APPENDIX 4 – FLOODING AND HYDROLOGY

SITES REPORT

CONTENTS

Glossary of Abbreviations

BDC – Bromsgrove District Council
C&NMPC – Catshill & North Marlbrook Parish Council
EA – the Environment Agency
FRA – Flood Risk Assessment
NhP – Neighbourhood Plan
NWWM – North Worcestershire Water Management
RDC – Redditch District Council
STW - Severn Trent Water
SFRA – Site Specific Flood Risk Assessment
SPZ – Source Protection Zone [groundwater]
SDS/SuDS – Sustainable Drainage Systems
WCS - Water Cycle Strategy

1. Introduction

The Catshill & North Marlbrook Neighbourhood Plan is essentially a community led initiative intended to guide the future use and development of land within the parish over the next 20 years. It is the first planning document compiled by Catshill and North Marlbrook parish under the Localism Act (2011) and the Neighbourhood Planning (General) Regulation (2012).

The Neighbourhood Plan is intended to complement existing local, national and strategic planning policy and seeks to provide valuable local inputs that have their origins coming from residents of Catshill & North Marlbrook.

This particular document seeks to provide an overview and information on the Flood Risk and Hydrological aspects of the Parish and surrounding area.

Note: This report takes into account the particular requirements of the Catshill & North Marlbrook Parish Council It forms part of the Neighbourhood Plan and is not intended for and should not be relied upon by any third party and no responsibility is accepted in respect to any such third party

2. The Catshill & North Marlbrook Parish – Overview.

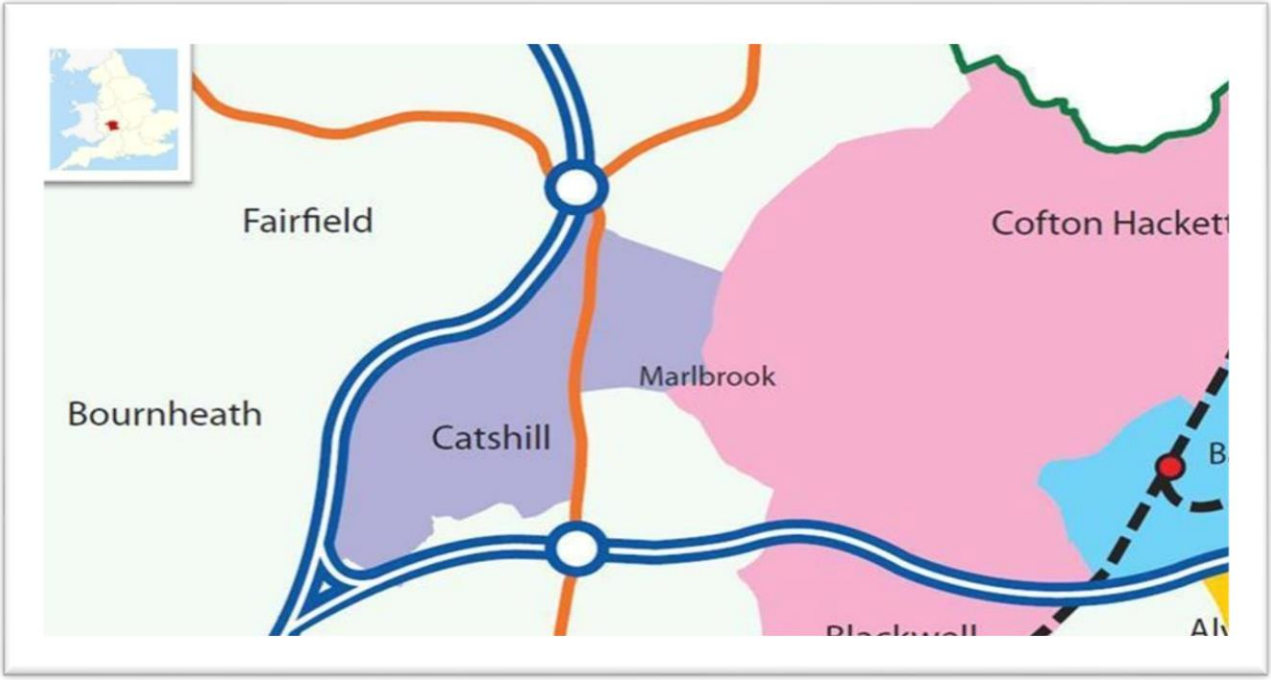


Fig 1. Catshill and North Marlbrook Parish Council Area (purple)

The earliest documented use of the name Catshill dates from the 13th century when it appears in the Assize Rolls dated 1221 and was then referred to as "Catteshulle".

Catshill is most famous for its nail making. This was a cottage industry and in 1750 the Bromsgrove area was reported to employ about 1000 nailers and Catshill was reputedly very much at the centre for this trade. The village contained many small cottages with adjoining nail making shops.

By around 1861 Bromsgrove had become the leading centre for nail making but by 1881 the industry was in decline, although it persisted in Catshill right up to the end of the Second World War when only a handful of nailers remained.

3. The Hydrology, Geology and Flood Risk of Catshill & North Marlbrook.

3.1 Water Courses.

Catshill and North Marlbrook Parish is hydrologically characterised by the two small stream/brook course that meet in Lower Catshill near to Church Road and close to the northern edge of the open space known as 'the Meadow'.

These brooks are referred to locally as the 'Battlefield Brook' and the 'Marl Brook' and both are tributaries to the River Salwarpe. The Salwarpe flows in a south-easterly direction from just upstream of Sugar Brook Lane to the District Boundary south of Bromsgrove town. Beyond this it flows through the villages of Stoke Prior, Upton Warren and Wychbold and on through the town of Droitwich to its confluence with the River Severn near Hawford.

Fig 2: Course of the Battlefield Brook and Marl Brooks in the Catshill & North Marlbrook area.

Showing Battlefield Brook and Marl Brook courses.

The Salwarpe retains the status of Main River upstream of Sugar Brook Lane as far as the M5 motorway, although its name confusingly changes repeatedly along this stretch, where it is commonly referred to as; the 'Sugar Brook', the 'Spadesbourne Brook' and the 'Battlefield Brook' travelling upstream.

