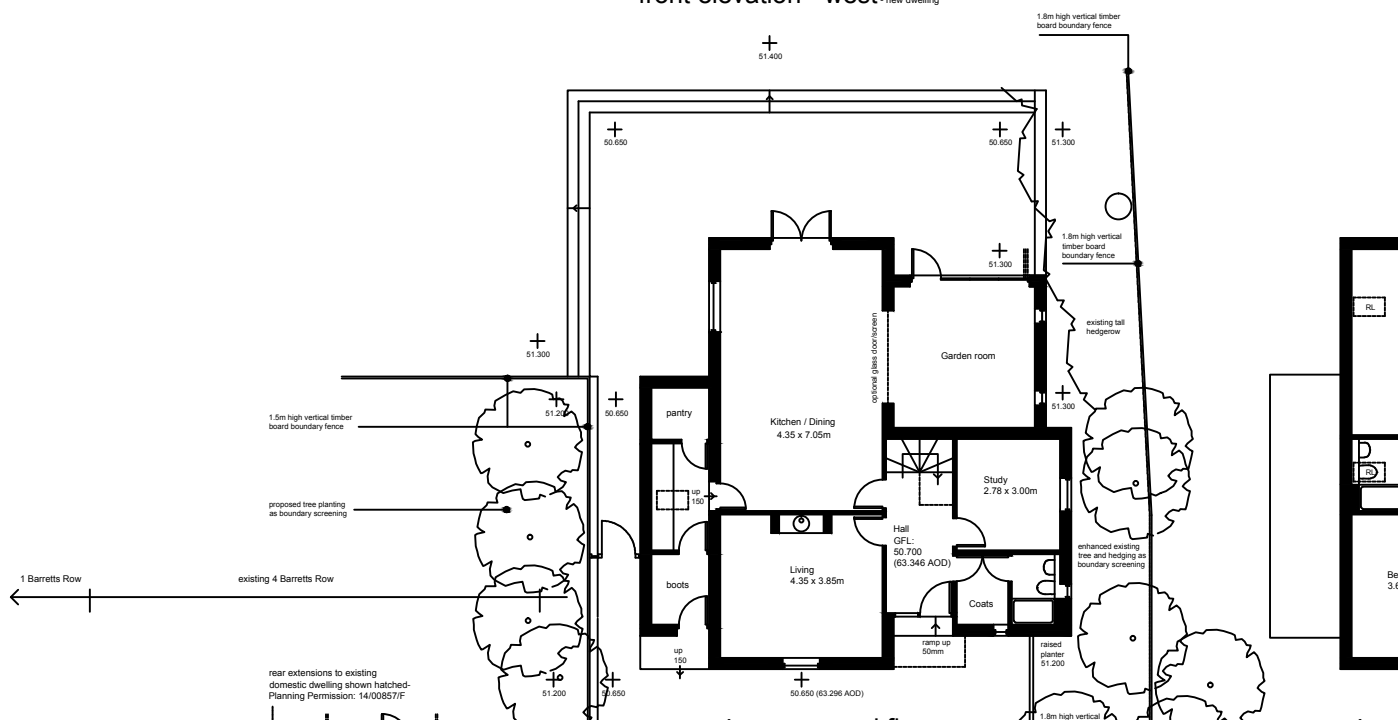


front elevation - west - new dwelling

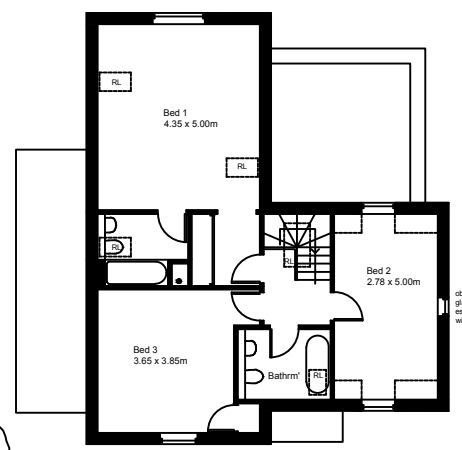


side elevation - south - new dwelling

- SCHEDULE OF EXTERNAL MATERIALS
- 1 natural slate roof
 - 2 conservation rooflights
 - 3 render
 - 4 lead sheet to dormer cheeks and gable
 - 5 natural stone coursed rubble
- windows and doors paint finished timber casements
 rainwater goods powder coated metal



