

# Flood Investigation

Section 19 Flood and Water Management Act 2010

## Green Street, Chorleywood Hertfordshire



Chorleywood Residents Association website:

<http://www.chorleywoodresidents.co.uk/news/transport/thesagaoffloodingongreenstreetcontinues>



**Prepared by:**

Sophie Williamson  
Senior Flood Risk and Sustainable Drainage Systems Officer  
Flood Management Team  
Environment and Resource Planning

Hertfordshire County Council  
County Hall  
Pegs Lane  
Hertford  
SG13 8DN

Date: 30 June 2014  
Reference: ERP-INV-01  
Revision: 03

**Revision Schedule**

<b>Rev</b>	<b>Date</b>	<b>Details</b>	<b>Author</b>	<b>Checked</b>	<b>Approved</b>
01	03/06/2014	Draft Report	Sophie Williamson, Senior Flood Risk Officer	Andy Hardstaff, Flood Risk Management Team Leader	Andy Hardstaff, Flood Risk Management Team Leader
02	20/06/2014	Draft Report	Sophie Williamson, Senior Flood Risk Officer	Andy Hardstaff, Flood Risk Management Team Leader	Andy Hardstaff, Flood Risk Management Team Leader
03	30/06/2014	Final Report	Sophie Williamson, Senior Flood Risk Officer	John Rumble Head of Environmental Resource Planning	John Rumble Head of Environmental Resource Planning



## **1. Introduction**

This Section 19 Flood Investigation Report has been produced by the Flood Management Team at Hertfordshire County Council. It is accompanied by, and should be read in conjunction with, a detailed Technical Assessment Report carried out by McCloys Consulting on behalf of Hertfordshire County Council, to investigate the ongoing flooding of Green Street, Chorleywood.

The opinions, conclusions and recommendations in this Report are based on assumptions made by McCloy Consulting and Hertfordshire County Council when preparing this report, including, but not limited to those key assumptions noted in the Report, including reliance on information provided by others.

## **2. Context**

Under section 19 of the Flood and Water Management Act (FWMA) 2010 Hertfordshire County Council (HCC) as Lead Local Flood Authority (LLFA), on becoming aware of a flood in its area, must, to the extent that it considers it necessary or appropriate:

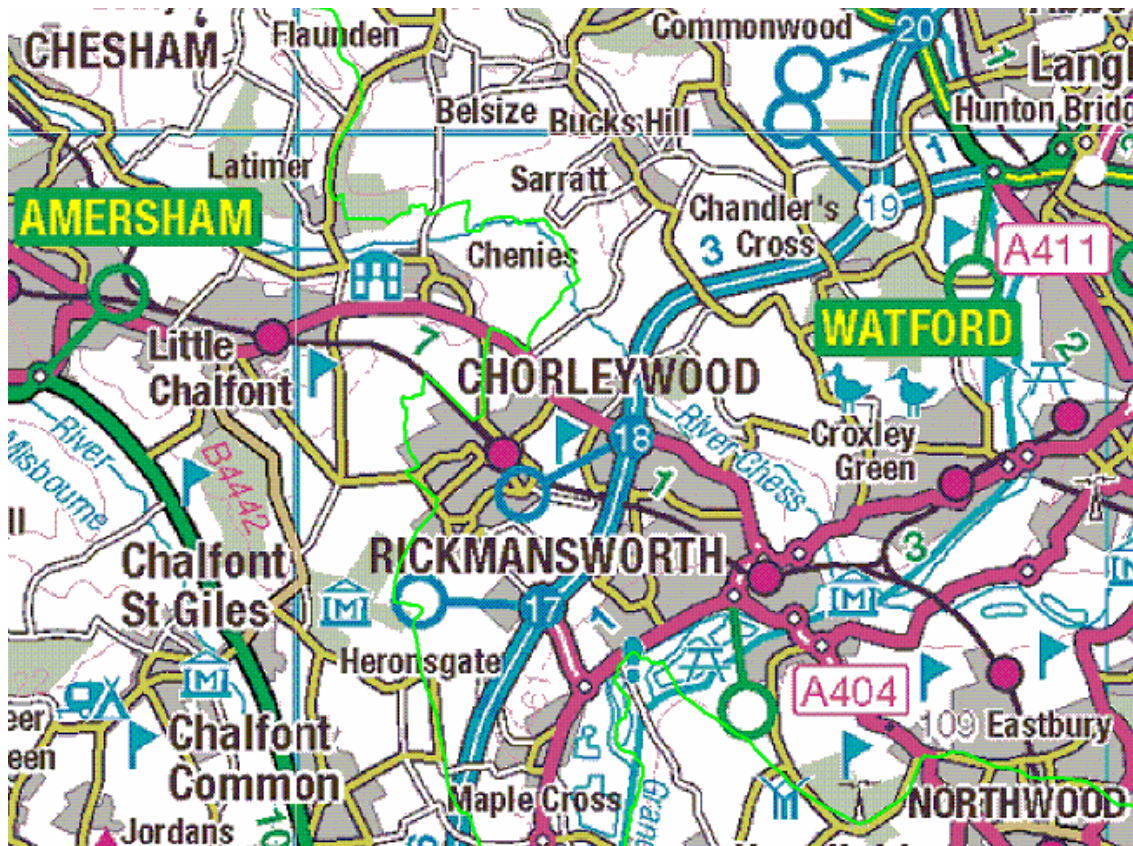
- investigate the incident;
- identify the Risk Management Authorities (RMAs) with relevant flood risk management functions;
- establish if the relevant functions have been exercised or if it is proposed to exercise them;
- publish its findings in a Flood Investigation Report; and
- inform the relevant RMAs of its findings.

