

Broadland Futures Initiative

Minutes of the Flood Modelling meeting held on 09 March 2020

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Attendees:

Mark Johnson (Environment Agency)
Gavin Rumsey (Environment Agency)
Kellie Fisher (Environment Agency)
Kevin Marsh (Jacobs Consultants)
Silvia Garattini (Jacobs Consultants)
Peter Doktor (Environment Agency)
Guy Cooper (Environment Agency)
Richard Starling (Chairman Somerton Parish Council)
Stephen Lee (Horsey Parish Council)
Chris Pearson (Horsey Parish Council)

1. Welcome and introductions

PD thanked and welcomed everyone to the meeting. Introductions around the room were made. Purpose of the meeting clarified to all attendee's. A really useful opportunity to meet and talk about matters concerning the BFI's remit and objectives as a whole and the flood modelling that will be undertaken as a part of the process.

2. Flood Modelling Presentation.

The Partnership:

KF opened the presentation by explaining the BFI partnership. **KF** summarised that the Initiative has been set up by organisations responsible for managing coastal and inland flood risk.

- The Environment Agency
- Broads Authority
- Natural England
- County and District Councils
- Internal Drainage Boards
- National Farmers Union
- Water Resources East
- RSPB and Wildlife Trusts

The BFI will also work in partnership with local communities and other stakeholders to identify the way forward.

KF addressed the governance structure of the BFI including the Initiative Project Team, as well as Jacobs Consultants.

Why do we need flood modelling?

Computer flood models are used to represent a physical environment in order to make qualified predictions as to where flooding may occur and test future management options.

- Variety of return periods (severity of storms/flooding)
- Impacts of physical changes or structures
- Planning purposes
- Flood warning
- To take account of the potential effects of Climate Change and Sea Level Rise in future

All flood models require calibration and validation using real-world observations from long data records. Hence our recent flood modelling survey that we have shared online, which is running until 29th March.

GC explained modelling is a complex process and that the Broadland area is large, complicated and drains a large part of Norfolk and Suffolk through many watercourses which are heavily influenced by the tide through Great Yarmouth. There are different techniques and software available to use. The approach chosen needs to be most appropriate for the physical situation and the required outputs. .

We are ensuring that the modelling undertaken not only supports the aims of a large strategy project but also provides the detailed information required day to day for the EA to perform other functions such as assessing planning applications. This is a more efficient use of public resources.

GC shared examples of the modelling computer program on screen and talked attendee's through the process. GC made reference to how physical structures are taken into account, such as bridges and culverts, as well as the structure of the channel and any embankments. Surveying should include flood plains, which need to be properly represented in the model to determine depths, flow and velocity of floodwater in the floodplain. In both protected and unprotected scenarios.

GC – Reiterated that BFI is dealing with a very complex system of water, lots of different aspects are considered in the tidal and fluvial influences.

Product 3 – Flood Modelling

SG – covered Product 3 – Modelling inception report - Summary of client requirements

- Review of previous hydraulic models and recommendations to improve
- Review of hydrometric data and ratings and recommendations
- Review of existing surveys, planning applications, permits
- Review of structures and defences

- Background to the study area
- Proposed modelling approach (design flows, storm durations, calibration, climate change)
- Proposed model boundaries
- Interaction with existing coastal/ fluvial models
- Unprotected scenario for planning purposes (flood zones do not take account of flood risk management structures)

Client Requirements

Summary of BFI requirements from new modelling:

- Frequency of onset of flooding
- Generating flood extents, depths and duration (present day and climate change)
- Determining interactions between fluvial and tidal events
- Enable flood extents to be sub-divided in compartments
- Modelling salinity
- Gain buy-in and trust of stakeholders
- Create engaging outputs
- Optioneering testing
- Policy implementation

EA wider requirements from new modelling:

- Frequency of onset of flooding
- Generating flood extents, in-channel peak flood levels and flows, flood depths and flood hazards for present day and climate change
- Unprotected flood extents
- Gain buy-in and trust of stakeholders
- Option testing

Conclusions and recommendations from modelling review:

KF – Spoke about adopting simplest approach which meets the needs of both the BFI and wider EA. Construction of a new 1D model (providing optimum reliability and value) covering BFI extent and wider reaches.

