JBA consulting

Boverton Flood Modelling

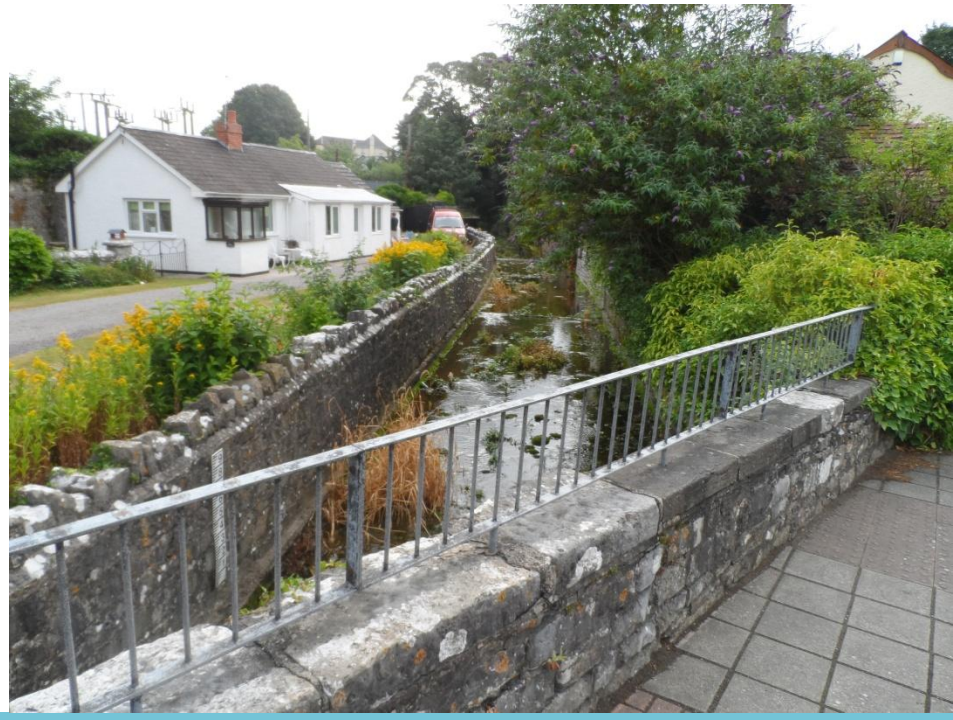
George Baker, Technical Director

11th April 2014

Consultants of the Year 2010 nce ace Winner

Introduction

1. Model Calibration & Verification
2. Culvert options testing
3. Downstream effects
4. Additional flood risk management measures



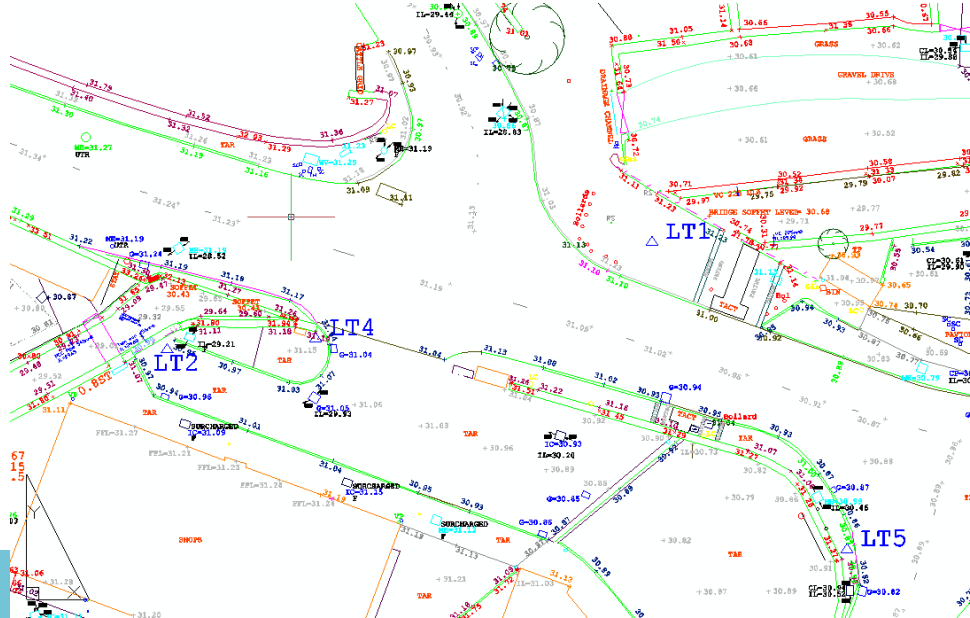
Model Calibration & Verification

1. Collection of additional survey

   (1998 flood level ~32.0m AOD)