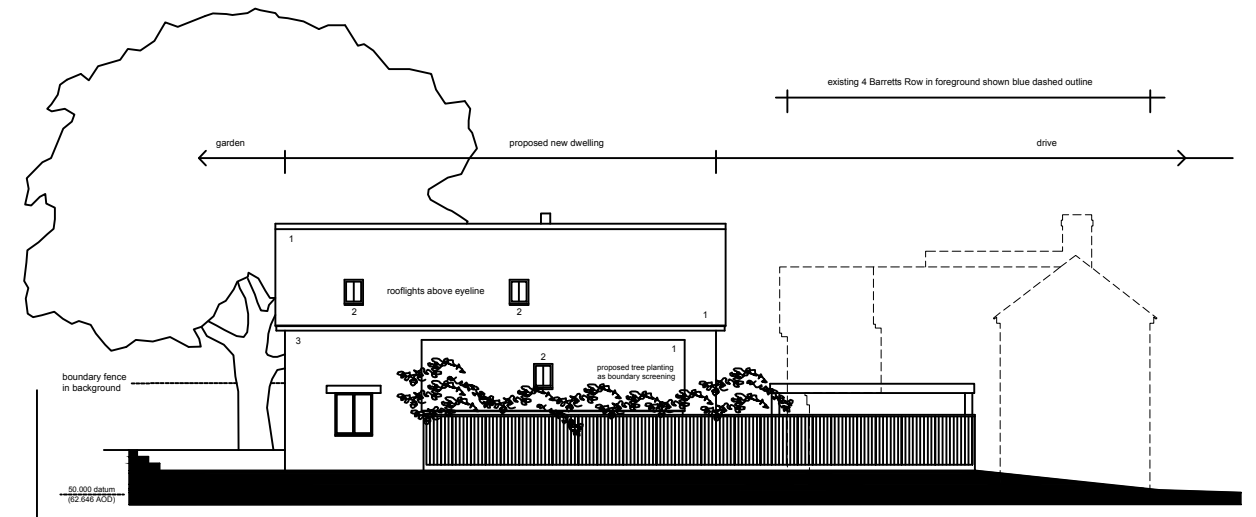
ground floor - new dwelling



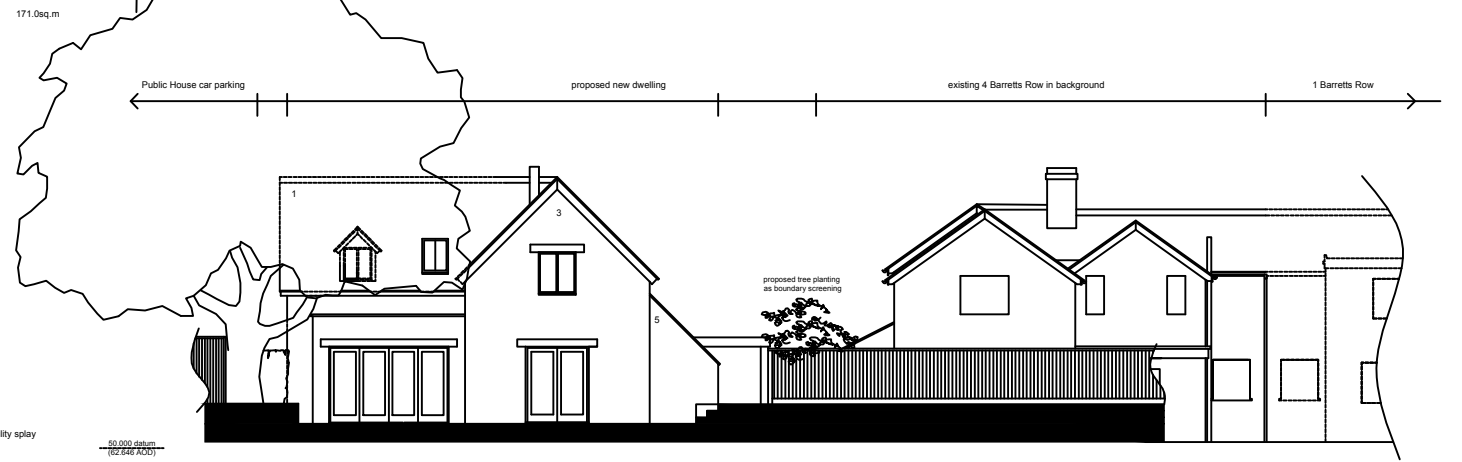
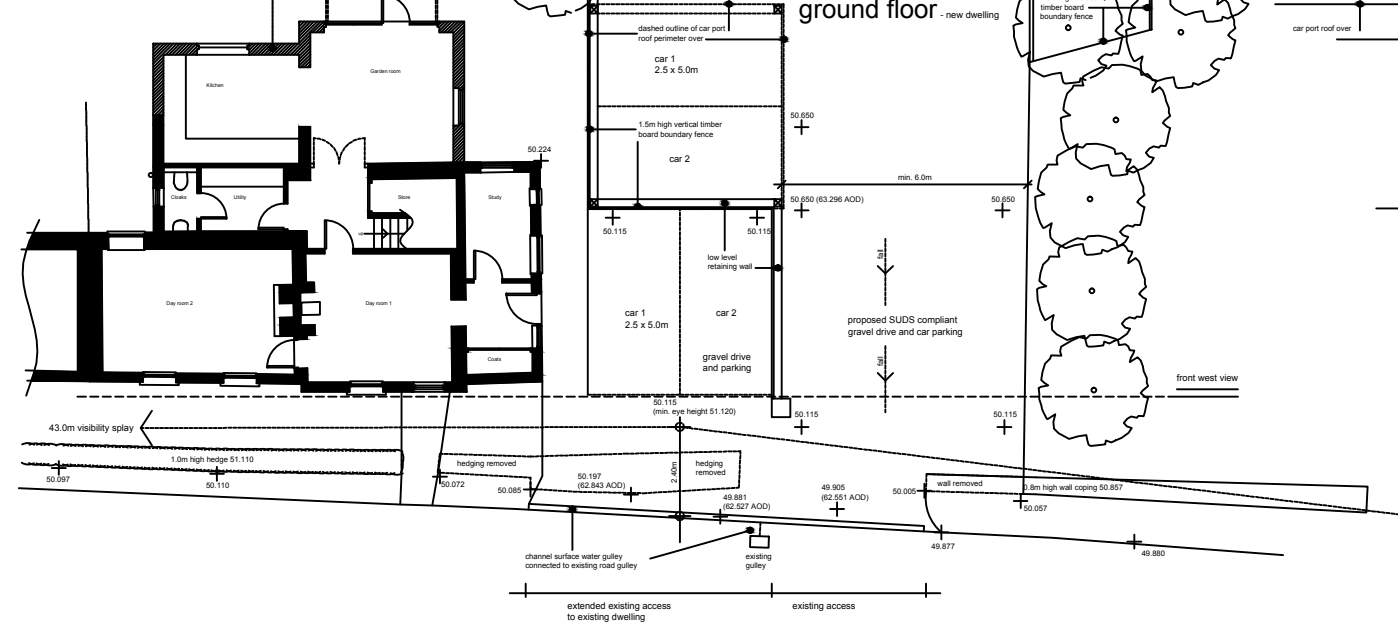
first floor - new dwelling

Gross Internal Floor Area

ground floor:	99.0sq.m
first floor:	72.0sq.m
Total	171.0sq.m



side elevation - north - new dwelling



rear elevation - east - new dwelling

A: 16.01.15: design modifications.
 revisions:



Appendix B – Site Topographic Survey & Extended topographic survey



Appendix C – Environment Agency Product 4 flood data



Product 4 (Detailed Flood Risk) for 4 Barretts Row, Wendlebury OX25 2PH
Our Ref: OX_0896_01

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

- i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
- ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
Model extents showing *defended* scenarios;
FRA site boundary (where a suitable GIS layer is supplied);
Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
Flood Map areas benefiting from defences (where available/relevant);
Flood Map flood storage areas (where available/relevant);
Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
Statutory (Sealed) Main River (where available within map extents);

A table showing:

- i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
- ii) Flood defence locations unique identifiers and attributes; (supplied separately)
- iii) Historic flood events outlines unique identifiers and attributes; and
- iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please read the enclosed guidance which sets out our requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at

<http://www.environment-agency.gov.uk/research/planning/82584.aspx>

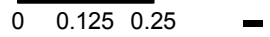
If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at

<http://www.environment-agency.gov.uk/research/planning/33580.aspx>

Flood Map centred on 4 Barretts Row, Wendlebury OX25 2PH
Created on 04/09/2014 REF: OX_0896_01



Kilometres



Legend

- Main River
- Flood defences
- Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Flood Map - flood storage areas

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.

Defence information

Defence Location: No defences on Main River

Description: This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

Model information

OX_0896_01

Model: Wendlebury Brook 2014

Description: The information provided is from the Wendlebury Brook Flood Mapping Study completed in April 2014. The study was carried out using 2D modelling software (ISIS-Tuflow).

Model design runs:

1 in 5 / 20% AEP; 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP, 1 in 100+20% / 1% AEP with climate change and 1 in 1000 / 0.1% AEP.

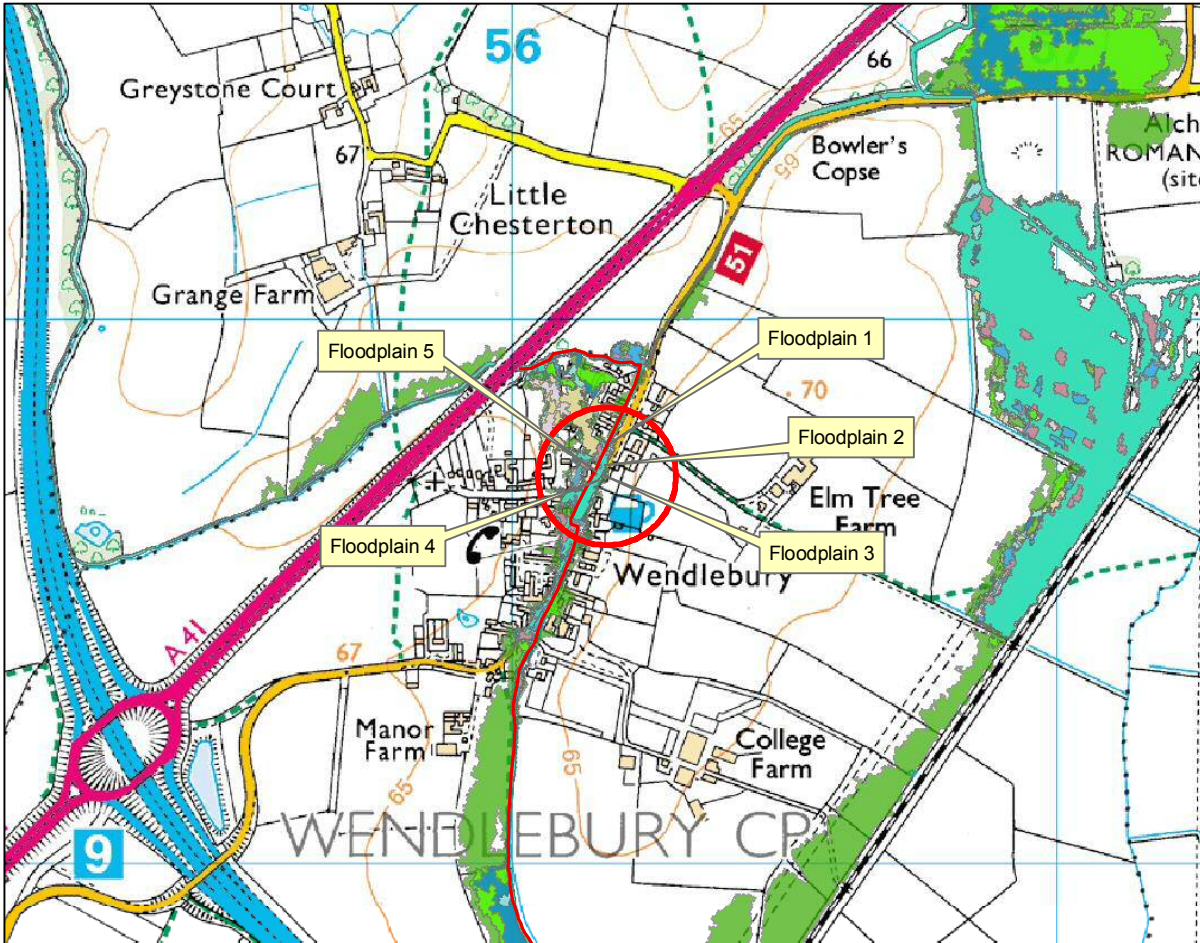
Mapped outputs:

1 in 5 / 20% AEP; 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP, 1 in 100+20% / 1% AEP with climate change and 1 in 1000 / 0.1% AEP.

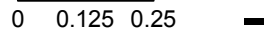
Model accuracy:

Levels \pm 250mm

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

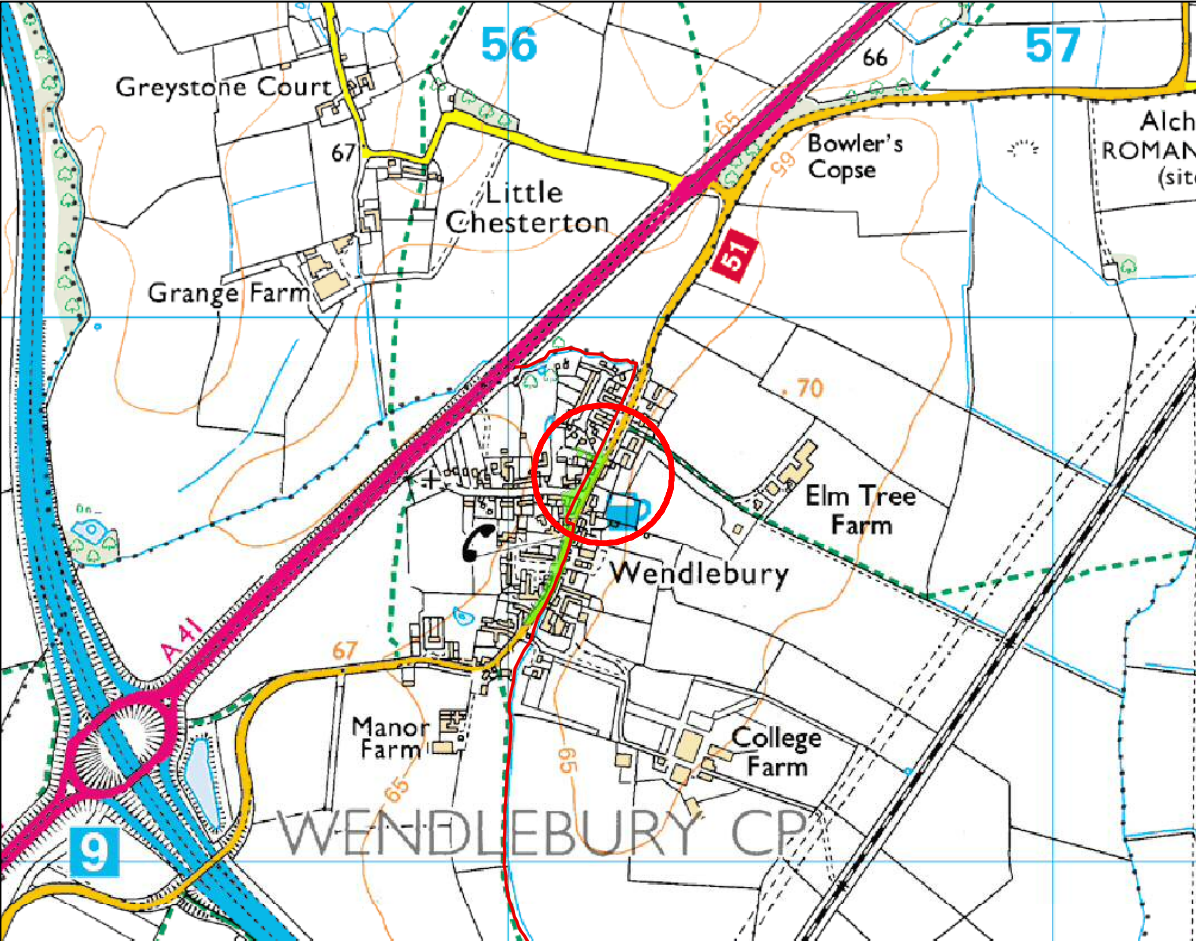
OX_0896_01

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

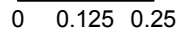
2D grid cell reference	Model	Easting	Northing	flood levels (mAOD)				
				20% AEP	5% AEP	1% AEP	1% AEP with climate change allowance (+20% on river flows)	0.1% AEP
Floodplain 1	Wendlebury Brook 2014	456,181	219,771	62.91	62.97	63.03	63.07	63.14
Floodplain 2	Wendlebury Brook 2014	456,173	219,730	62.83	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.

Historic Map centred on 4 Barretts Row, Wendlebury OX25 2PH
Created on 04/09/2014 REF: OX_0896_01



Kilometres



Legend

— Main River

year

2008

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.

Historic flood data

OX_0896_01

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA061140001	Wendlebury_Fluvial	03/06/2008	10/06/2014	main river	channel capacity exceeded (no raised defences)

Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.



Appendix D – Flood evacuation plan



SURVEY INFORMATION
 Survey Company - Midland Survey LTD
 DRG NUMBER: 22231/1
 DATE RECEIVED: 27/03/2015