Green Street, Chorleywood has flooded significantly on several occasions during the winter periods of 2012 /13 and 2013 /14. There is also a history of flooding outside of these periods documented from 2002.

There are no properties directly affected by the flooding, however the road has been closed for extended periods. This meets the current criteria for HCC as LLFA to conduct a detailed formal investigation using powers under section 19 of the FWMA 2010. The criteria are as outlined in Section 2 (Procedure 2) of the Local Flood Risk Management Strategy for Hertfordshire.

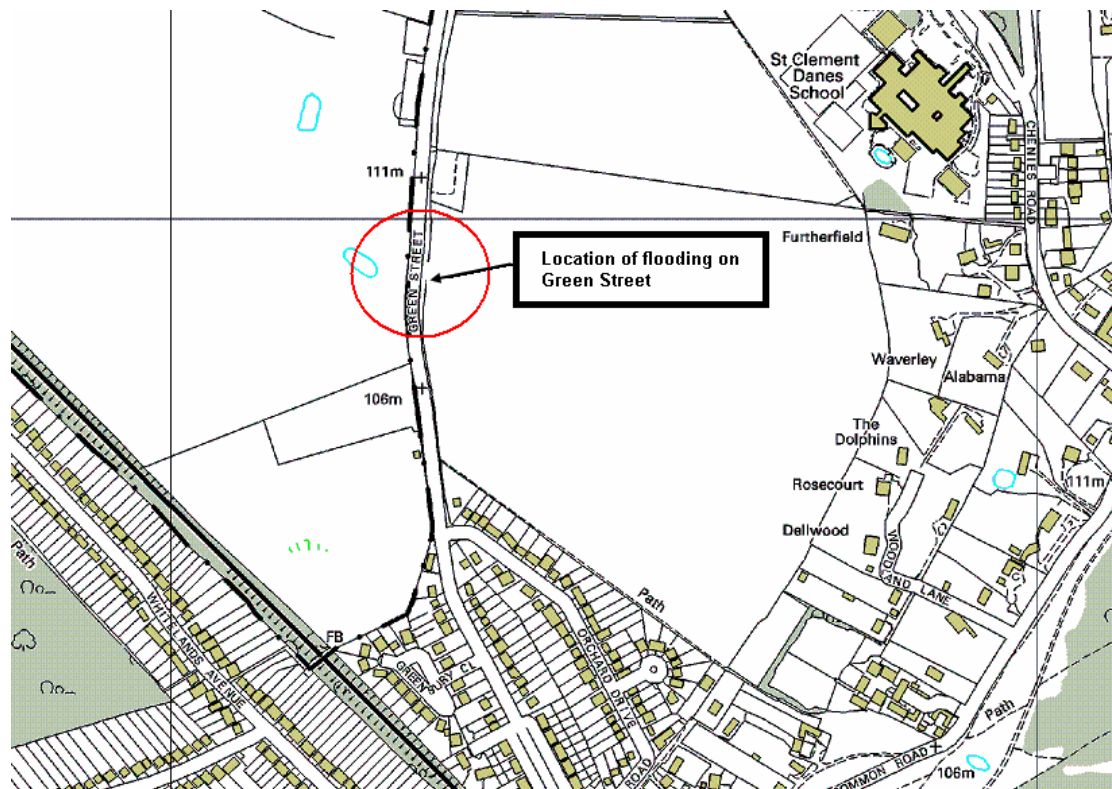
### 3. Site Location

Map 1: Location map for Chorleywood, Hertfordshire



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Map 2: Flooding location map for Green Street, Chorleywood



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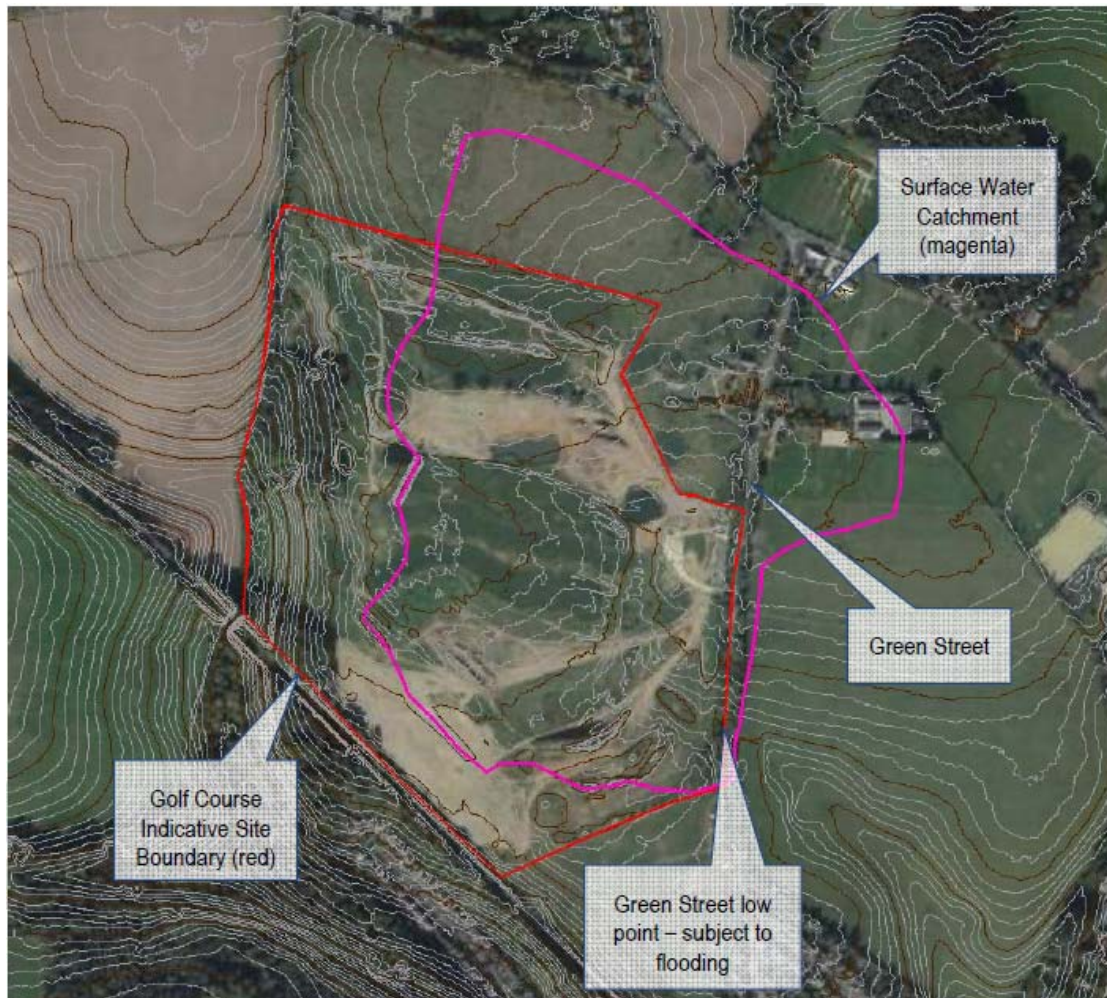
#### 4. Site and Flood Incident Observations