2. Review of culvert modelling approach

3. Addition of further walls and buildings



Model Calibration & Verification

- 1 in 20 year water level at pub entrance 30.05m AOD
- 1 in 100 year water level at pub entrance 30.25m AOD
- Final culvert capacity **4.45m3/s**

Model Calibration & Verification

Boverton Flood History

Date	Peak Stage	Flow (cumecs) Modelled	Event
31 Oct 1998	>1.5 (estimated)	5.8-6.0 (estimated)	6 residential properties along Boverton Brook together with 5 business premises, a telephone exchange, an electricity substation and 10 garages flooded in the centre of Boverton. Further upstream, Frogland Old Brewery PH, Frogland House and Parwg House were also flooded. At the village of Llanmaes (Llanmaes Brook), 7 houses suffered from flooding.
22 Dec 2012	1.484	6.0	Reports of flooding to 11 properties in Boverton
30 Oct 2000	1.402	5.1	3 residential properties and an electrical sub-station flooded at Boverton Square 37.4mm of rainfall recorded at Llantwit Major rain-gauge in 8hrs
04 Sep 2008	1.368	4.7	Flooding reported to 1 property in Boverton and some flooding to gardens
05 Sep 2008	1.361	4.6	2 properties flooded at Turkey Street in Llantwit Major – no reports of flooding in Boverton
01 Jan 2003	1.245	3.5	No reports of flooding
25 Nov 2012	1.234	3.4	No reports of flooding to property

Flow estimates for Boverton Culvert

Return Period, yrs	AEP	FLOW (m^3/s)
2	50%	3.1
5	**20%**	**4.3**
10	10%	5.2
20	5%	6.2
50	2%	7.8
75	1.3%	8.6
100	1.0%	9.3
200	0.5%	11.0
500	0.2%	13.7
1000	0.1%	16.5

Culvert options testing

- Two standard culvert design sized considered viable by VoG engineers:
  - Option B - 3.6m width x 1.05m height
  - Option C - 4.2m width x 1.05m height
  - (current culvert is 3m x 0.8m)
- Culvert gradient optimised

