

KINGS SOMBORNE FLOODING RESILIENCE

Lead Local Flood Authority

Hampshire County Council is the Lead Local Flood Authority (LLFA) for the County. Their responsibility is managing the risk of flooding from:

- surface water (rainfall) runoff - flows over surfaces such as roads, roofs and patios that cannot absorb water
- ordinary watercourses - smaller, non-main rivers and water bodies. These include rivers, streams, ditches, drains, cuts, culverts, dikes, and sluices *Note the Bourne is categorised as a national river, so HCC do not have responsibility but the Environment Agency.*
- groundwater - caused when heavy or prolonged rainfall makes the water table rise above its normal level.

HCC have a number of specific Groundwater Management Plans for various locations. There is no existing plan for Kings Somborne.

- 1. Recommendation we endeavour to get a management plan for Kings Somborne Parish put into place. See example from LLFA for St Mary Bourne, Attachment 1.*

HCC have set up a Strategic Flood and Water Management Board. The Partnership Board includes representatives from:

- Hampshire County Council
- Water Companies
- The Environment Agency
- Adjoining LLFAs (Southampton, Portsmouth and the Isle of Wight)
- District councils
- Parish councils
- The two National Parks in Hampshire

The board is supported by a Technical Delivery Group. This group provides a forum for sharing best practice and guiding flood risk management work.

- 2. Recommendation we find out more about the board and engage with board members to highlight our issues and help determine solutions.*

Government Flood and coastal resilience innovation programme

This is a transformative £200m programme to improve the resilience of communities at risk of flooding. It was opened on the 9th of November. It is managed by the EA. Applications must be made by the LLFA (HCC in our case) by the 15th of January. 25 areas nationwide will be selected to take part in the scheme.

It is unlikely that we would qualify as one of those 25 selected due to our size of catchment, number of affected properties and in any event there is probably insufficient time now to apply.

There are however several creative approaches that could be adopted to improve resilience.

Strategy

The following is a suggested approach for the PC going forward.

- 3. Ensure a Catchment Wide Approach*
- 4. Engagement*
- 5. Investigate Solutions*
- 6. Determine Potential Funding.*
- 7. Continue to Develop a Resilience Plan*

Catchment Wide Approach

Any plan must be catchment wide. The ground water emanates largely from above the village up to Crawley. Disposal is via the Bourne from New farm to Horsebridge. Restriction is at various points from New Farm to Horsebridge. The plan must therefore encompass it all.

Engagement

The PC has already engaged with some landowners and with the Environment Agency. It is vital now that HCC is fully engaged and they are held to account for their responsibilities outlined above. They have no responsibility for the Bourne. However this does not give them any excuse to abdicate their responsibilities.

- 8. Recommendation following engagement with the board, see recommendation 2 above, we arrange a meeting with the Technical Delivery Group to seek further support in determining potential solutions.*

Landowners rather than householders are going to be key in any viable adopted plan. Without their buy-in any plan will be severely limited. Some of these have already been contacted and have given positive feedback to a solution that improves the situation for all.

- 9. Recommendation we now fully engage with all the landowners from Up-Somborne down to the culvert at Horsebridge to find their level of interest and continually liaise with them informing them of progress along the way.*

There other organizations from which we may be able to glean useful information or practical solutions. These include:-

- Natural England
- Southern Water
- Hampshire Highways
- Wessex Rivers Trust *(PC already engaged with the Trust and received some support)*
- Catchment Based Approach CaBA
- Wildlife Trust
- Woodland Trust

- 10. Recommendation we carry out further research to determine what further support can be obtained from these organisations.*

Potential Solutions

The flooding issue can be summarized by one key word **flow**.

If the flow into the Bourne is less than Bourne flow at maximum level, then fluvial flooding does not occur. The potential solutions can therefore be categorised into the following.

- Measuring and understanding flow
- Reducing Flow into the Bourne
- Improving the flow of the Bourne

Measuring and Understanding Flow

The EA currently provides two important measurements in relation to flooding. These are ground water levels in Kings Somborne Village and Bourne Water Levels. In theory the higher the ground water level the higher the Bourne level. This however is assuming steady state flow conditions in the Bourne. Analysis of these levels over the past years winters months indicates the following.