Overland surface water flows onto Green Street, Chorleywood led to frequent and prolonged flooding of the highway in 2013 and 2014. There have also been other highway related flood events reported between 2002 and 2012. This has sometimes necessitated the closure of Green Street by HCC Highways and the Emergency Services due to the risk of vehicles being driven into the flooded area and becoming immobilised. The extent of the surface water catchment for Green Street can be seen in Map 3.

The flood water can be of a depth that makes it difficult for occupants to evacuate vehicles due to the pressure of water acting against the opening of the doors. The flooding has also had an impact on the operation of the local bus service, operated by Carousel Buses, which cannot be diverted elsewhere and therefore cannot maintain the service when the road has needed to be closed.

When the road is flooded, St Clements Danes School pupils who use this as a pedestrian route to the school from Chorleywood have been walking through the adjoining fields or have taken risks by walking through the flood water. The flooding also causes a major inconvenience to the local residents of Chorleywood as this is one of two main access routes into the village.

Map 3: Green Street surface water catchment map

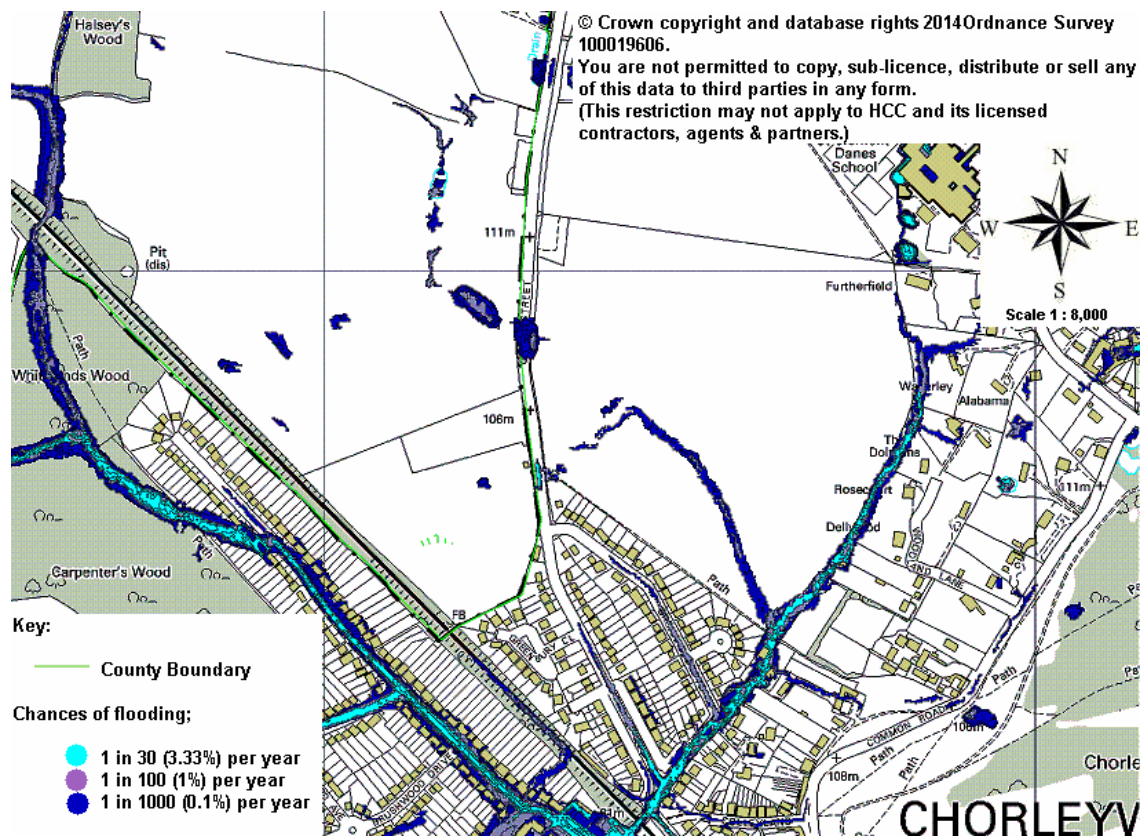


This flood investigation has found that there is a primary overland flow route which flows from the north-west to the south-east (see map 4). The primary overland route starts with runoff from the rural catchments north, north-east and north-west of a golf course and includes a new housing development on Stubbs Farm to the north-east