Culvert options testing – Option B

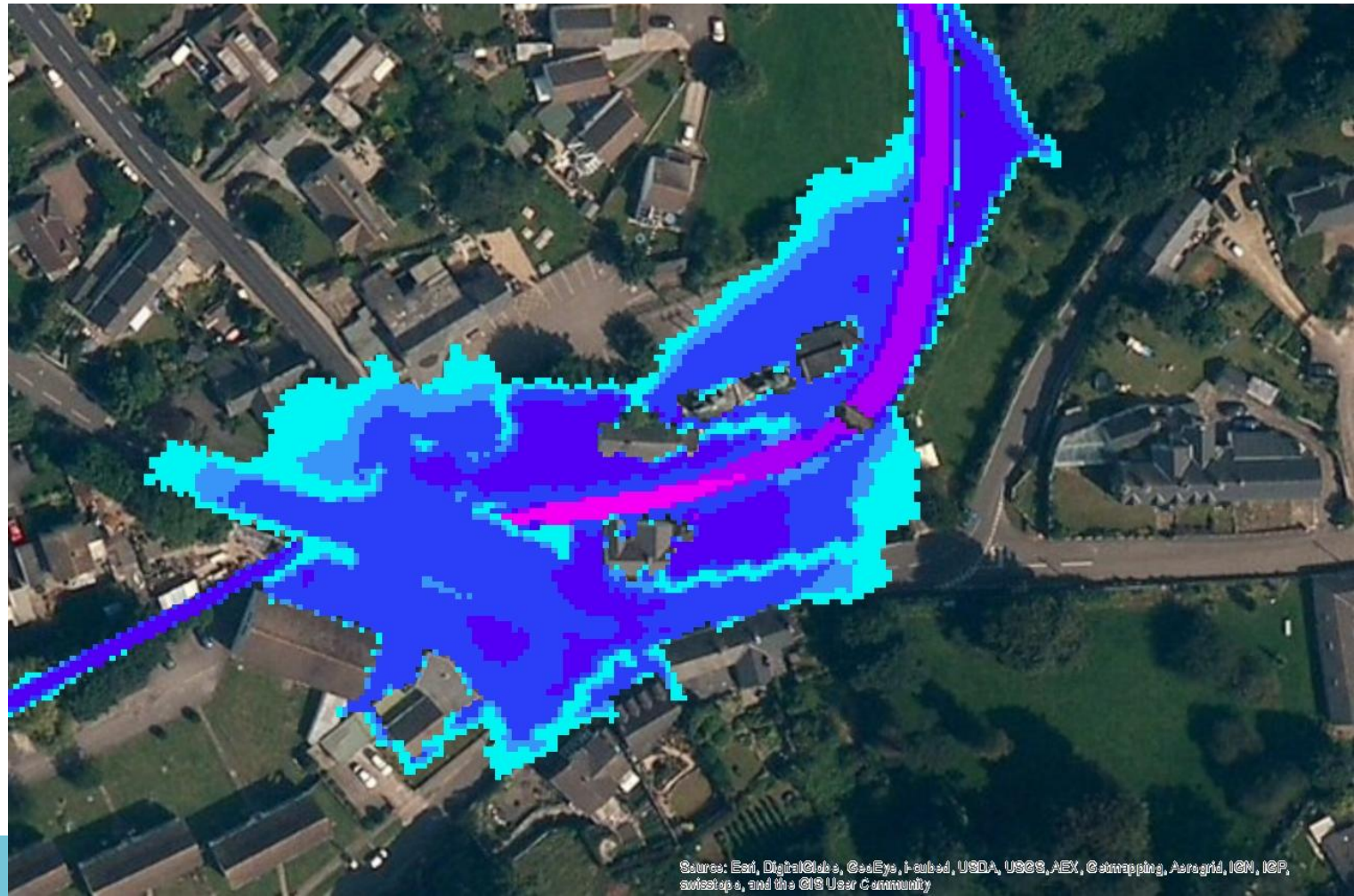
- Peak culvert capacity 7.9m3/s
- 1 in 20

