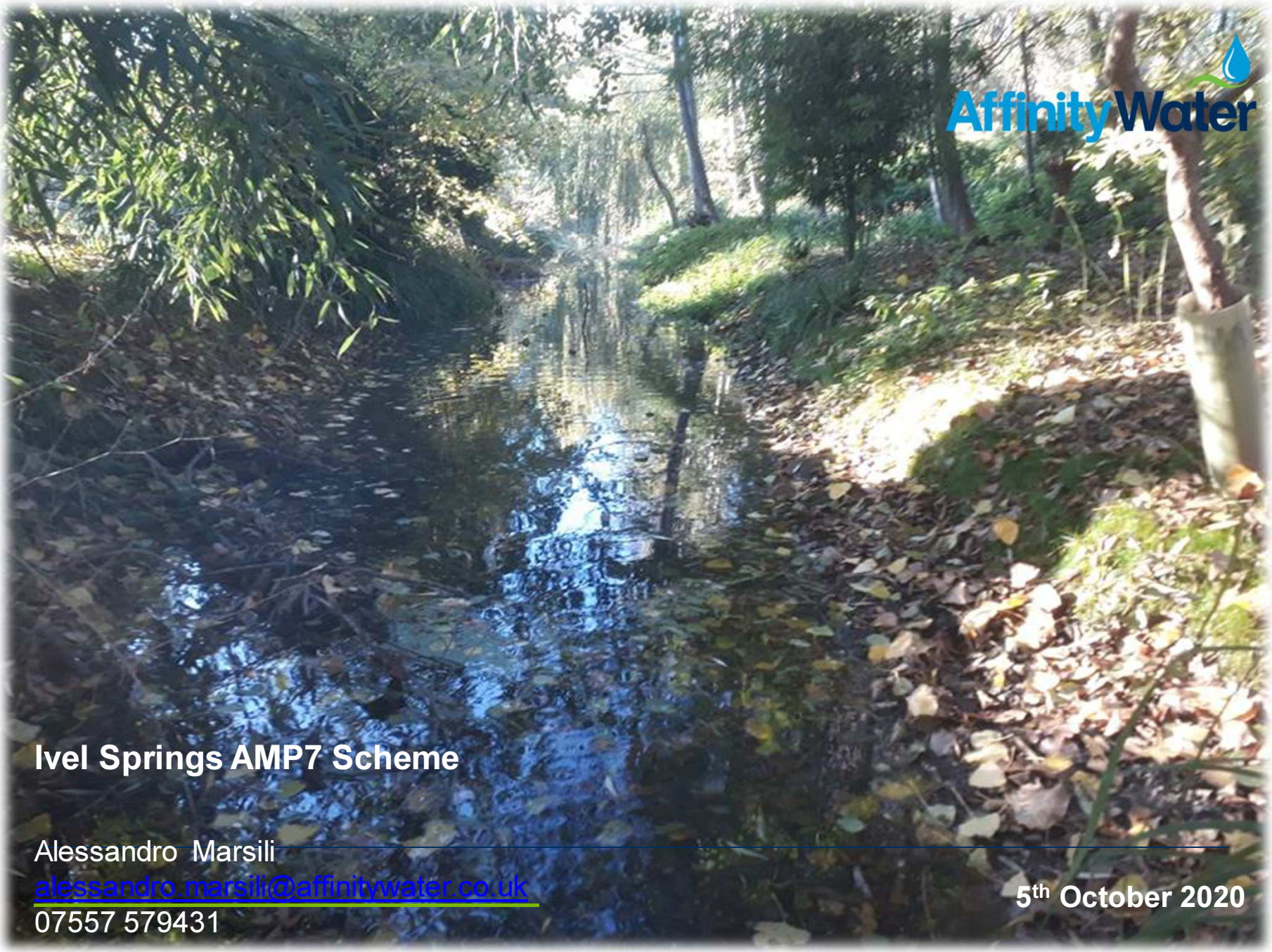

Ivel Springs AMP7 Scheme

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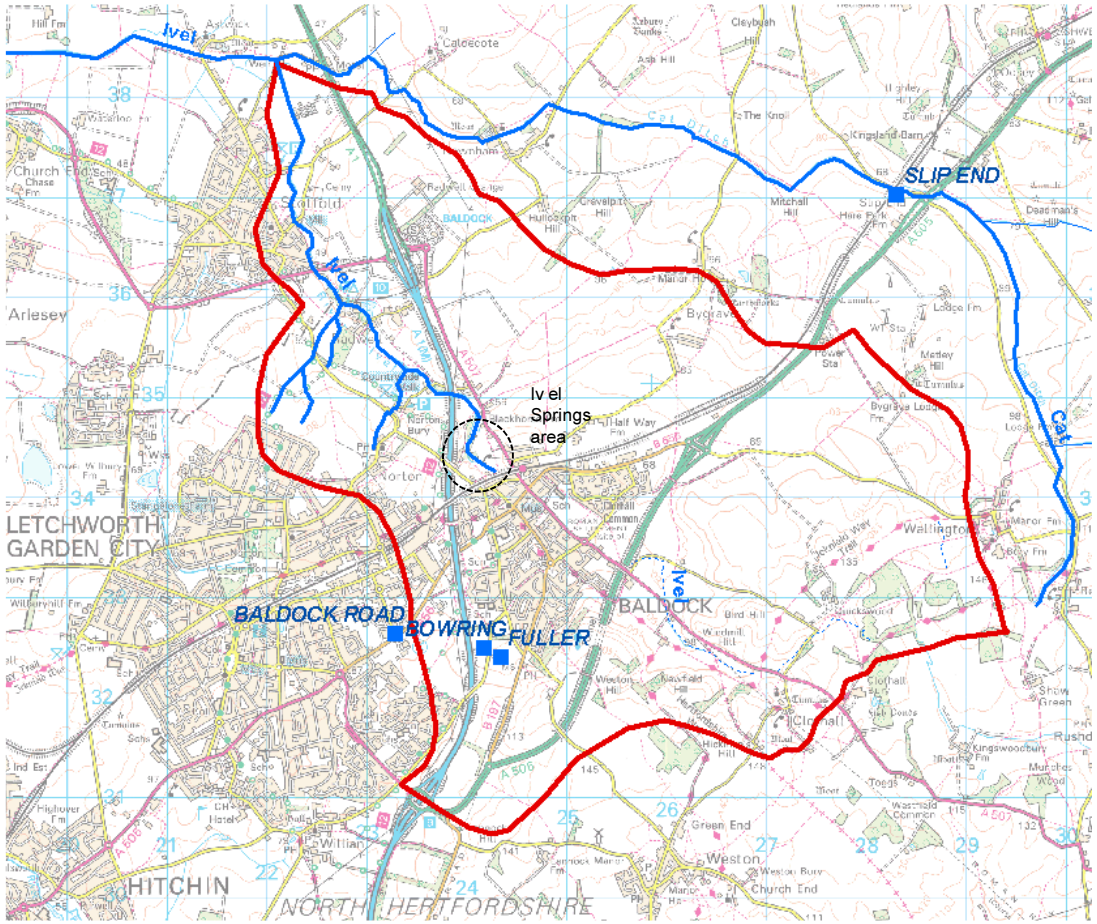
5th October 2020

AMP 6 NEP Investigation Background Information



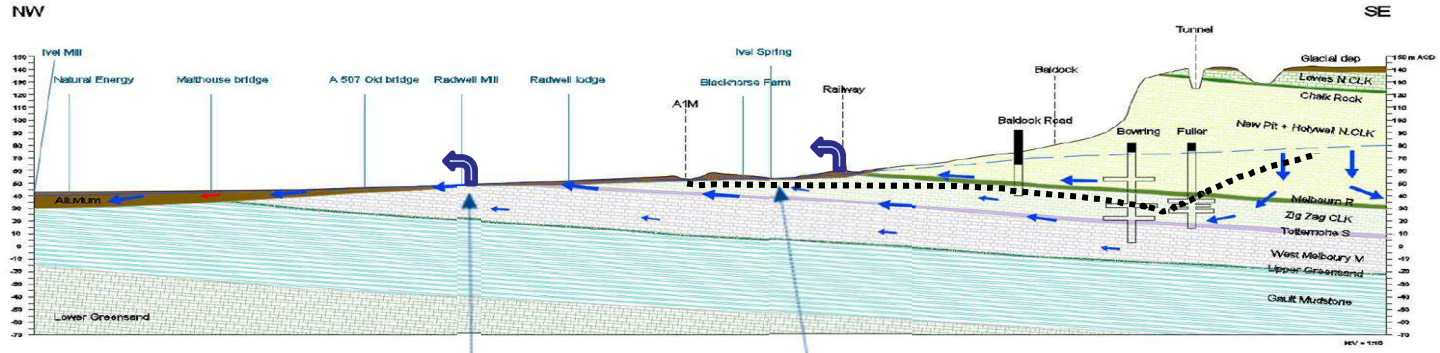
- The EU Water Framework Directive requires all rivers to be of "good ecological status" by 2027
- Water Body GB 105033037720 Ivel Headwater status was classified as "Moderate" by EA in 2013
- This triggered an AMP6 investigation
- Both flow and morphology are influencing the ecology (invertebrate community)
- Affinity Water works with Environment Agency, landowners, community groups and catchment partnerships to reach "good ecological status"