Following heavy and prolonged rainfall events, surface water overtops and flows from the built surface water drainage ponds (built as part of a golf course development) and down the highway itself, collecting within a well defined natural dip in the road. Due to an earth embankment on the eastern side of Green Street, the water stays within the highway and is unable to flow into the adjoining field to the east.

On the other side of the embankment, to the east, there is a well defined valley, where water has been observed (by residents) to flow when the level of the flooding rises above the embankment. This then spills over into the eastern field. There are residential properties at the bottom of the valley. No reports of flooding beyond the boundary of this field, which flows to the south eastern corner, have been received.

Map 4: Environment Agency Surface water flood map for Green Street, Chorleywood



Along both sides of Green Street, there are several gullies as well as a ditch either side of the road to collect surface water from the highway. The west side gullies drain through a pipe underneath the road into a deep bore soakaway, which the east side gullies also flow into.

Information on drainage assets within the highway are based on site inspections as no formal records are held by HCC Highways for this location. Since the production of the technical assessment report it has been confirmed there are no known surface water or foul water sewers within the area.

To the west side of Green Street there is land upon which a golf course is being developed, this is owned by Quattro Ltd. Within this development there are several ponds, installed as part of the approved planning application, to manage surface water and to be used as irrigation for the golf course. This site has a long planning history and the previous landowners of the site are understood to have imported inert waste onto the site. Quattro Ltd also owns the land to the east of Green Street; this is currently used for grazing livestock. It is understood that the previous landowners (also the same previous landowners to the west of Green Street) built the earth embankment on the eastern boundary of Green Street. The embankment is not on highway land and does not impact upon the highways gullies or ditches.



Verbal confirmation from both the current landowner, Quattro Ltd, and a local resident has stated that around 2002 there used to be a gap which was dug through the embankment by the previous landowner to allow water from the highway into the field. However, in 2009 this gap was filled in, by the current landowner, to stop the flooding of their land in order to keep livestock. This may explain the lack of recorded flood events between 2002 and 2009.

Regional scale rainfall, soil and land classification maps show this area to be permeable with high infiltration rates. However following site observations, including the digging and testing of 3 trial pits, clay was found to be present below the topsoil on both the golf course site and the field to the east. Whilst the trial pits do not represent the whole catchment area, it provides an indication that the larger scale maps may be inaccurate or inconsistent.

## 5. Possible causes of flooding on Green Street

Possible cause	Summary
Geology	Clay was found to be present immediately below the topsoil. Clay has poor permeability and would prevent rainfall from infiltrating at a quick enough rate to prevent overland surface water flows developing.
Current land use to the west of Green Street	The drainage on the golf course was designed to allow water to drain through the surface into the underlying geology, however infiltration is poor due to the presence of clay. Clay was also found to the east of Green Street where there has been no development. The ponds therefore cannot infiltrate quick enough, causing them to overflow until the lower pond overtops onto Green Street.
Previous land use	Compaction of soil during construction and importation of inert waste onto the golf course may have increased the impermeability of the ground. The earth embankment to the east prevents overland flow from flowing off the highway when it reaches above kerb/verge height, obstructing its path along the natural valley and overland flow path.
Topography	The defined valley to the west of Green Street creates a route for the overland flow. Observed overland flow routes and the EA surface water maps confirm this.
Highway drainage infrastructure	The highway drainage is built to cater for water from the highway. Additional flow from third party land overwhelms the highway drainage and leaves behind soil and silt which can then cause blockages. The soakaway is a deep bore soakaway to allow the water to