Culvert options testing – Option B

- Peak culvert capacity 7.9m3/s
- 1 in 20
- 1 in 50

Culvert options testing – Option B

- Peak culvert capacity 7.9m3/s
- 1 in 20
- 1 in 50
- 1 in 75



Culvert options testing – Option B

- Peak culvert capacity 7.9m3/s
- 1 in 20
- 1 in 50
- 1 in 75
- 1 in 100

Culvert options testing – Option C

- Peak culvert capacity 8.5m3/s
- 1 in 20

Culvert options testing – Option C

- Peak culvert capacity 8.5m3/s
- 1 in 20
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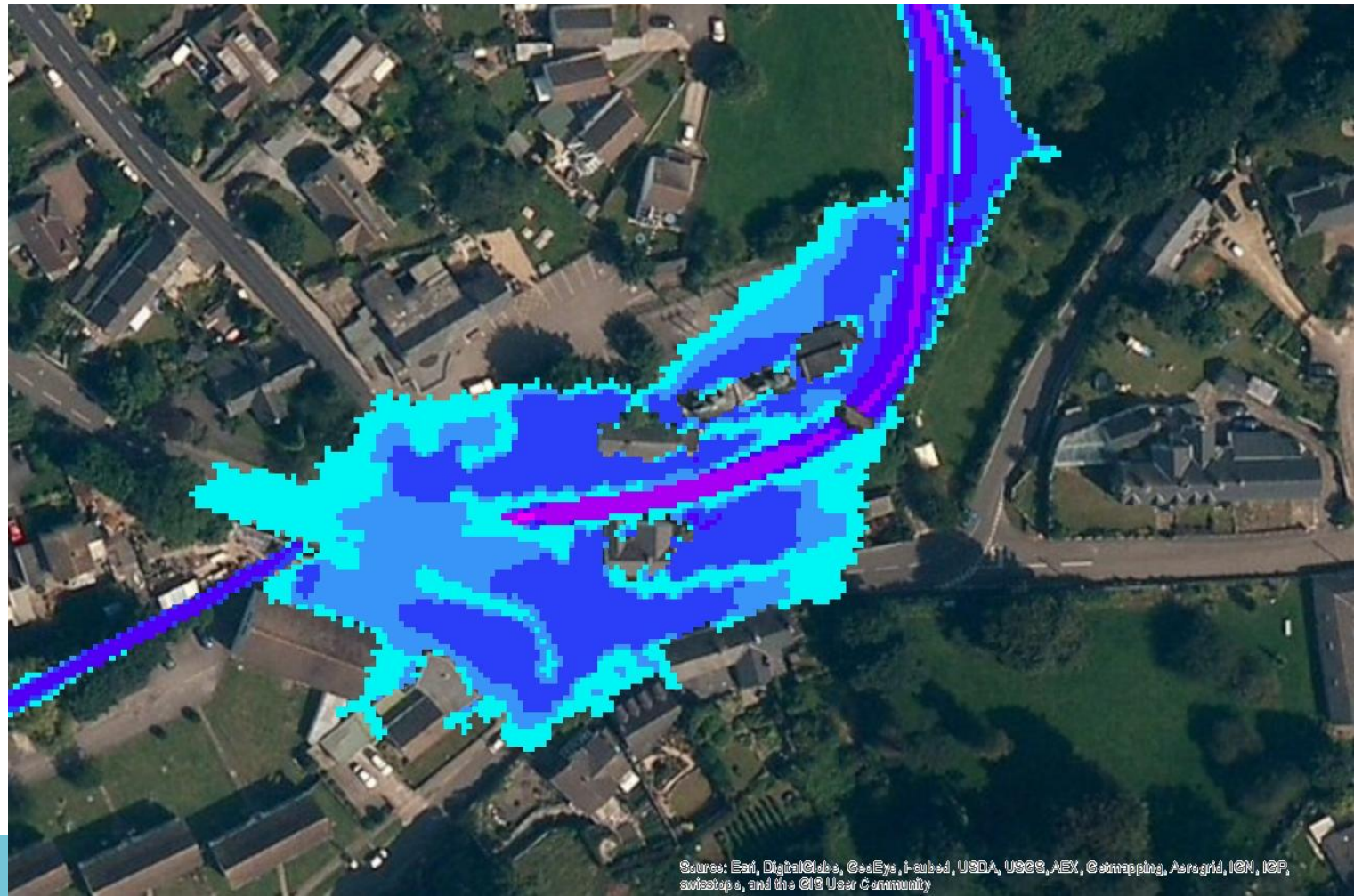
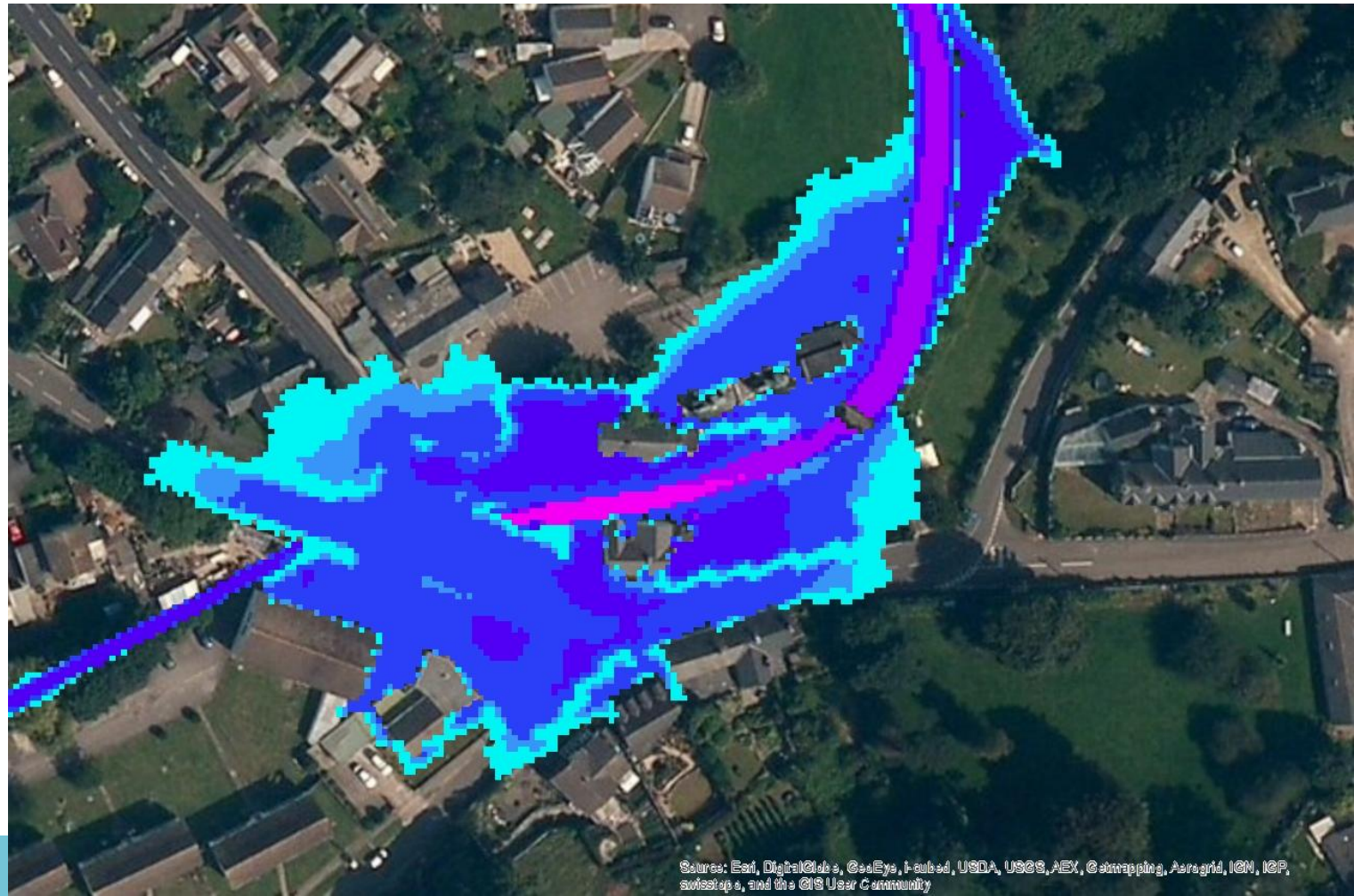


