Community survey of flood risk to 48 homes

at

St Ebbes, Oxford

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with

SENDRA volunteer team

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Abstract: An optical levelling survey was carried out by a community group in a residential area of central Oxford to address the residents' concern that the Environment Agency Flood Map was not accurately expressing the flood risk as it affected insurance premiums. Surveying broadly confirmed the front-door thresholds (ETLs) recorded in the Environment Agency's `(EA's) laser survey of 2003, but the relationship to the a resident's observation of the peak flood level in 2014 suggested that the flood conformed to a 9 year return, while it has since been assessed by EA as a 15-year return (OFAS Hydrology Report 2018).

The implication was that actual flood levels were lower by 14 cm than those indicated by the EA Flood Map data as supplied 2016, and that there would at that time have been grounds for a map challenge. When however the OFAS do-minimum modelling appeared in 2018 this disparity had shrunk to 7cm, making the challenge less relevant, and meaning that on completion of the OFAS project (flood level lowered by average 10cm) all but one of the SENDRA properties would have moved up to Zone 1 Flood Plain and should benefit in household insurance assessment.

Introduction: SOFAG was approached on 8 April 2016 by St Ebbes New Development Residents Association (SENDRA) , who were interested in a better understanding of their insurance risk. The enquiry followed an article in the Oxford Times on 24 March 2016; "Get peace of mind over flood risk". The approach was as follows:

1. SENDRA was considering a Map Challenge in respect of properties backing onto the Castle Mill Stream because none of the properties in question had ever flooded.
2. An EA Ground Level Survey of the path along the Castle Mill Stream was available.
3. The EA Flood Map showed the 1 in 100-year and 1 in 1000-year flood extents (EA 2016).
4. The flooding was described by EA as largely driven by backing-up created by the Castle Mill Stream meeting the Thames.

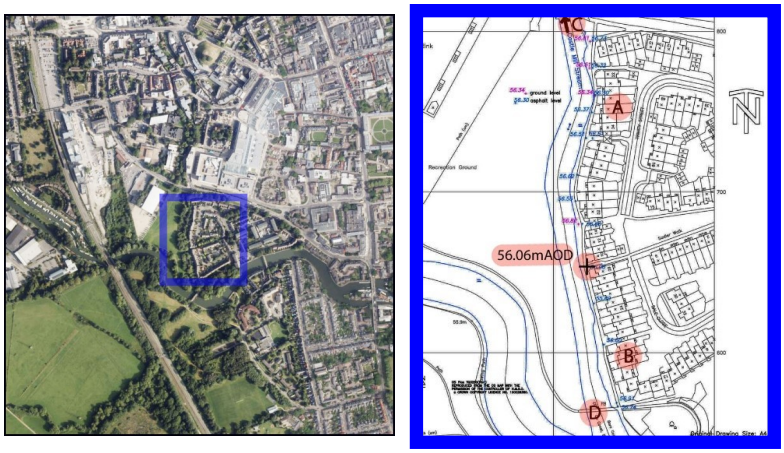

Figure 1: Survey area location and detail, including levels kindly provided by the Environment Agency for the Mill Stream path. D represents the location of Node 10 from the OFAS 2018 modelling; + shows location of Dr Dedhia's observation of 2014 flood peak 56.06m AOD.

SENDRA's proposed challenge noted that the available EA spot-height survey (Fig 1 above) appeared to have been confined to the Castle Mill Stream path, while the residential floors are at a higher level. EA had confirmed that the computer-generated map on which the survey points were presented probably did not include a detailed topographic survey of the area, hence validation could show that these properties are in fact at a higher level than the path as surveyed, and that flooding would not enter the properties except in an extreme event. The EA advised that a 'Map Challenge' would entail householders engaging an independent surveyor to carry out a confirmatory survey to measure heights where water might enter individual houses including all properties backing onto Castle Mill Stream. EA estimated the cost to be in the region of £2,000 for properties backing onto the Castle Mill Stream Dependent on findings of such a survey, the EA could update the flood map accordingly (pers comm Ian Norriss for EA, via SENDRA).

SENDRA offered volunteers to help with a DIY survey under SOFAG supervision.

Geology – The local geomorphology is the north edge of a triangle of flood plain at the confluence of the Rivers Thames and Cherwell. The natural flood plain surface is at around 54m AOD, and the modern ground level around 56.5mAOD arises largely from fill associated with the Victorian City Gas works and housing, including a branch line from the railway via the surviving iron bridge over the Thames. The existence of this fill means that modern ground level is very close to Flood Level 1, the lowest risk at Oxford on present modelling, a risk that would be removed by the modelled alleviation provided by the proposed OFAS. The housing development backs onto the sinuous line of a mill stream to west and the R Thames to south.