ARCHITECT SITE PLAN INFORMATION
 ARCHITECT PRACTICE - *****
 DRG NUMBER: *****
 DATE RECEIVED: *****

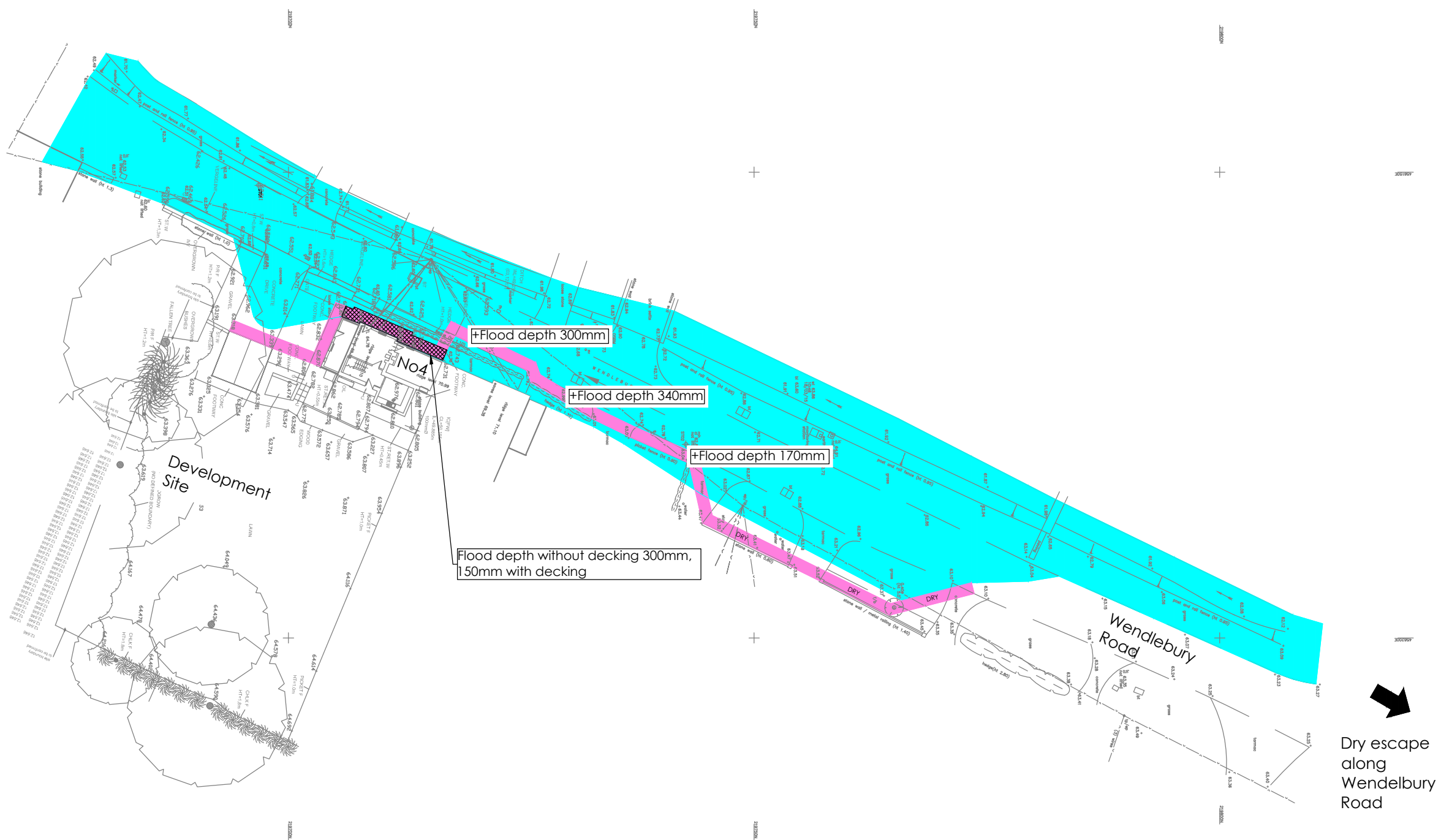
- NOTES**
- All dimensions and levels are in metres unless otherwise noted
 - This drawing is to be read in conjunction with the relevant Architects/Engineers drawings, specifications and CDM documentation
 - This drawings has been produced electronically and may have been photo reduced or enlarged when 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.

CDM Notes

Flood Key

	Extent of flood zone (83.07 1% AEP + 20%cc) Note this is only the extent within the surveyed area and does not show the full extent to the north of Wendlebury Road
	Escape route
	Raised decking 1.2 wide 150mm height
	Flood depth

P01	ATD	DJ	Initial issue	30/03/15
Rev	Drawn by	Chkd by	Comments	Date
DRAWING TITLE Flood Evacuation				
PROJECT 4 Barretts Row, Wendlebury, Oxon, OX25 2PH				
DESIGNED BY DJ	DRAFTED BY ATD	APPROVED BY RJW		
DATE 30/03/2015	STATUS PLANNING			
SCALE 1:250 @ A1	 Scale bar @ 1:250			
CLIENT Mr J Cordy		 Infrastruct CS Ltd		
JOB NUMBER 14-1555	DRAWING NUMBER 02	REVISION P01		



Flood Evacuation
 Flood escape route is to the east of proposed development to access dry section of Wendlebury Road. Part of the escape route has shallow flood levels (flood event considered 1 in 100 plus 20% climate change). These depths flood depths vary but are 340mm at their deepest. Table 4 Hazard To People classification rates a 400mm of flooding with 0.1m/s velocity to have a hazard rating of 1.24 this is classified as having an element of danger for children, the eldest and infirm. It is not considered a danger to general public and emergency services. The emergency services using the appropriate vehicles should be able to access the site should an emergency occur.



Appendix E – Extract from FD2320/TR2 (FRA guidance for new development)

This table is recommended for development planning and control use.