Year	Month	Bourne Level m AOD on the 15th	Ground Water Level m AOD on the 15th
2020	Dec	33.195	31.802
	Nov	33.167	31.102 (31.556 on 18th)
	March	33.551	32.871
	Feb	33.431	32.535
	Jan	33.345	32.494
2019	Dec	33.179	31.675
	Nov	33.083	31.271
	March	31.565	31.500
	Feb	31.527	31.430
	Jan	31.505	31.262
2018	Dec	31.529	30.877
	Nov	31.519	30.697
	March	Only available mid 2018	31.722
	Feb		31.665
	Jan		31.255

It will be noticed that there is a huge disparity in the recorded Bourne level between spring and autumn 2019. Recalibration of the Bourne level instrument was obviously carried out on the 1st July as a reading of 31.489 m AOD was posted at 2.00pm whilst a reading of 33.072 m AOD was recorded at 2.30pm on the same day. This makes it difficult to find any trending of groundwater level corresponding to Bourne level. However some conclusions can be drawn.

In November 2019 the Bourne was empty (corresponding to a level of 33.084 m AOD) and only started to fill at the beginning of December. This year 2020 the Bourne has maintained a level all through the summer and a steady rise has been perceived from mid November. A step jump in level on the 18th of November from 31.102 m AOD to 31.556 m AOD indicates instrument malfunction. We need consistent reliable data of both ground water and Bourne depth to make any confident analysis. Conjecture that ground water levels below the measuring point and the Bourne flow rate are also a controlling factor as well as local and upstream levels is one view point. The EA carried out some tree clearance work in October above the weir at John o Gaunt Derr Park which improved flow dramatically and despite some obvious instrument malfunction

it appears ground water dropped by 50mm over a couple days. Bourne level was unaffected but the increase flow could be observed with the naked eye.

It will be noted that ground water levels in February 2020 were only 41mm higher than those in January. Bourne levels were however 86mm higher indicating another factor was influencing Bourne level in addition to ground water levels. Analysis of other corresponding readings indicates an increase in ground water level is accompanied with an increase in Bourne level but at a lower value rather than an increased value as in February 2020. The most likely reasons being impeded flow or saturated/flooded ground downstream.

It would appear that Bourne performance would be better measured by flow. This can be achieved with an open channel of prescribed dimensions, water depth and a turbine meter thus converting the velocity recorded into flow. Whilst flow measurement will not cure flooding it would give an overall better picture and together with the other two measurements will give an indication of problems and a better understanding of overall performance of the catchment area.

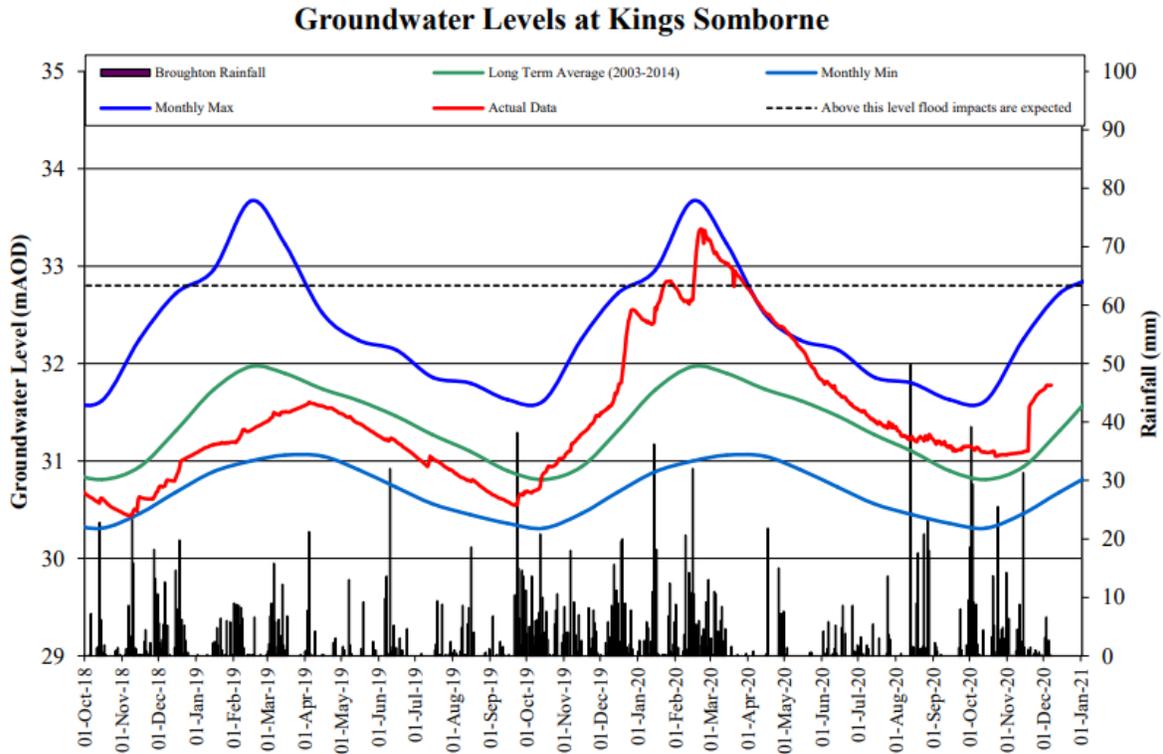
11. Recommendation we lobby for recordable flow measurement