Key areas of improvements for BESL model identified as:

- In-channel data is 15+ years old in places
- Schematization (how the model is 'built') along Upper Thurne and Hundred Stream
- Floodplain not using latest LiDAR survey data
- Extent not covering wider reaches, (additional smaller watercourses)
- The model does not provide hazard/ velocity on the floodplain

KF – Flood modelling essentially allows us to replicate reality and we can then test future management options – ensuring that we don't inadvertently put anyone at higher risk. We can also test more extreme flood events which may not have been witnessed in living memory.

Key items required for new model

SG – All of these elements will be planned into the new model.

- Bathymetrical (the bed surface under the water) surveys of Breydon Water
- Hydrometric (water flow and levels) data in Breydon Water
- Prioritisation of key areas for topographical surveys (ground level data) where flood extents are more sensitive to conveyance
 - Upper Bure
 - Upper Thurne
 - River Ant
 - Waveney Upstream of Beccles
- Floodplain Schematisation (how the floodplain is represented in the model)
- Hydrological Approach (how we account for the freshwater flow and tidal influence and the way they interact)
- Representation of unprotected scenario
- Calibration of salinity model

Online Flood Modelling Survey

We wish to continue to keep stakeholders and communities at the heart of the BFI project and so we are inviting the public to contribute to our latest computer-based flood modelling. The survey runs from 28 February and closes on the 29 March, results will be shared on our webpage and at our public consultations later this year.

Take part in the survey: <https://www.surveymonkey.co.uk/r/bfifloodmodelsurvey>

Comments and answers to questions:

RS - Will the model be per catchment?

GC – We looked at the BESL model and shortlisted 4 options to investigate further. It is very important to start such a complex modelling process carefully and assess all possible options before we start. This is due to the complex interactions in the area. If the modelling is undertaken on an individual watercourse catchment basis then we could misrepresent these complex interactions. Therefore, we feel it is wise to model as one system. We must clarify we are at inception stage and the best approach is still being identified by our modelling team in conjunction with the findings of our latest survey. The whole system will be made of a set of river catchment models interacting. These can be separated later to test options and issues on an individual watercourse catchment basis if desired.

RS – What about sea level rise?

KF – The Environment Agency supports the [Met Offices UKCP18 Projections](#). Other sources that may have been published in the media are often from non-UK based sources. If we are unable to verify the data and outputs we cannot support alternative projections. **KF** explained the slide showing different sea level rise forecasts (a MET Office infographic).

RS – Do you plan to reduce the effects of flooding as part of the BFI?

SG - Yes, this will be part of the BFI's wider objectives in terms of the options and policy agreements that could be considered for flood and coastal erosion risk management.

3. Questions from Richard Starling

1. Levels;

a) Sea Level ? Rate of rise, how measured by whom and where.

KF – As we mentioned earlier, we use CP18 projections to inform our modelling and forecasting of potential sea level rise over the next century or so.

GC –We have data from Class A gauges, maintained by National Oceanographic Centre which help inform the modelling. Expanding on this point, sea level rise is not uniform everywhere, both on a global scale and nationally. It is relative and very much dependent upon land levels reacting steadily to the last peak glaciation period 20,000 years ago. Also, we don't apply the

same rate of sea level rise each year, as this process isn't uniform. Projections suggest the rate of rise will increase per year over time. We add allowances for projected increase in wave height and wind speed for the open coast. This is very complex and the science not as certain as for sea level rise projections, hence we allow a 10% uplift in both wind speed and wave height in the modelling at the open coast. The forecasted sea level rise we are modelling to is between 1.2m and 1.6m by 2125. There are a range of projections from UKCP18 dependent on emission scenarios. The figures we are using are the 'upper end' scenario, indicating continued high carbon emissions into the future. This is a risk based approach.

RS – Confidence is a big element in trusting the system: that it is accurate and works. That professionals and partnerships are working all together. All agreed with RS. RS mentioned he had personally witnessed how water levels behave in certain conditions at a particular time and GC asked if RS would be able to send him more details on this for flood warning data collection purposes. **FOR ACTION**

b). Land Level? How measured and what is the accuracy. Is Lidar accurate over wooded areas?