Culvert options testing – Option C

- Peak culvert capacity 8.5m3/s
- 1 in 20
- 1 in 50
- 1 in 75
- 1 in 100



Downstream effects

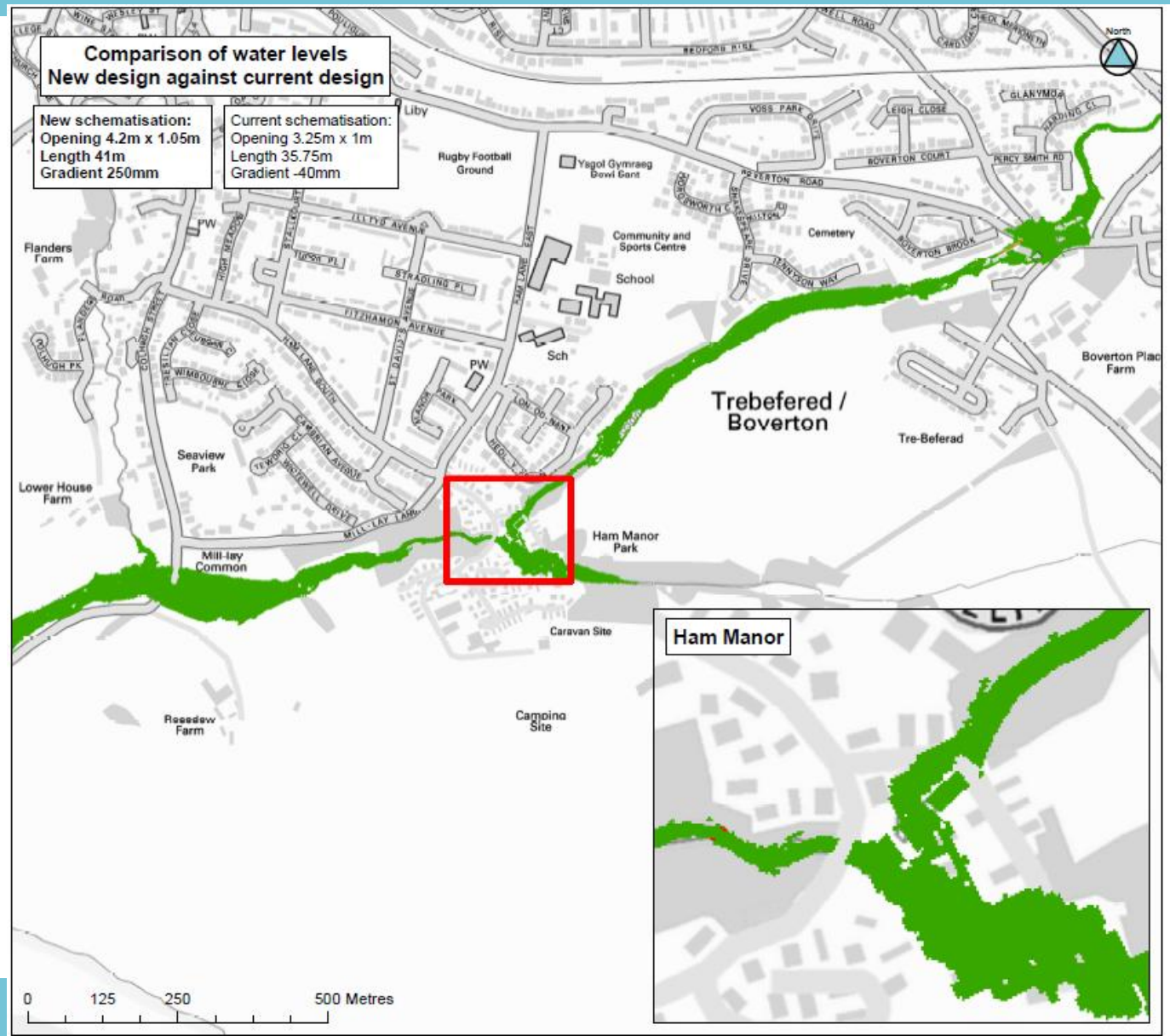
- General principal:

  speed up the flow of water, increase flooding downstream

- Issues with planning and consent due to impacts on 3rd parties
- Threshold: Water level increase >5mm

- Tested by comparing flood depth before and after works
- Results for Option B and C very similar