We currently have no idea of the maximum expected flow into the Bourne. The matter is somewhat complex as both run-off and groundwater make a contribution the largest component being ground water which is itself governed by rainfall quantity and intensity. However, without having an estimate of the maximum expected flow into the Bourne it is difficult to evaluate whether the water course is fit for purpose including any restrictions bridges, weirs, culverts etc. If an estimate can be provided this could then be compared with real time flow data if recorded to get a better picture as well as verifying the impact of restrictions. Any practical solutions must have a reasonable estimate of flow.

12. Recommendation an effort should be made to obtain an estimate of the required maximum flow.

Reducing Flow Into the Bourne

The principal flow into the Bourne comes from ground water. Ground water levels vary throughout the year the following graph produced by the EA indicates the levels seen in Kings Somborne over the last 2 years.



Analysis of the chart indicates that we should expect ground water levels to fall between the two blue lines. Ideally we would like to see the level mirror the green line i.e follow the long term average. What can be seen in practice is some years fall below the ideal some above. Generally 2019 levels were lower and 2020 has been higher, what we do not want to see is levels above the dotted line. We also do not want to see levels drop too low either with the associated negative environmental effects. Reducing ground water anywhere along the route of the bourne should over time reduce the amount of ground water entering the Bourne as upstream ground water will directly replace any removed lower down.

The spiky lines at the bottom of the graph are rainfall which of course cannot be controlled. Given the high rainfall in August, Sept and October it can be concluded the actual groundwater levels represented on the graph are incorrect as outlined above.

Another factor determining how much water enters the Bourne is the geology – what type of chalk the nature of the fissures etc. But that cannot, like the rainfall, controlled that either.

From the data we have it suggests that the solution is that peak shaving is required of the ground water levels when levels rise above an acceptable value say 32.5 m AOD.

Peakshaving can be achieved by natural means with the provision of attenuation ponds. The location and size of these could be problematic as ground water pressure could cause bypassing and the volumes are likely to be large. Another possibility is the creation of wet lands. Specialist technical advice would need to be sought to see if these solutions are practical.

Construction techniques for control of ground water traditionally fall into two categories barriers and pumping. The first is not practical as under flowing is likely to occur. The second however could present a viable solution. By pumping out ground water directly into the Bourne once it reaches a level above the average but well below the defined critical level, we could effectively use the existing ground as the attenuation or reservoir maintaining the ground water level within acceptable limits. The pumps could be wind powered to make them carbon efficient and low cost requiring little infrastructure. There would be some visual impact. Such pumps have relatively low capacity and would not provide a solution on their own but a number placed in several locations could perhaps be part of the catchment wide solution. The quantity and size of such pumps and associated infrastructure as well as the cost would need expert advice. The system would of course need more reliable instrumentation (solar powered) than it would appear currently exists.