KF – Lidar is the technique we most commonly use to measure land levels. It produces reasonably accurate data, efficiently. LiDAR can vary in its accuracy but we must publicise its resolution at its coarsest. Therefore, most LiDAR in the Broads area is at 15cm resolution... However, in flat areas such as Broadland we can achieve a much greater accuracy, down to a few cm. In forested or mountainous regions this accuracy is greatly reduced.

GC – The aerial surveys are carried out in autumn and winter, therefore gaining a more true representation of the land levels because due to reduced vegetation cover. Techniques have improved to capture the second data return from each light point to filter out vegetation canopies and post-processing techniques for the data have improved greatly. In East Anglia we have invested significantly in LiDAR data for a long time, therefore, we are experienced in utilising the outputs and have good confidence in this technique.

KF – Where LiDAR is not sufficient for any specific areas, we can hone our resources and potentially send out ground teams to complete a topographical survey, using traditional methods or drones.

SL – Peat will expand and shrink at a significant rate over years, how will the model cope with this?

KF – Good point, all models have to be reviewed and updated and this is one of the reasons why we need to update modelling. Generally, we update our flood risk models every 6 years.

**c). Should land between The Broads and the Coast be surveyed by best accurate means?
(Part done by Broads Drainage Board report ie. Burnley Hall levels)**

KM – Lidar should provide sufficient accuracy for the modelling in this area. It will also be important to understand the land use both now and in the future. We will need to have some difficult conversations about the viability of certain land uses in this area.

KF: We will be utilising LiDAR and supplementing our data with accurate methods where it is required. We will see what existing data is available to make best use of our resources. We may look at model outputs and ultimately decide more data is required in order to validate the model.

RS – The Environmental Land Management Scheme, are you involved?

KF – The EA will be involved as this is a Defra initiative, and other organisations within the BFI partnership will also be contributing.

2. Water depths in The Broads – when was last survey done? Allowance for sedimentation?

KM – Were you referring to the lakes?

RS – Yes

KM – Currently, the Broads Authority are responsible for dredging and this work is undertaken for navigable not flood risk purposes. Two areas which will need further investigation are Breydon Water and the Bure loop. Both need surveying as it hasn't been done in approximately 5 years and previously the dredging was controlled by the Port but is now with the BA.

RS – In terms of piling sediment on top of banks? Do you use this approach?

KM – Yes, we have been using dredgings for crest raising for about 5 years. We have been working with the BA who place the dredging behind the bank to dry out ready for re-use. Alternatively they have been filling our set-back area and we have been sourcing the material from these once it has dried out.

RS – That's good to hear, please do publicise this more often. Also, what figure do you allow for sedimentation?

KF – We use the latest bathymetry data available to inform the modelling. Dredging doesn't necessarily alleviate or reduce flood risk in tidal systems: when you consider the volume of water in the North Sea; dredging will not reduce flood levels in the event of a tidal surge. Dredging is more likely to increase flood water entering an estuary and increase flow speeds. Therefore, from a flood risk perspective, dredging in the Broads is not beneficial.

RS – With regards to dykes, they tend to silt up and inevitably reduce flow? How is this being dealt with?

KF – This aspect shouldn't affect the modelling results for flood risk, as the model assumes that dykes are already full.

RS – What happens with blocked off flood plain dykes? Arable land seems to be the only areas drained and dug out? Who is surveying blocked off dykes?

SL – To add to RS point, with the water not being able to drain evenly on flood plains and then becoming stagnated, with varying land levels, does this not affect everything else?

CP – If the dykes were cleared, the water could spread more evenly, that seems like a way of improving the ecology too?

GC – All of those are valid points, and sensitivity checks should pick this up in the modelling. Blockages might be more important in fresh water areas. If you want to provide a map with known blocked dykes marked on to us that would be useful.

RS explained he has had previous issues with GDPR.