Possible cause	Summary
	reach the permeable layer of chalk below. The embankment to the east of Green Street prevents water from flowing off the highway.
Rainfall / hydrology	Persistent heavy rainfall over a period of 5 days with existing saturated soils provides the necessary hydrological conditions for a flood to occur on Green Street. In the winter 2013/14 was the wettest on record for the UK. This may explain the frequency of flood events recorded during this period

## 6. Roles, rights and responsibilities

### 6.1 Hertfordshire County Council - Lead Local Flood Authority

HCC as the LLFA for its area has fulfilled its legal responsibility to carry out a Flood Investigation under Section 19 of the FWMA 2010, to;

- 1) Identify the relevant RMAs and;
- 2) Establish if those authorities intend to utilise their own powers and to what extent.

In order to achieve the responsibilities under section 19, HCC as LLFA must first establish the cause and impacts of the flooding and identify where possible, potential solutions, these are discussed in this report and the supporting Technical Report carried out by McCloy Consulting.

The LLFA has powers to carry out flood risk management works for flooding from surface water runoff and ground water in accordance with the Local Flood Risk Management Strategy for Hertfordshire.

HCC as the relevant LLFA intends to continue to work with the landowner and other relevant authorities to develop the identified options further in order to find if feasible solution/s to the flooding on Green Street can be realised. A solution to remove the flooding completely may not be feasible particularly where rainfall conditions occur like those in the winter of 2013/14.

### 6.2 Buckinghamshire County Council - Lead Local Flood Authority

HCC as LLFA led on the section 19 investigation at the time of commissioning. This was because resources were not available at the time for Buckinghamshire County Council (BCC) in its role as LLFA to undertake a joint investigation. It was also agreed with BCC LLFA that as the receptor of the flooding lies within the county of Hertfordshire it would be appropriate for Hertfordshire to take the lead.

BCC as LLFA for its area also has powers to undertake flood risk management works for flooding due to surface runoff and ground water within their area in accordance their Local Flood Risk Management Strategy.

The land to the west of Green Street lies within the boundary of Buckinghamshire where the main catchment of the surface water flooding on Green Street is located, therefore falling under the jurisdiction of Buckinghamshire County Council as LLFA for its area. HCC may in the future require support from BCC LLFA where an option to manage the flooding is identified within their boundary.

### **6.3 Chiltern District Council**

Chiltern District Council is the relevant local planning authority for any development on the land to the west of Green Street. It is the responsible regulatory authority for compliance checking the built development and its drainage in accordance with the planning approval and planning conditions.

Any future proposed works would need to be discussed between the relevant landowner and Chiltern District Council as they may require planning permission or variation to the existing planning permission and other permits.

### **6.4 Landowners**

It is the responsibility of the landowner to manage the surface water run-off within and from their land.

### **6.5 Three Rivers District Council**

Three Rivers District Council is the relevant responsible authority for planning matters within its boundary.

The landowner may require planning permission or other permits from Three Rivers District Council for any works to the earth embankment to the east of Green Street.

### **6.6 Hertfordshire County Council Highways**

Hertfordshire county council highways have the responsibility for ensuring that the highway is appropriately drained.

Following the flooding in 2012/13, HCC Highways used their powers under the Highways Act 1980 to require the landowner of the golf course to remove a formal discharge pipe from the lower pond on the golf course which directly drained into the adjacent highway ditch. HCC Highways have also enlarged the existing highway ditches either side of Green Street within the highway boundary.

## 7. Conclusions and Recommendations

HCC as the LLFA have investigated the flooding at Green Street to establish the relevant RMAs that have Flood Risk Management Functions in accordance with the FWMA 2010. (Those RMAs and their relevant powers and functions are set out in section 6 of this investigation report.)

The flooding of Green Street is caused by surface water (pluvial flooding) primarily caused by rainfall in the catchment forming overland flows which pond at the low point in the catchment at Green Street. A number of external factors contribute to the frequency of flooding at this location, these include:

- Periods of prolonged and exceptional wet weather
- The re-instatement of the embankment to the east of Green Street
- That there is no current means of final discharge of flows from existing attenuation storage other than from the low point of the site

It is not possible to identify any one of these possible causes as the sole reason for the flooding on Green Street. Each possible cause contributes to the flooding.