The Battlefield Brook rises in the Lickey Hills and flows to the south towards Catshill where it is joined by another small brook known locally as the Marl Brook which also has its source in the Lickey Hills. The Battlefield Brook then continues in a southerly direction crossing under the M42 motorway and then under the M5, running parallel with the motorway until crossing back under the carriageway just south of Red Cross where it enters Bromsgrove town next to Whitford Farm. It then flows through Sanders Park and converges with the Spadesbourne Brook. At the point at which the watercourse becomes enmained [just downstream of the M42], it carries a flow of 3.2m³/s in a 1 in 100 year return period event (CEH dataset).

According to the most recent Environment Agency quality reports it is designated as ecologically –*moderate*, chemically – *good* and has an overall rating of – *moderate* [1]

[1] http://apps.environment-agency.gov.uk/wiyby/37833.aspx

There is a third small brook course which appears to have its origins in the area of North Marlbrook/Lydiate Ash. It is most apparent where it flows along side the eastern edge of Woodrow Lane after which it crosses Woodrow Lane near to the access to Public Footpath 528(D) to the west towards the M5. It turns south towards along a hedge line and heads towards Cobnall Road, partly in culvert. It eventually enters a surface water sewer in Wildmoor Lane near the M5 overbridge and ultimately drains to the Battlefield Brook.

3.2 Lakes, Ponds and open bodies of water

The topography of the Parish is not such that it has any significant areas of natural, open water bodies although there are a number of small to medium sized surface water balancing and ornamental ponds usually associated with more recent developments as a means of reducing surface water run-off.

Balancing/detention ponds are most notably illustrated in Photograph 6A & B in the Appendices below and are more normally dry except in times of moderate to heavy rainfall.

3.3 Geology

The Permo-Triassic sandstones of the South Staffordshire and North Worcestershire region lies within the Worcester Basin, formed during the Permian and early Triassic period. It has undergone several phases of rifting resulted in the formation of a complex system of interconnected basins. This rifting resulted in thick sequences of sandy deposits, which form the Sherwood Sandstone series [formerly the Kueper

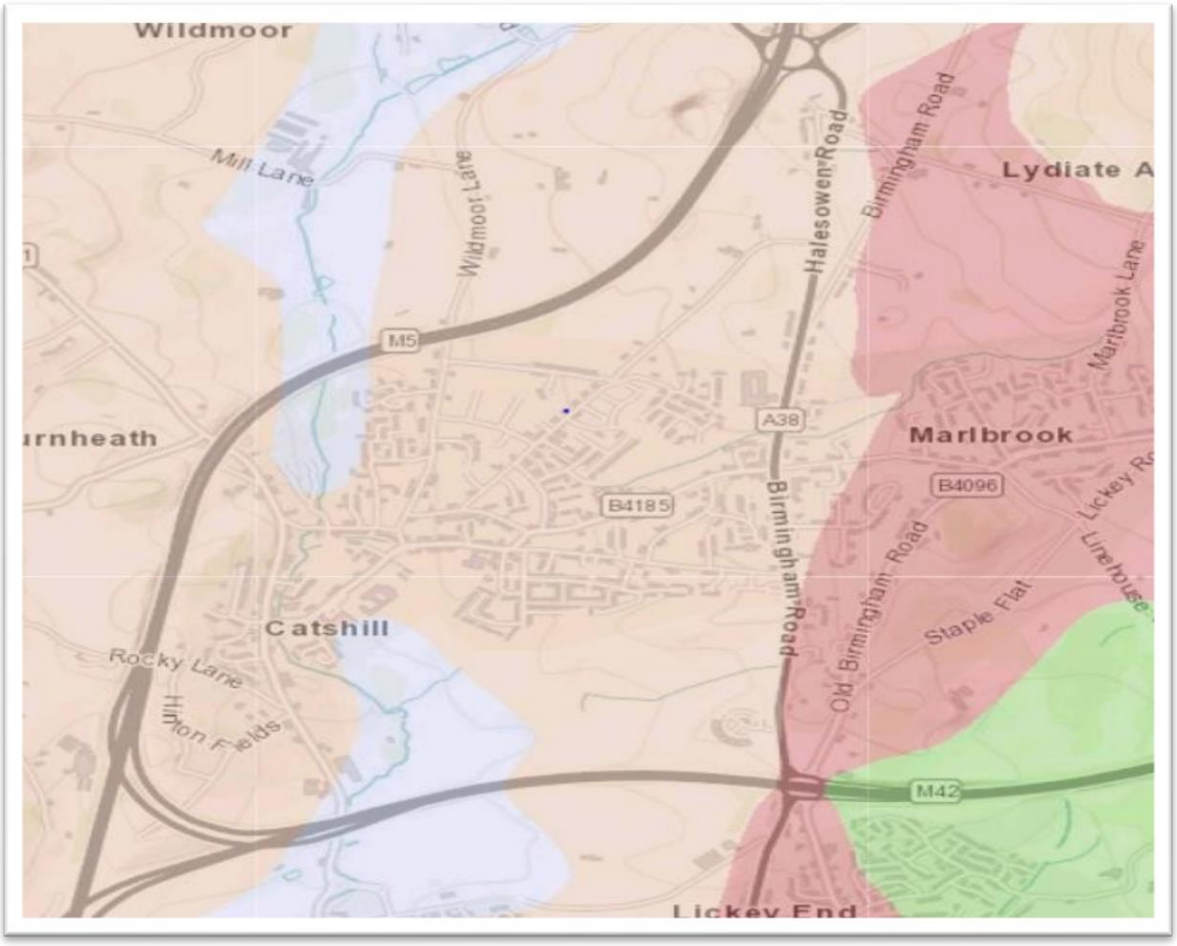
Sandstones], known locally as the Bromsgrove & Wildmoor Sandstone Formations. The thickness of these sandstones is variable and ranges from approximately 650 m at Wildmoor in the south-east to some 100 m to the west of Kidderminster.

3.4 Soils Types.

Generally Bromsgrove District is characterised by seven key soil types which overlie the Bromsgrove and Wildmoor Sandstones.