Available data (laser survey, EA flood map): The project examined a laser survey of Entry Threshold Levels (ETL, effectively residential ground floor levels) for Oxford flood plain properties as commissioned by the Environment Agency in 1996, updated 2003 (Spreadsheet kindly supplied by EA). The survey provides levels for front door thresholds for most of the flood plain houses in Oxford, expressed as metres above Ordnance Datum (mAOD = above Sea Level). For values see Fig. 5 The original architect's drawings were available for only the north part of the development, with floor levels grouped in short runs.

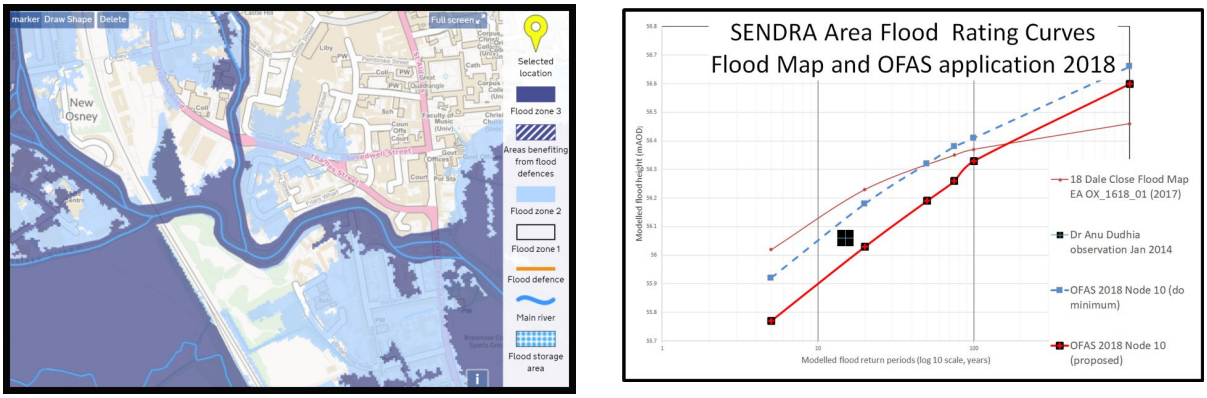

Figure 2: Lett—Extract from Environment Agency Flood Map downloaded 17 April 2021; right—plot of modelled flood risk at quoted return periods (rating curves), as supplied by EA in 2017, and as quote in OFAS planning application (withdrawn March 2020)

Community optical survey: The community survey revisited a selection of front-door thresholds using an optical levelling instrument for independent determination of the height of each front door threshold in mAOD with reference to a local Ordnance Datum benchmark (value supplied by EA).

Figure 3 SENDRA Survey team, September 2016

The values from the optical survey were compared to the laser survey and to the EA's flood levels as predicted in future more extreme events. The project also records an authoritative observation of the local peak water level in the 2014 flood, so as to better understand how this related to model rating curves as provided by EA and as modelled for OFAS.

Survey method – A surveyors levelling instrument, tripod and staff kindly loaned by Oxford City Council were used to transfer the levels of selected thresholds back to an EA BM value (56.73mAOD) close to Thames Street. SENDRA members resident in Dale Close, Sadlers Walk and Trinity Street were invited to allow their front-door threshold to be measured, the results being anonymised for confidentiality. Date

Observation of January 2014 flood peak: A resident was also able to give an authoritative indication of the peak level in the 2014 flood locally, recorded photographically. (photo of Dr Anu Dudhia) equated to 56.06mAOD.

Figure 4 **Dr Anu Duhia indicates (left foot) the peak flood level in 2014 (photo 5 November 2016)**