Downstream effects – 1 in 100 years

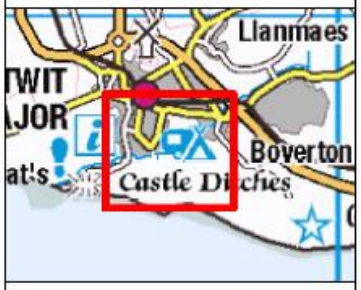


KEY

Increase in water level

- <0.005m
- 0.005 -0.01m
- 0.01 - 0.025m
- 0.025 - 0.05m
- 0.05 - 0.1m
- >0.1m

KEYPLAN



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for

Natural Resources Wales

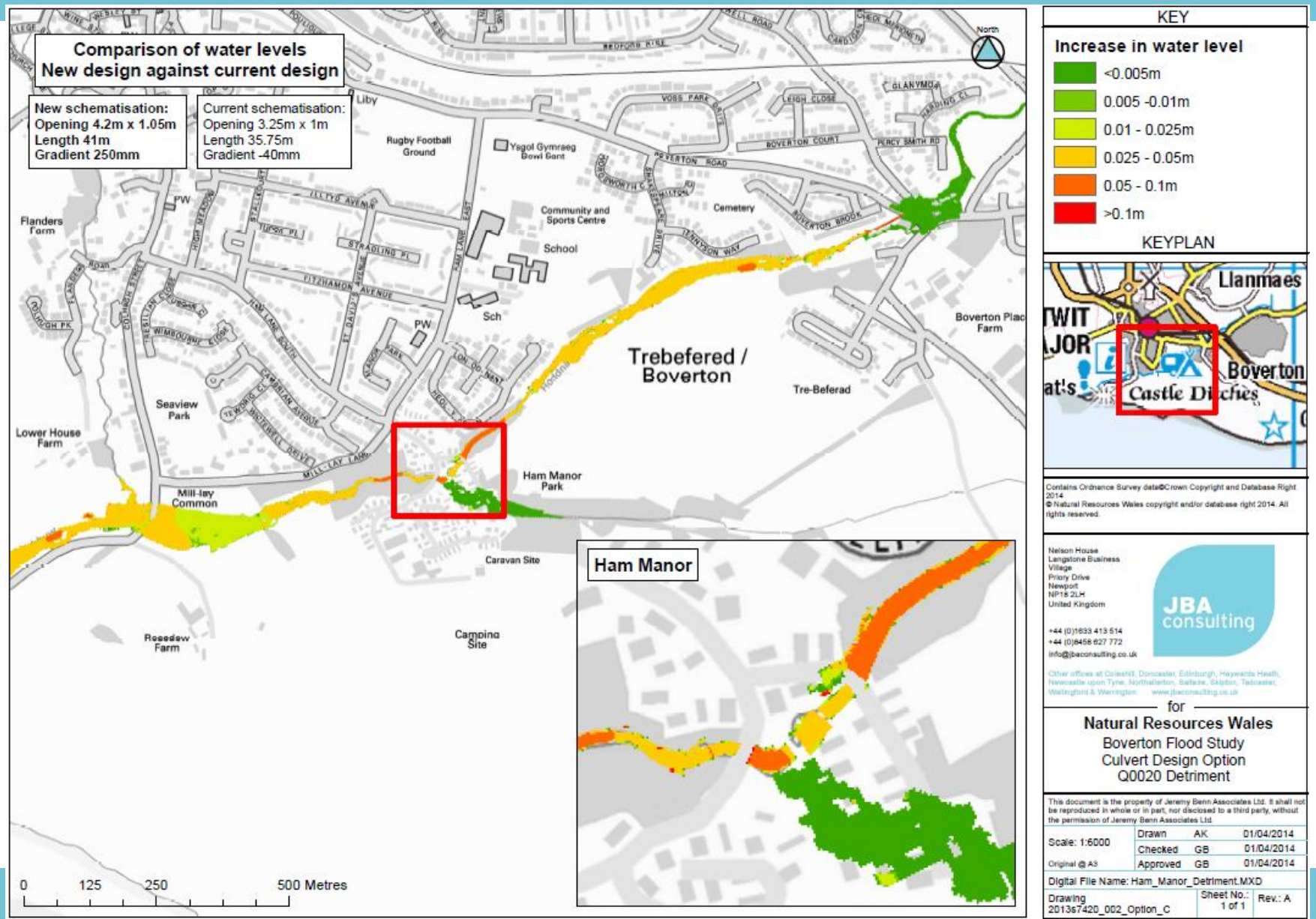
Boverton Flood Study
Culvert Design Option
Q0100 Detriment

Scale: 1:6000	Drawn	AK	01/04/2014
	Checked	GB	01/04/2014
Original @ A3	Approved	GB	01/04/2014

Digital File Name: Ham_Manor_Detriment.MXD

Drawing 2013s7420_001_Option_C | Sheet No.: 1 of 1 | Rev.: A

Downstream effects – 1 in 20 years



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Q0020 Detriment

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Digital File Name: Ham_Manor_Detriment.MXD

Drawing 2013s7420_002_Option_C	Sheet No.: 1 of 1	Rev.: A

Additional flood risk management measures

- Can we do more to reduce flood risk (now or in the future)?
  - Bigger culvert? No
  - Upstream wall? Probably not
  - Downstream improvements? Maybe
- Engineering, landownership and budget challenges