These are shown as the three localised soil types to be found in the Catshill & Marlbrook area illustrated in Fig 3 below:

Fig 3 – Underlying Geology of Catshill & North Marlbrook



Light Pink = Very acid loamy upland soils with a wet peaty surface
Dark Pink = Wet very acid sandy and loamy soils
Light Blue = Loamy and clayey floodplain soils with naturally high ground water

A large swathe of the District, between West Hagley and Clent to the northwest, lying underneath Catshill and Bromsgrove town to the southeast and east of Rubery is

generally a freely draining very acid loamy soil, except in the stream valleys which are of mixed loam and clay.

3.5 Ground water

Groundwater levels across the region are variable and groundwater flooding has not been seen to be a particular cause for concern [1] as the underlying aquifer tends to drain naturally when water levels within it become too high. If anything the area has suffered from unsustainable and over abstraction which has resulted in a depletion of groundwater levels and much reduced base-flows to the Battlefield and Spadesbourne Brooks.

Flow augmentation borehole abstraction points have been installed in various locations to improve the summer base flows in certain rivers and streams. The Environment Agency is also seeking to reduce abstraction to much more sustainable levels particularly in the Battlefield Brook, Blakedown Brook and Bow Brook catchments.

The Environment Agency has also stated that due to the high levels of abstraction from this aquifer for water supply, the groundwater levels have "never recently reached the ground surface". Hence there are no known reports of groundwater flooding within the Parish

[1] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap

4. Flooding and Flood Risk

4.1 Historic Flooding

Catshill and Marlbrook are known to suffer from flooding usually associated with run-off from short-duration, high-intensity storms. This has occurred along much of the length of the Battlefield Brook upstream in Catshill and along the Marl Brook. Flooding was especially notable in the period 1998-1999 when the catchment experienced a series of heavy storms. This situation was repeated in July 2007 and then again in 2012.

Bromsgrove Council had attributed much of these high runoff problems associated with the motorways and recent development in the catchment and had noted that "it was in the Catshill area that warranted urgent attention to control localised flooding" in their 2009 Strategic Flood Risk Assessment [2]. However as a response to the 2012 Green Lane flooding event BDC/BDHT constructed a large detention pond in Upper Catshill [Lingfield Walk] in order to provide greater flood protection to the downstream resident on the Marl Brook.

There are no recorded flood defences located along the Battlefield brook and it is categorised as an 'Ordinary Water Course' upstream of the point where it crosses under the M5 at the Kidderminster Road Bridge. Battlefield Brook is said to have been hydraulically [computer] modelled along its length extending as far as just downstream of the M5 undercrossing north of Catshill.

[2]-[http://www.bromsgrove.gov.uk/council/policy-and-strategy/planning-policies/local-development-plan/evidence-base/sfra-water-cycle-strategy.aspx]

4.2 Possible causes of flooding

Potential causes of flooding are generally given to be one or more of the following:

i. Overflow of watercourses and existing flood defences including water retention
ii. Breaching or overflow from facilities such as flood storage reservoirs/washlands and storm water balancing ponds;
iii. Breaching of flood defences (including flood storage areas);
iv. Mechanical, structural or operational failure (including due to blockages) of hydraulic structures, water mains, sewers, pumps etc.
v. Localised surface water flooding (including surface water sewer flooding, highway drainage flooding and overland flooding);
vi. Manmade waterways such as reservoirs and canals;
vii. Functional Floodplains or Washlands; and,
viii. Groundwater flooding.

There are no canals, waterways or impounded lakes or reservoirs [with the exception of the Marlbrook Quarry Tip reservoir which caused flooding when a culvert collapsed but this is understood to have now been addressed].

The most likely cause of flood risks in the area are considered to be associated with fluvial and pluvial flash flooding in the Battlefield and Marl Brooks sub-catchments and overland flows from open areas

4.3 Surface water flooding - recent historic reporting:

There have been a number of reported flooding incidents in Catshill and Marlbrook and many more of these have gone unreported and undocumented. However the ones that have been reported are recorded as:

TABLE 1 - CATSHILL & NORTH MARLBROOK HISTORIC FLOODING REPORTS

Location	Flooding	Cause	Notes
Upper Catshill	Mayfield Close	Battlefield Brook	and localised surface water flooding from motorway run off
Upper Catshill	Cheltenham Avenue	Surface flooding	repeatedly
Catshill	Golden Cross Lane	Battlefield Brook	Repeatedly – over highways
Upper Catshill	Green Lane	Marlbrook over flow from culvert and channel to houses and highways	Under capacity culverted section and blocked trash-screen
Upper Catshill	Cobnall Lane	M5 drainage	Overland from stream from Lydiate Ash
Lower Catshill	Marsh Way	Marlbrook flooding onto highway at Wildmoor/Church Road. Overland flow to Marsh Way	Overland flow and highway drainage due to blocked/under capacity culvert.
Lower Catshill	Church Road	Battlefield Brook flooding cottages and houses.	Active Flood Plain
Marlbrook	Cottage Lane	Marlbrook – Over bank flows.	Repeatedly
Marlbrook	Marlbrook Lane,	Restricted Brook culvert	Repeatedly from run off
Lower Catshill	Washingstocks,	Run off from Hinton Fields	Repeatedly
Lower Catshill	Church Road to Golden Cross Lane	Marlbrook	Series of culverts and screens through rear gardens causes numerous problems to property

The greatest risk of flooding within Bromsgrove District and Redditch Borough is reportedly due predominately to "*rapid rainfall runoff resulting in high flows on poorly maintained ordinary watercourses which are constrained by development and have subsequently overtop*". BDC/RDC Strategic Flood Risk Assessment 2009. [3]

[3] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap

4.4 Flood Risk Mapping

The Indicative Flood Risk mapping provided by the Environment Agency [4] shows the following indicative flood zones for the area under review:

The principle causes of surface water flooding in the area are seen to be along the Battlefield Brook and the Marl Brook and these are generally within the reasonably well-defined flood plains shown.