KF – We don't foresee this being a GDPR issue, however, if you view any blockages as a potential flood risk issue then anyone can report these via our National Incident Hotline 0800 80 70 60, anonymously. Our enforcement teams can then investigate whether flood risk is being increased as a result of any unpermitted work **ACTION**

3. What shrinkage rate allowed for floodbank settlement? Dutch reports that peat land shrinks up to 1 cm per year. What does EA allow?

Covered by earlier discussion

4. Changes in floodplain area i.e. Hoveton Great Broad proposed barriers, sluices & dams blocked broads & dykes.

Covered by earlier discussion

5. Water volume inputs from Drainage Board Pumps – important especially in the Upper Thurne with Potter Heigham Bridge restricting downstream flow, more so during surge tide events. Can trial modelling be run on zero input for 24hrs and 48hrs after peak of surge tide with NO input from drainage pumps.

KF – Yes we can, essentially, we can run a model on a 24hr and 48hr delay. We can model these things if required.

6. Yare Bridge design – impacts especially surge tide events.

KF – We are currently in consultation with The Planning Inspectorate regarding the Flood Risk Assessment submitted as part of the planning process for the Great Yarmouth Third River Crossing. Our letter aims to assist the Examining Authority in making a decision and at this stage we have concerns regarding the proposal. The applicant now has an opportunity to

respond to our concerns and submit further information, therefore, it is important that we do not pre-empt this process, which is a normal part of the planning procedure. However, if the proposal is granted we will aim to incorporate the structure into any flood modelling.

7. Can modelling incorporate 'surge tide effect reduction' eg incorporating washlands?

GC – Yes this will be incorporated.

8. Best way forward – individual catchment modelling with input from locals, landowners, Drainage Boards etc.

GC – Whilst there are benefits to an individual catchment approach, and we are yet to make any decisions, we are currently considering a full study area model, this is because this will capture any interrelating transitions between catchments.

We can break down areas to individual catchments so that we can help people understand what happens to them locally.

9. Confusion with 'Flood Maps' i.e. Flood Map for Planning and Flood Risk map. (Examples of Somerton) Also, on the flood map for planning it included 'areas benefiting from flood defences' but none are shown? Somerton benefits from flood defences.

We acknowledge the differences between the various maps can be confusing. The Flood Map for Planning shows unprotected flood outputs, as if all flood risk management structures were removed. . These were first published in 1999 following an instruction from the Peter Pye report into the 1998 Easter floods. It is under government instruction that these maps do not include the presence of flood risk management structures to show the true floodplain.

The National Flood Risk Map is clipped to the same outlines as the Flood Map for Planning but includes the presence and condition of flood risk management structures. It is a snapshot in time to show the probability of flood risk based on the height and condition of flood risk management structures present. This output is based on a 50m grid square..

Any 'Areas Benefitting from Defences' marked on the maps follow strict criteria. We can only show an area as protected if it benefits from structures which protect it from all sources of flooding at prescribed return periods (for example, the 0.5% annual exceedance probability event for tidal flooding). So flood risk management structures may be present but may not meet the minimum criteria, therefore, the area is not shown as an ABD.

4. Any other business

RS – It is important you talk to communities about these issues and really be present with them to gain their buy – in. To come out and talk to the parish councils etc.

GR – Absolutely, we are aiming to hold public events in the late summer and this would be a great opportunity to have those discussions and gain that feedback. Do you have any suggestions on venues? **RS** – Somerton Village Hall, and also Waxham Barn would be a good venue.

KF – We are also seeking BFI community representatives/ambassadors to support the project and help disseminate information to the communities, as well as direct any questions. We would be really interested to hear whether you or any of your contacts would be interested in this role?

SL – With regards to people seeing the seals, the Marram grass is being decimated by people walking all over it, are there any plans in place to prevent this?

KM – Agreed, the marram grass has suffered, and unfortunately due to the public rights of way it is difficult to legally stop people’s free movement, despite putting signs up. However, I am aware that in Lincolnshire areas have been fenced off and this may become a common theme in the future to stop further damage.

The meeting ended at 1.30.

Action List

Outstanding actions	Complete Y/N
GR to circulate minutes to attendees	Y
RS to send Guy details of water levels he witnessed	
GR to contact suggested venues	
RS to report blocked dykes through NIRS or provide map.	