Table 4 - Hazard to People Classification using Hazard Rating ($HR = d \times (v + 0.5) + DF$) for (Source Table 13.1 of FD2320/TR2 - Extended version)

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03+0.5 = 0.53	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.13+0.5 = 0.63	0.15+1.0 = 1.15	0.20+1.0 = 1.20	0.25+1.0 = 1.25	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25
0.1	0.03+0.5 = 0.53	0.06+0.5 = 0.56	0.12+0.5 = 0.62	0.15+0.5 = 0.65	0.18+1.0 = 1.18	0.24+1.0 = 1.24	0.30+1.0 = 1.30	0.36+1.0 = 1.36	0.48+1.0 = 1.48	0.60+1.0 = 1.60	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.55
0.3	0.04+0.5 = 0.54	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.19+0.5 = 0.69	0.23+1.0 = 1.23	0.30+1.0 = 1.30	0.38+1.0 = 1.38	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	1.13+1.0 = 2.13	1.50+1.0 = 2.50	1.88+1.0 = 2.88
0.5	0.05+0.5 = 0.55	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.25+0.5 = 0.75	0.30+1.0 = 1.30	0.40+1.0 = 1.40	0.50+1.0 = 1.50	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.50+1.0 = 2.50	2.00+1.0 = 3.00	2.50+1.0 = 3.50
1.0	0.08+0.5 = 0.58	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.38+0.5 = 0.88	0.45+1.0 = 1.45	0.60+1.0 = 1.60	0.75+1.0 = 1.75	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	2.25+1.0 = 3.25	3.00+1.0 = 4.00	3.75+1.0 = 4.75
1.5	0.10+0.5 = 0.60	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.50+0.5 = 1.00	0.60+1.0 = 1.60	0.80+1.0 = 1.80	1.00+1.0 = 2.00	1.20+1.0 = 2.20	1.60+1.0 = 2.60	2.00+1.0 = 3.00	3.00+1.0 = 4.00	4.00+1.0 = 5.00	5.00+1.0 = 6.00
2.0	0.13+0.5 = 0.63	0.25+0.5 = 0.75	0.50+0.5 = 1.00	0.63+0.5 = 1.13	0.75+1.0 = 1.75	1.00+1.0 = 2.00	1.25+1.0 = 2.25	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.75	6.00	7.25
2.5	0.15+0.5 = 0.65	0.30+0.5 = 0.80	0.60+0.5 = 1.10	0.75+0.5 = 1.25	0.90+1.0 = 1.90	1.20+1.0 = 2.20	1.50+1.0 = 2.50	1.80+1.0 = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18+0.5 = 0.68	0.35+0.5 = 0.85	0.70+0.5 = 1.20	0.88+0.5 = 1.38	1.05+1.0 = 2.05	1.40+1.0 = 2.40	1.75+1.0 = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20+0.5 = 0.70	0.40+0.5 = 0.90	0.80+0.5 = 1.30	1.00+0.5 = 1.50	1.20+1.0 = 2.20	1.60+1.0 = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23+0.5 = 0.73	0.45+0.5 = 0.95	0.90+0.5 = 1.40	1.13+0.5 = 1.63	1.35+1.0 = 2.35	1.80+1.0 = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25+0.5 = 0.75	0.50+0.5 = 1.00	1.00+0.5 = 1.50	1.25+0.5 = 1.75	1.50+1.0 = 2.50	2.00+1.0 = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28+0.5 = 0.78	0.60+0.5 = 1.10	1.10+0.5 = 1.60	1.38+0.5 = 1.88	1.65+1.0 = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75
Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification											
Less than 0.75		Very low hazard - Caution											
0.75 to 1.25		Danger for some - includes children, the elderly and the infirm											
1.25 to 2.0		Danger for most - includes the general public											
More than 2.0		Danger for all - includes the emergency services											

Appendix F – Photos



No 4 Barretts Row, Wendlebury



View east along Wendlebury Road



View west along Wendlebury Road. Wendlebury Brook on right