Fig 4. Environment Agency Indicative Flood Map - Fluvial

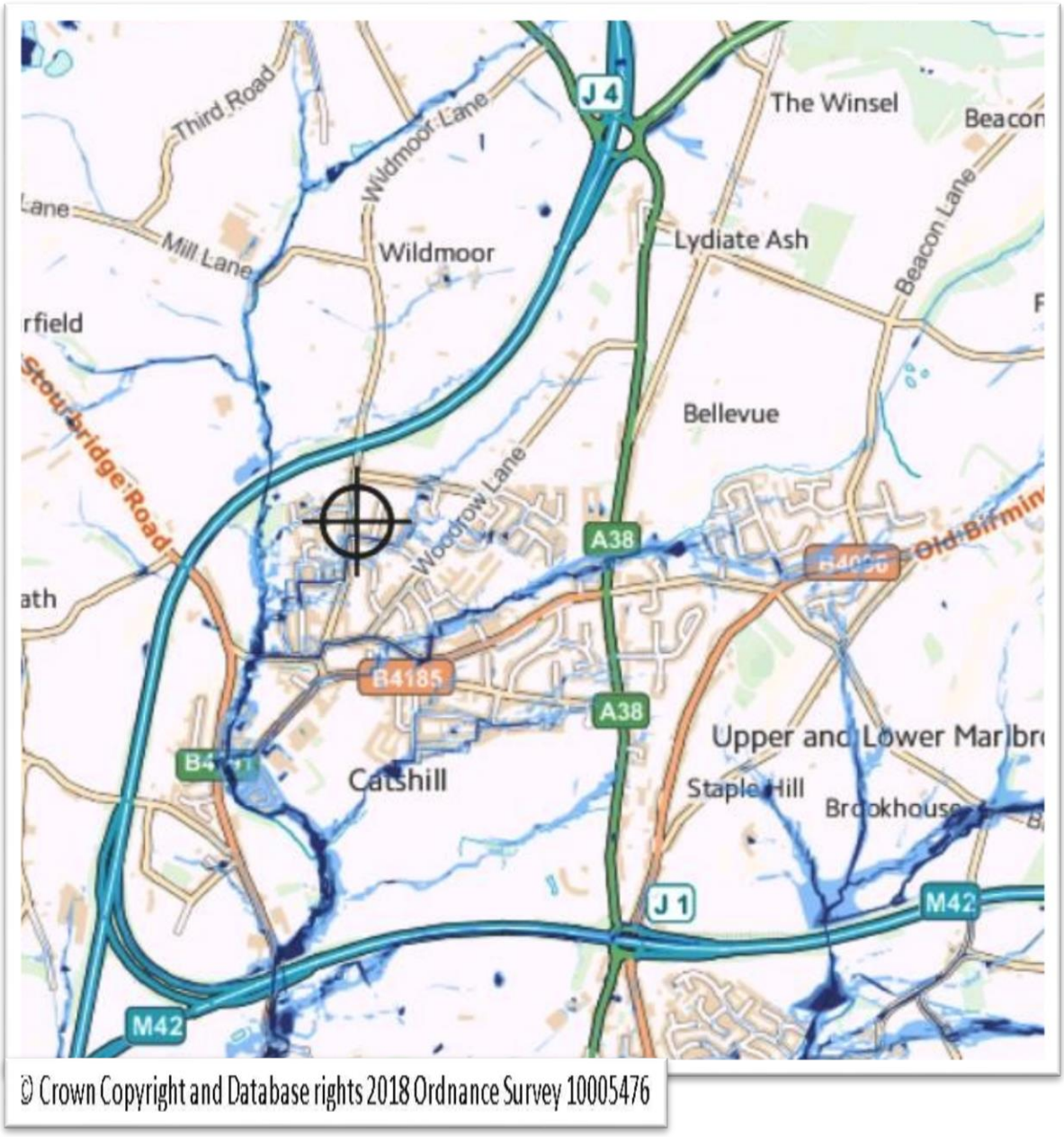
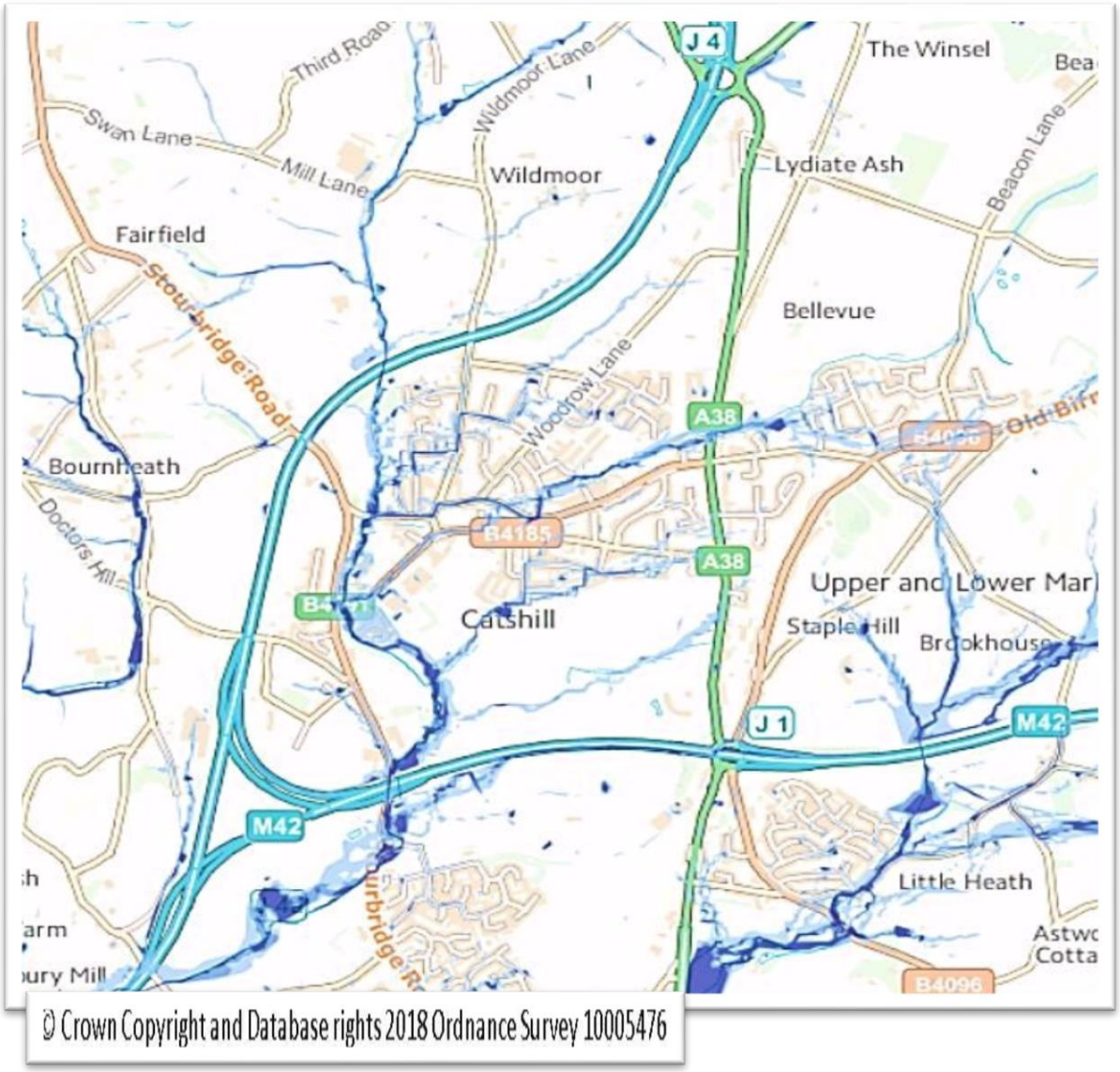