Additional woodland may also prove to be a useful measure in ground water reduction. Trees remove water from the environment in two different ways:-

- Transpiration: The way water is taken up by tree roots from the ground and is evaporated through the pores on the surface of leaves.
- Interception: The way water adheres to the surface of leaves, branches and trunks during and after rainfall which is directly evaporated back to the atmosphere. This is often expressed as a proportion of annual precipitation termed interception ratio.

Evergreen coniferous trees have more water usage than the deciduous trees because interception rates are maintained throughout the year especially as the winter months are the wettest and windiest when the broadleaves are leafless. As the annual rainfall here is about

1000mm interception of conifers will consume about 38% of the rain compared with the deciduous trees 20%. Coniferous trees are generally faster growing so the benefits of newly planted woodland will be earlier and could present a cash crop for landowners if managed correctly. Clearly the whole area cannot be covered with trees but selective planting could have a role to play.

13. Recommendation attenuation, pumping and planting solutions should be fully evaluated. The effect on water quality should be part of the evaluation.

Improving the Flow of the Bourne

The Bourne characteristics vary along its length. A section is through an area of housing whilst some runs through farmland. Some is shaded by trees some is in direct sunlight. All sections would benefit from regular maintenance. Any obstruction will restrict water flow allowing a build up of both the fluvial and ground water behind it. Regular maintenance of the Bourne is essential.

The EA has had several meetings with members of the Parish Council and the Clerk during 2020 which has culminated in them producing a draft Kings Somborne Flood Action Plan see Attachment 2. This plan which is comprehensive deals with fluvial the centre of the village the prime area of the EAs responsibility.

In addition to the above the areas of the Bourne behind Hayes Farm and running down through John O Gaunt Deer Park down to Horsebridge need consideration.

The Bourne behind Hayes Farm has been crossed continuously by livestock (mainly by horses) over many years which has resulted in shallowing and widening. The area through the deer park has at some point been modified from its original course and the weir added. In addition to this the culvert at horsebridge consisting of 2 x 600mm concrete pipes gets blocked with debris causing restricted flow. A meeting with Wessex trust in July 2020 suggested a study should be made of the course of the Bourne to evaluate if the flow could be enhanced naturally increasing velocities to prevent silt and reed growth this would be of benefit requiring less ongoing maintenance. Conversations between one of the landowners and the Wessex River Trust have taken place the outcome unclear at present irrespective of this however a comprehensive report of the whole run is desirable.

14. Recommendation provision of a report covering from the road bridge on A3057 and the culvert at Horsebridge is commissioned.

15. Recommendation the suitability of the culvert at Horsebridge and the weir on the edge of the Deer Park to accommodate the full flow is evaluated including their propensity to block.

Funding

As can be seen above the overall situation is relatively complex with many fingers in the pie several of them either local or national government agencies all of whom have their own budgets and responsibilities. Protective of both and a distinct aversion to crossing or getting near any perceived boundaries it is difficult to unravel what is what.

Whatever we do decide to do expert advice is going to be required and it will need paying for.

The following may be sources of funding:-

- Local Levy
- Local Authority Capital and Revenue Funding
- Funding sources relating to development and regeneration, such as [section 106 agreements](#), [Community Infrastructure Levy \(CIL\)](#) and [New homes bonus](#)
- Non-government organisations and charitable trusts
- Community fundraising and events
- Public appeals
- Lotteries (Heritage Lottery Fund, Big Lottery, Arts Council)
- [Landfill Tax](#)
- [Rural grants](#), including Environmental Land Management Schemes
- [Nature for Climate Fund](#)
- Grants from other government departments, such as BEIS, MHCLG, DfT, DfE (for example, Flood Resilient Schools)
- [UKRI – the research councils funding](#)
- [Business in the community](#)
- [Green recovery challenge fund](#)

King's Somborne Flood Action Plan – Environment Agency – Draft for Consultation (Attachment 2):

The attached Draft Action Plan was forwarded to Council from Artur Podsiadly, Environment Agency, seeking comment. In consideration of the importance of this piece of work in respect to flooding timescales, and the impending Christmas period before our next meeting, I agreed with the Chair and Proper Officer that a holding document be forwarded, providing initial thoughts (Attachment 3).

From the above discussions we now need to collate comments from the Council, specifically anything additional to the attached, that will support Artur move this piece of work forward.

Cllr Graham Searle – December 2020