With regards to the flooding in the winter of 2013/14, where the road was flooded on a frequent basis, it can be assumed that this was down to the amount, longevity and intensity of the rainfall from November 2013 to February 2014. This was confirmed to be the wettest winter on record for the UK.

In order to develop and provide a solution to the flooding, there needs to be a collaborative approach between the LLFA, the landowner and all other relevant authorities.

### 7.1 Recommendations

Any recommended actions outlined in this Flood Investigation Report will be for the relevant responsible body or persons to assess in terms of resource implications, priority and cost/benefit analysis of the proposal. Moving forward, these may be included in the Action Plan linked to the Local Flood Risk Management Strategy or in the relevant risk management authority's future work programmes as appropriate.

#### ***Landowner - Land to the west of Green Street - Golf course***

HCC as LLFA recommends that the landowner re-assesses the existing drainage within this site, as it has been identified that the drainage ponds may not be operating as they were designed to function. This is as set out in the design which received planning approval and was based on the assumption that the land is permeable. As a result of infiltration tests carried out on site as part of the investigation it is thought likely this assumption may not be the case and therefore disposal of water from this site is difficult.

The landowner throughout this investigation has been working closely with HCC as LLFA to allow access to both the golf course site and the eastern field to undertake assessments of the ground conditions and drainage. The landowner has indicated that they are amenable to providing part of the solution to the flooding, possibly using land within the golf course site by creating either a new and larger attenuation pond and/or a raised embankment to the south east of the golf course adjacent to Green Street if technically feasible.

Any proposals to undertake these works will need to be assessed in more detail and a detailed hydraulic model and further infiltration tests would be recommended.

### ***Landowner - Land to the east of Green Street***

It has been recognised that the earth embankment to the east of Green Street (which is within Hertfordshire) prevents any flood water from the highway from flowing into the adjacent field.

Before this embankment could be removed (a decision for the landowner), it is recommended that a detailed assessment is carried out by the landowner to ensure that there will be no increase in flood risk downstream to the residents of Homefield Road and Orchard Road.

### ***HCC Highways***

It has been identified that works are required to the existing deep bore soakaway and drainage infrastructure. It is recommended that this is assessed further by HCC Highways to determine if these works are feasible, what the likely timescales would be and associated costs.

Consideration should be given to replacing the existing soakaway as it is towards the end of its design life and this is potentially compromising the capacity of the highway drainage. HCC Highways have agreed that the upgrade to the soakaway will be carried out and a timescale for these works will be provided in due course depending on funds available to carry out the works.

It is possible that, depending on further assessment, any other option on the highway identified within the McCloy technical assessment report may not be able to manage and resolve the flooding on Green Street completely but as a minimum it may be able to reduce the frequency of the flooding.

If this is the case it is recommended that HCC Highways look into the possibility of resilience measures to ensure users of the road are aware of the risk i.e. installing permanent warning signs, installation of a gauge board so users are able to see how deep the flood water is and continue to manage the closure of the highway in conjunction with the emergency services.

HCC Highways could also look into the possibility of a more engineered solution however this would need to be technically assessed and costs established before these options could be taken forward. It is recommended if any of these options are feasible, that they are discussed between HCC Highways, HCC LLFA and the landowner.

## **8. Actions**

HCC as the relevant LLFA will continue to work with the landowner and other relevant authorities to develop the identified options further in order to find if feasible solution/s to the flooding on Green Street can be realised. A solution to remove the flooding completely may not be feasible particularly where rainfall conditions occur like those in the winter of 2013/14. The aim will be to identify potentially viable options by the end of October 2014.

## **9. Disclaimer**

This report has been prepared as part of Hertfordshire County Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide context and information to support the delivery of the local flood risk management strategy and should not be used for any other purpose.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore may not include all relevant information. As such it should not be considered as a definitive assessment of all factors that may have triggered or contributed to the flood event.

McCloy Consulting and Hertfordshire County Council expressly disclaim responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and McCloy Consulting and Hertfordshire County Council expressly disclaim responsibility for any error in, or omission from, this report arising from or in connection with those opinions, conclusions and any recommendations.

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