Fig 5. Environment Agency Indicative Flood Map – Surface Water



[4] http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap

However there have been a number of other flooding events that are attributable to over-land surface water flow routes. These are generally areas within the topography that lend themselves to conveying surface water run-off during heavy and/or persistent rainfall over the catchment. These are likely to have been formed by ancient, historic and natural land drainage channels or by the re-contouring of the land surface during more recent development. These Surface Water over-land flow routes are indicated in Fig 5 above and are again seen to be predominately related to the Battlefield and Marlbrook courses and are indicated to present a medium to high risk.

4.5 The Existing Drainage System

The original Bromsgrove town sewers were constructed in 1887 as a combined drainage system and this was subsequently extended in the mid 1930s to take in the growing satellite areas of Sidemoor, Catshill, Marlbrook and Aston Fields. It is these extended systems that are known to suffer from high stormwater inflow and infiltration and as a result off-line balancing systems were constructed at Washingstocks, Catshill and the Strand in Bromsgrove [town centre] in order to contain these flows.

More recently separate sewer systems have been required for all new developments and surface water controlled 'at source' by soakaways or attenuation systems and this has assisted in reducing to some extent sewer flooding in the District.

It is therefore a requirement that any new development takes this into account and minimises the volume of runoff produced through the implementation of appropriate Sustainable Drainage Systems [SDS][5] and by preserving viable, existing over-land flow routes, especially where such developments are to be located on Greenfield sites.

[5] https://www.gov.uk/government/publications/a-review-of-the-application-and-effectiveness-of-planning-policy-for-sustainable-drainage-systems

4.6 Sustainable Drainage Systems

Sustainable drainage systems have been shown to be cost effective and easy-to-manage solutions that can replace or mitigate flows in existing sewerage systems that are close to or at their full capacity. They are designed to naturally manage runoff flowrates, reduce the impact of urbanisation and the risk of flooding, provide water treatment and protect water resources from point and diffuse pollution. Additionally they can also potentially create new habitats for wildlife and enhance leisure activities.

Adoption of sustainable stormwater management methods delivers multiple benefits in comparison to conventional drainage systems.

These are:

- Protect water & air quality
- Reduce stormwater treatment costs (capital infrastructure, maintenance and operating costs)
- Promote aquifer recharge
- Reduce peak flow and pipe capacity increases in cost
- Reduce stormwater runoff/pollution/ flooding and erosion risk
- Reduce degradation of rivers, lakes, ponds and ditches.
- Reduce landscaping maintenance costs
- Enhance natural environment, community aesthetics and recreational opportunities
- Attract wildlife
- Promote a safer/healthier community and encourage social interaction.

Different types of aboveground and underground SDS exist and their application is decided according to particular flow attenuation and water conveyance needs, land available and prevailing economic and geological parameters.

The permeability of the subsoil beneath a development site influences the range of applicable techniques with the more permeable soils lending themselves to the application of infiltration based systems. The application of an SDS approach to a site with a soil of low permeability will probably necessitate the use of attenuated flows to a suitable watercourse or drain with a 'positive' discharge connection.

Throughout most of Bromsgrove District, the underlying geology is composed of silts, sands and clays some of which tend to have lower permeability and may therefore render infiltration techniques problematic other than for certain and very localised conditions.

This factor, coupled with restrictions on the capacity of local watercourses and the location of a proposed development may lead to many new development requiring the adoption of SDS. Most of these will probably require run-off to be attenuated/stored prior to controlled disposal to a suitable positive discharge point. Such an approach would also enable developments to consider using Sustainable Demand Management techniques to look at rainwater harvesting, recycling and similar options.

Both North Worcestershire Water Management [NWWM] and BDC have adopted the Sustainable Drainage Design & Evaluation Guide www.SuDSguide.uk which provides guidance to developers on preparing their plans by incorporating Sustainable Drainage Systems. It is intended that this guide will facilitate consultation in order to achieve the best possible SDS designs for such new development proposals. Here particular reference is made to the Bromsgrove District Plan 2011-2030 under BDP 23.1 a, c, d, e, f & g respectively.

Where appropriate the Planning Authority should ensure that green corridors along the lines of watercourses are allocated/protected when considering new developments and also that the paving of gardens or other areas should be carefully controlled in order to mitigate run-off at source.

In the case of 'Greenfield' site development this will require estimation of 'Greenfield runoff' rates and also give full consideration to improving existing culverted water courses by either opening them up, or if this is not practicable, then these should be improved in capacity wherever appropriate.

4.7 Severn Trent Drainage System.

According to Severn Tent many of the 1 - 24 sites identified have been flagged as potentially medium sewerage infrastructure risk due to known flooding downstream of these sites. For many of these potential sites there is no current surface water sewer and therefore developers would be expected to utilise SDS practices as much as possible and drain to the nearest watercourse or drain if available.

STW expect surface water to be managed in line with the Government's Water Strategy, Future Water. This strategy sets out a vision for more effective management of surface water to deal with the dual pressures of climate change and housing development. For new developments STW would not expect surface water to be conveyed to their foul or combined sewage system and, where practicable, they support the removal of surface water already connected to foul or combined sewer.

They believe that greater emphasis needs to be paid to consequences of extreme rainfall where in the more recent past, even outside of the flood plains; some properties have inappropriately been built in natural drainage paths.