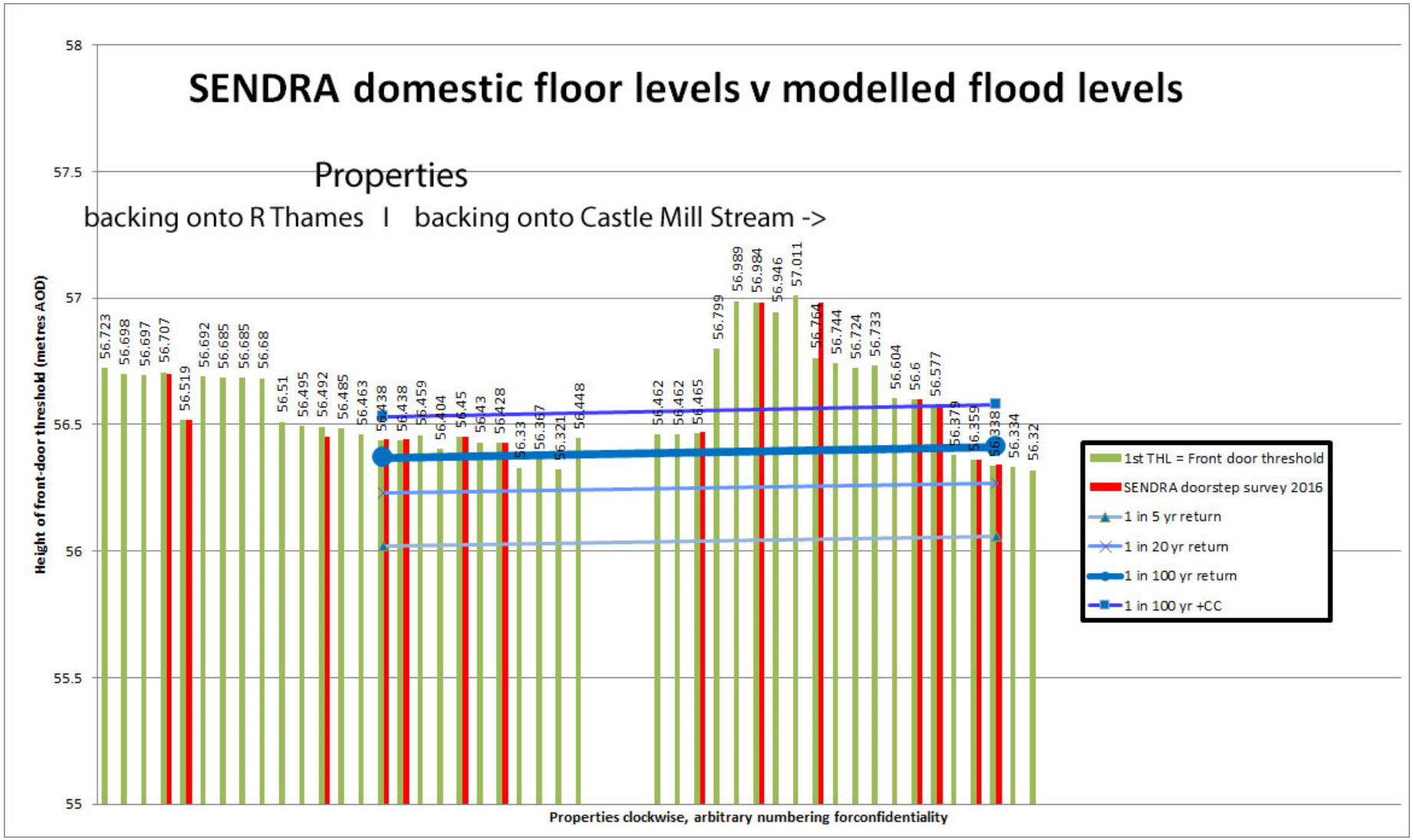

Figure 5: Results of optical survey (red) plotted against laser survey (green) and projected OFAS flood levels (shades of blue)

Discussion – The results indicate:

1. The optical survey shows front-door threshold values an average +30mm higher than the laser survey values. This might arise because the optical survey included a raised aluminium weather strip in each case, but the averaging conceals a spread of difference values from +22mm to -14mm. The +22mm value suggests that the laser survey had accidentally measured the paving in front of the threshold, because the adjoining (identical) property was precisely on the mean.
2. The anonymised histogram of properties backing onto the Mill Stream shows a crank north of Sadlers Walk where Trinity Street levels are substantially higher.
3. The peak water level observed In 2014 was significantly lower than the 15-year return as assessed at that time by OFAS (Final Hydrology Report Ch2m (2016, Table 1-1), being more like a 10-year return. Comparison of this value with Node 10 of the subsequent OFAS hydraulic model as submitted for planning permission in 2018 (Detailed Design Hydraulic withdrawn) shows that the 2014 observation (56.08m AOD) now lies between a 10-year (56.06mAOD) and 20 year (56.18mAOD), which may suggest that the Hydraulic Model has been adjusted following the SENDRA survey (see chart)
4. The slope from N to S along the mill stream (blue lines, Fig. 5) suggests that the hydraulic model is seeing a significant discharge from the Castle Mill Stream that is tilting the main Thames flow from Osney Lock/weir, irrespective of return times. As presented, this distortion is independent of high flows when water might be expected to follow the Mill Stream corridor.
5. There is no explanation as yet why the 2018 OFAS model sees the flood rating curves as a steady upward gradient beyond the 100-year return, as compared with the more exponential curve from the 2016 supplied data (Fig. 2). This is presumably an effect computed for long term climate change predictions, and hopefully can be clarified by the Environment Agency in due course.
6. On the basis of Fig. 5, seven homes currently have ground floors at risk of an EA modelled 100-year flood in the latest published modelling (OFAS `do minimum', EA 2018). The currently withdrawn scheme would make a 10cm improvement in a 100-year return event, reducing seven properties down to a single property.

Brian Durham

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Sources

EA 2016 St Ebbes Survey Data J00389-01 February 2016

EA 2017 Flood Map centred on Dale Close, St Ebbe's, Oxford, OX1 1TU, Created on 22/08/17 REF: OX_1618_01

EA 2018: OFAS Hydraulic Modelling Report February 2018, Tables 32 and 33