They will require that developers provide sewers on new developments that can safely accommodate floods which exceed the design capacity of the sewers.

4.8 Groundwater Source Protected Zones

As both the Battlefield and Marl Brook watercourses currently fail to meet, at least one parameter of the required River Water Quality targets, then such Sustainable Drainage Systems could/should also play an important role in reducing pollutants entering these watercourses. These will need to be correctly designed and integrated within the sub-catchment of such development schemes.

Ground Water Protected Zones are defined by the Environment Agency who maintain details of Source Protection Zones (SPZs) [6] for groundwater sources such as wells, boreholes and springs used for public drinking water supply

Fig 6. Environment Agency Groundwater Source Protected Zones

[6] http://apps.environment-agency.gov.uk/wiyby/37833.aspx

The zones shown in Fig 6 illustrate the potential risk of contamination of the underlying aquifer from any activities that might cause pollution in the area.

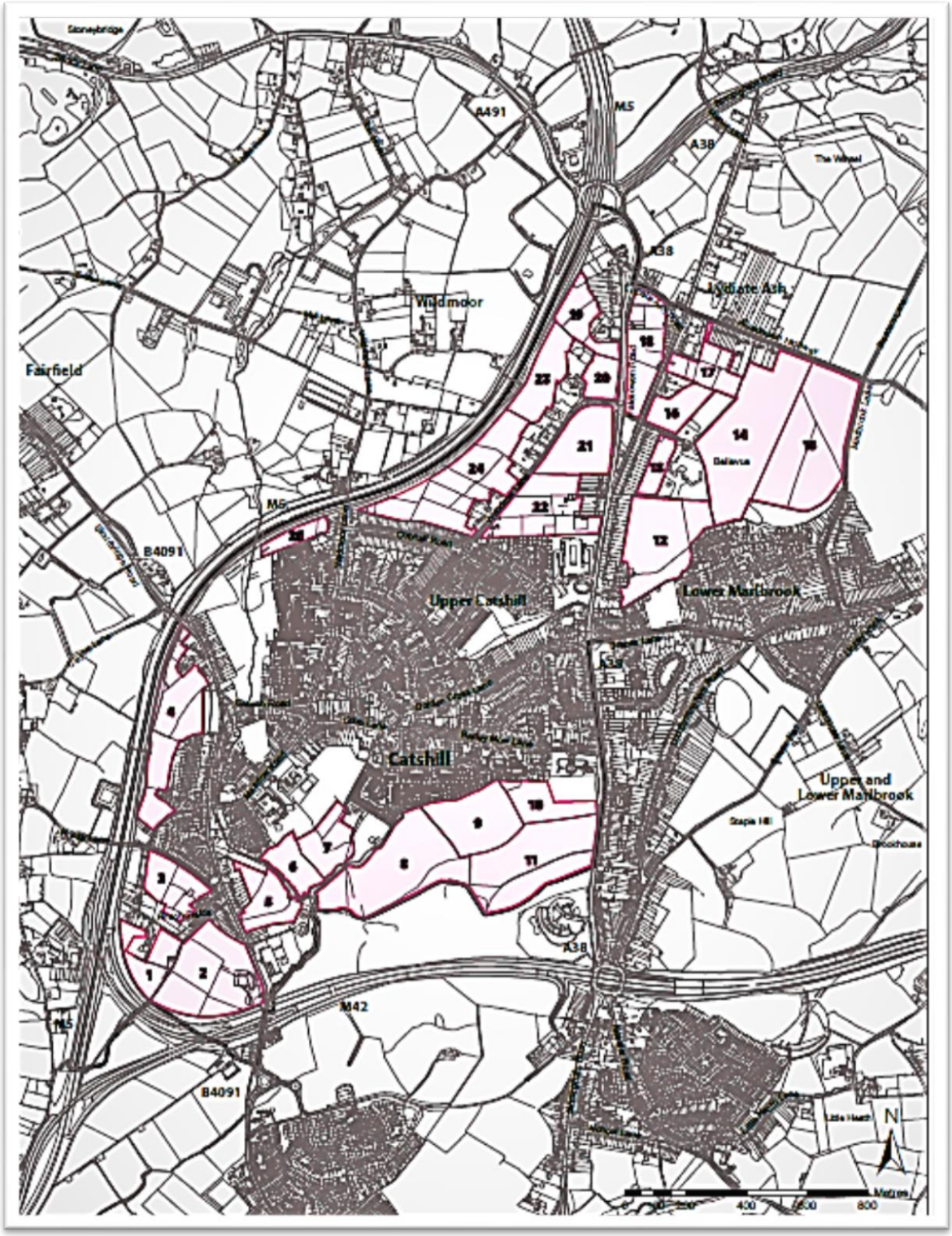
This is based on the principle that the closer the activity, the greater the risk. Such activities will include, amongst many other potential sources, impacts from

development and will therefore influence the Surface Water Management strategy adopted for such developments. This has particular relevance to the use of SUDS techniques involving infiltration methods.

The above map identifies the three main zones [inner, outer and total catchment], which the EA applies to a particular groundwater source protection requirement.

It can be seen that Lower Catshill in particular is affected by both Inner [pink] and Outer [green] zoning constraints. This will impose certain restrictions on surface water drainage arrangements in any new developments.

5. Potential Site Locations Plan.



6. Overall Area General Flood Risk Assessment Summary

Table 2 below provides a basic summary of the more common Flooding Risks likely to be encountered in the Catshill & North Marlbrook Area and therefore any future development will need to undertake the necessary Site Specific Flood Risk Assessment, on a case by case basis, to inform the Planning Authorities.

TABLE 2: CATSHILL & NORTH MARLBROOK PARISH COUNCIL. GENERALAREA RISKS

Type of Flooding	Highway	Garden/Open spaces	Homes	Source	COMMENTS
i)	**H**	**H**	**M**	Battlefield & Marlbrook	Indicative Flood Plains
ii)	**L**	**L**	**L**	**-**	-
iii)	**L**	**L**	**L**	**-**	-
iv)	**M**	**M**	**M**	Battlefield & Marl Brook	Low capacity in trash screens and culverts
v)	**M**	**M**	**M**	Highway Drainage & Overland Flow	Historic flooding reports refer.
vi)	**L**	**L**	**L**	-	Not applicable
vii)	**H**	**H**	**M**	Battlefield & Marl Brook	Historic flooding reports refer.
viii)	**L**	**L**	**L**	-	None recorded/reported

FLOOD RISK MECHANISIMS.

i) Overflow of watercourses

ii) Breaching or overflow from facilities such as flood storage reservoirs/washlands and storm water balancing ponds;

iii) Breaching of flood defences (including flood storage areas);

iv) Mechanical, structural or operational failure (including due to blockages) of hydraulic structures, water mains, sewers, pumps etc.

v) Localised surface water flooding (including surface water sewer flooding, highway drainage flooding and overland flooding);

vi) Manmade waterways such as reservoirs and canals

vii Functional Floodplains or Washlands;

viii) Groundwater flooding.

Flood Risk Aspects

Using the individual EA Indicative Flood Maps [7] shown in this section for each of the potential sites assessed a risk matrix has been included as Table No 3.

[7] [http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodma]

**TABLE 3: - CATSHILL & NORTH MARLBROOK PARISH COUNCIL
INITIAL SCOPING SUMMARY SITE SPECIFIC FLOOD & HYDROLOGICAL RISKS**

Site Ref	Flooding Aspects			Site Characteristic	Mechanism	Overall Risk Ranking
	Fluvial	Sewer	Surface			
1	L/M	L	M	The topography is high to the west adjacent to the M5 and falls to the south east towards Stourbridge Road. Small enclosed fields on higher ground generally used for grazing by small holdings. Medium sized fields with field hedgerows to the slopes. Small wooded area on the high ground, embankment planting adjacent to motorway, hedgerows, ornamental garden plants, mature field trees.	No overland flow routes identified and M5 motorway is in elevated viaduct to the south.	L
2	L/M	L	M	The topography is high to the west adjacent to the M5 and falls to the south east towards Stourbridge Road. Small enclosed fields on higher ground generally used for grazing by small holdings. Medium sized fields with field hedgerows to the slopes. Small wooded area on the high ground, embankment planting adjacent to motorway, hedgerows, ornamental garden plants, mature field trees.	Some evidence of surface water overland flows and highway flooding parallel with Stourbridge Road. Southern corner some flood risk from Battlefield Brook	L/M
3	L	L	L/M	Small sized fields with undulating topography. Bounded each side by roads and houses/gardens to the south east (Hinton Fields Lane)	Defined overland flow route towards gardens on Hinton Fields. Know localised flooding to Stourbridge Road	L/M
4	L	L	L/M	Small sized fields with undulating topography. Bounded to the west by the M5 and its associated embankment planting. Treed hedgerows within the character area.	Some very localised overland flow evident to rear of Plough & Harrow/Catshill Garage in low spot.	L/M
5	L	L	L	Small undulating field for pasture, Battlefield Brook. The land slopes west towards the brook. Groundwater Source Protected Zones 1 & 2.	Bordering the flood plain of the Battlefield Brook. No known flood risks as higher then flood plain. Groundwater Sensitive Zone	M Medium due to Groundwater Protected Zoning

6	**L**	**L**	**M/H**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree. Battlefield Brook forming the boundary to smaller fields to the west	Bordering the flood plain of the Battlefield Brook. Known flood risks to western part and overland flow route. Groundwater Sensitive Zone	**M/H** Also Groundwater Protected Zoning
7	**L**	**L**	**L/M**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree. Battlefield Brook forming the boundary to smaller fields to the west	overland flow route and Groundwater Sensitive Zone	**M** Medium due to Groundwater Protected Zoning
8	**L**	**L**	**L/M**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree. Battlefield Brook forming the boundary to smaller fields to the west	Bordering the flood plain of the Battlefield Brook. Known flood risks to western part and overland flow route. Groundwater Sensitive Zone	**M** Medium due to Groundwater Protected Zoning
9	**L**	**L**	**L**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree.	No records/reports of flood risk.	**L**
10	**L**	**L**	**L**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree.	No records/reports of flood risk.	**L**
11	**L**	**L**	**L**	Very open with few landscape features. Gently undulating, medium to large sized fields. The border to the north is bound by mature hedgerow with the occasional tree.	Evidence of overland flow route to the southern boundary.	**L**
12	**L**	**L**	**L**	Medium scale fields enclosed by med/high hedgerows containing occasional mature trees. Ground slopes down from north to south. Lanes to north and east lined with mature trees. Marlbrook Stream close to southern boundary.	Above flood plain associated with Marlbrook flood plain and overland flow route from east.	**L**
13	**L**	**L**	**L**	Small fields with hedgerows and domestic house and gardens.	No records/reports of flood risk.	**L**
14	**L**	**L**	**L/M**	Large scale fields enclosed by med/high hedgerows containing	Southern boundary with	**L/M**

				occasional mature trees. Ground slopes down from north to south with undulations. Lanes to north and east lined with mature trees. Stream along southern boundary	Cottage Lane has some records of surface water flooding from Marlbrook	
15	**L**	**L**	**L**	Large scale fields enclosed by med/high hedgerows containing occasional mature trees. Ground slopes down from north to south with undulations. Lanes to north and east lined with mature trees. Stream along southern boundary	Southern boundary with Cottage Lane has some records of surface water flooding from Marlbrook. Site lies outside of flood plain.	**L**
16	**L**	**L**	**L**	Small field sizes bounded by medium hedgerows with frequent mature trees, grass verges, mature street trees. Stream/drain to the north.	No records/reports of flood risk.	**L**
17	**L**	**L**	**L**	Small field sizes bounded by medium hedgerows with frequent mature trees, grass verges, mature street trees. Stream/drain to the north	No records/reports of flood risk.	**L**
18	**L**	**L**	**L**	Small field sizes bounded by medium hedgerows with frequent mature trees, grass verges, Stream/field drain to the north	Low risk of overland surface water/highway run off from field drainage	**L**
19	**L**	**L**	**L**	Small scale fields enclosed by med/high hedgerows. Gentle ground undulation. Mature trees in hedgerows, small copses with some high quality mature trees as part of copse. Discrete area of land. Field drains.	No records/reports of flood risk.	**L**
20	**L**	**L**	**L**	Medium sized fields enclosed by medium and high hedgerows. Ground gently undulates with high spots in the north western most field and south eastern corner of the LLCA. Mature trees in hedgerows and a small copse. Field drains.	No records/reports of flood risk.	**L**
21	**I**	**L**	**L**	Medium sized fields enclosed by medium/high hedgerows. Ground gently undulates with high spots in the northeast corner and slopes to the south.	Low risk of overland flow flooding closer to Woodrow Lane from field/road drainage.	**L**
22	**L**	**L**	**L**	Small scale fields with medium high hedgerows and occasional hedgerow trees. Topography slopes down from east to west	No records of flooding/overland flow routes.	**L**
23	**L**	**L**	**L**	Small fields enclosed by medium height hedgerows. Small	Some potential for overland	**L**

				undulations, southerly sloping. Occasional hedgerows with well defined hedgerows, linear buffer planting to M5 boundary. Field drains.	flow route with culverted stream running north-south.	
24	**L**	**L**	**L/M**	Small fields enclosed by medium height hedgerows. Small undulations, southerly sloping. Occasional hedgerows with well defined hedgerows, linear buffer planting to M5 boundary. Field drains.	Some potential for overland flow route with culverted stream running north-south to the rear of houses in Cobnall Lane. Location of historic flooding.	**L/M**
25	**L**	**L**	**L/M**	Small fields enclosed predominantly by medium height hedgerows. Small fields are quite flat. Occasional hedgerow trees and linear buffer planting to M5.	Some reports of flooding to gardens of houses in Mayfield Close. Associated with motorway run-off	**L/M**

The above table summarises the key features of the indicative flood outlines, if any, at each site location due to fluvial and pluvial flooding mechanisms and it provides an overall Risk Ranking [sensitivity] for each individual site.

Definitions:

i) ***Fluvial flooding*** *is riverine flooding which occurs when excessive rain falls over a catchment causes a river to exceed its channel capacity.*

ii) ***Pluvial flooding*** *results from overland flow before the runoff enter a watercourse or sewer.*

iii) ***Sewer flooding*** *results when high flows exceed the hydraulic carrying capacity of the system and flow over the ground surface.*

7. Appendices.

Photographs and Illustrations

Photo 1A Green Lane (Walk) - June 2018

Photo 1B Green Lane (Walk) - July 2012

Photo 2A Church Road June 2018

Photo 2B Church Road July 2012

Photo 3A Marsh Way June 2018

Photo 3B Marsh Way July 2012

Photo 4A Green Lane -June 2018

Photo 4B Green Lane -July 2012

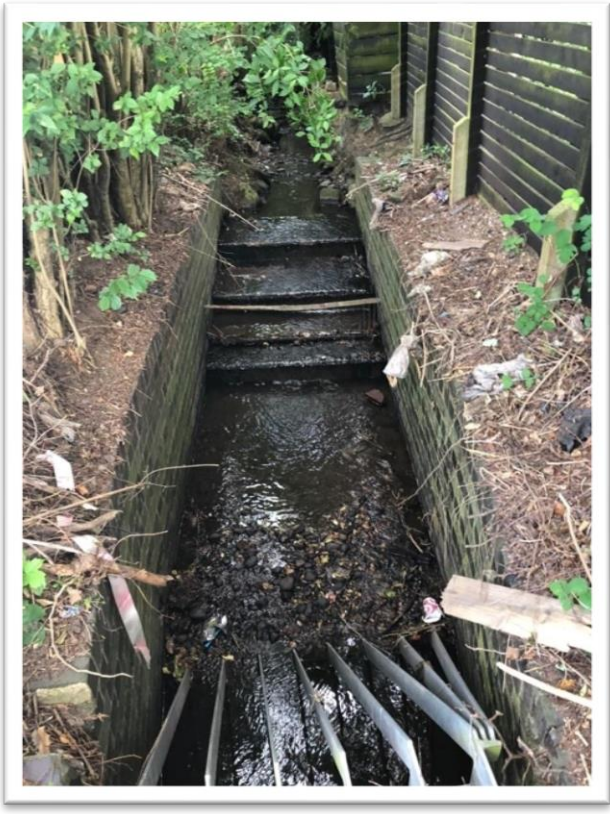


Photo 5A Marlbrook Golden Cross/Wildmoor Lane

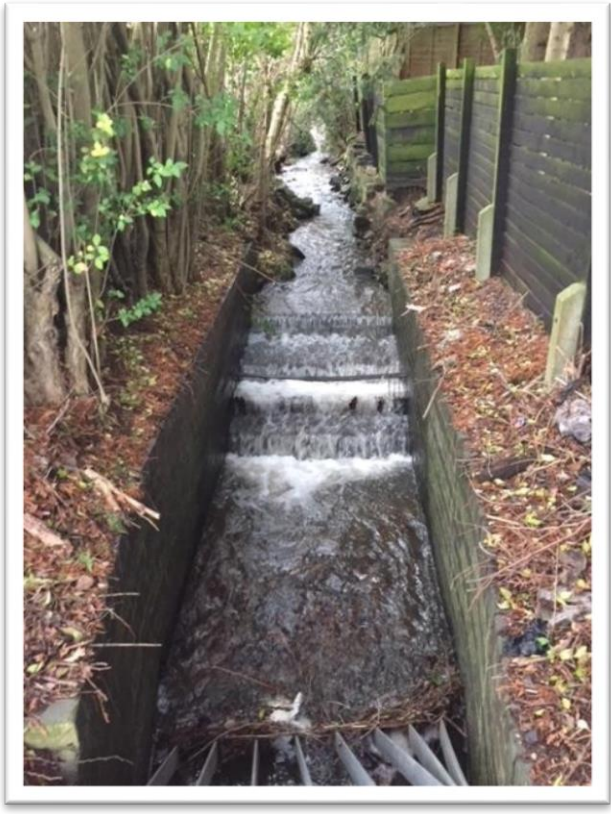


Photo 5 B Marlbrook Golden Cross/Wildmoor Lane

Photo 6A Lingfield Walk Detention Pond

Photo 6B Lingfield Walk Detention Pond

Note: This report takes into account the particular requirements of the Catshill & North Marlbrook Parish Council and is complied from publically available data for the purposes of the Neighbourhood Plan only.
It is not intended for and should not be relied upon by any third party and no responsibility is accepted in respect to any such third party.