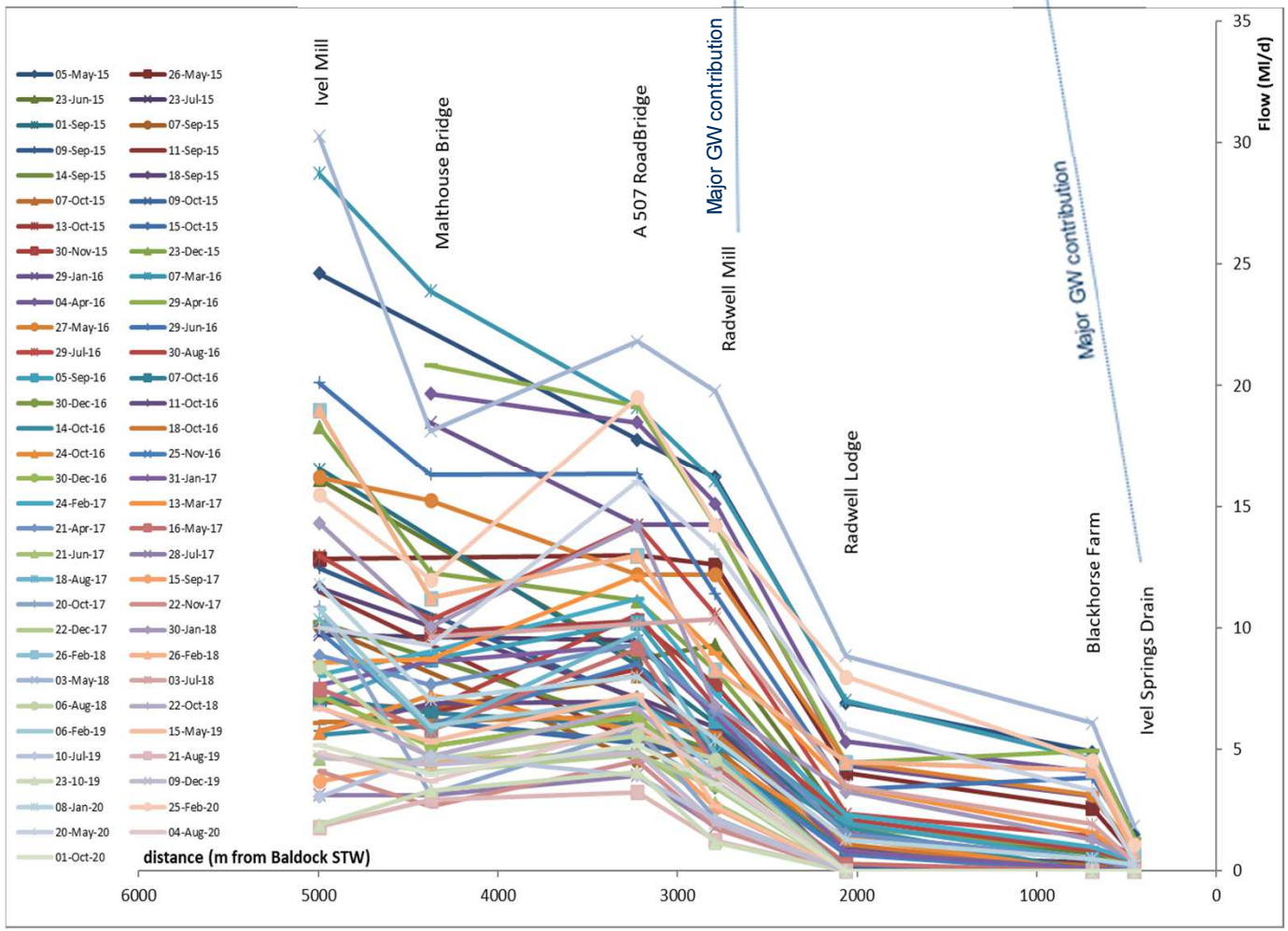
Source Name	Licence No.	Date issue	Licence Daily (Ml)	Group average (Ml/d)	Group daily peak (Ml)
Baldock Road	6/33/14/9	1966	4.54	14.8	20
Bowring	6/33/14/10	1966	7.96	14.8	20
Fuller	6/33/14/11	1966	7.96	14.8	20

Accretion Profile

= - + + + + + SG points flow trend

updated to
1st Oct 2020

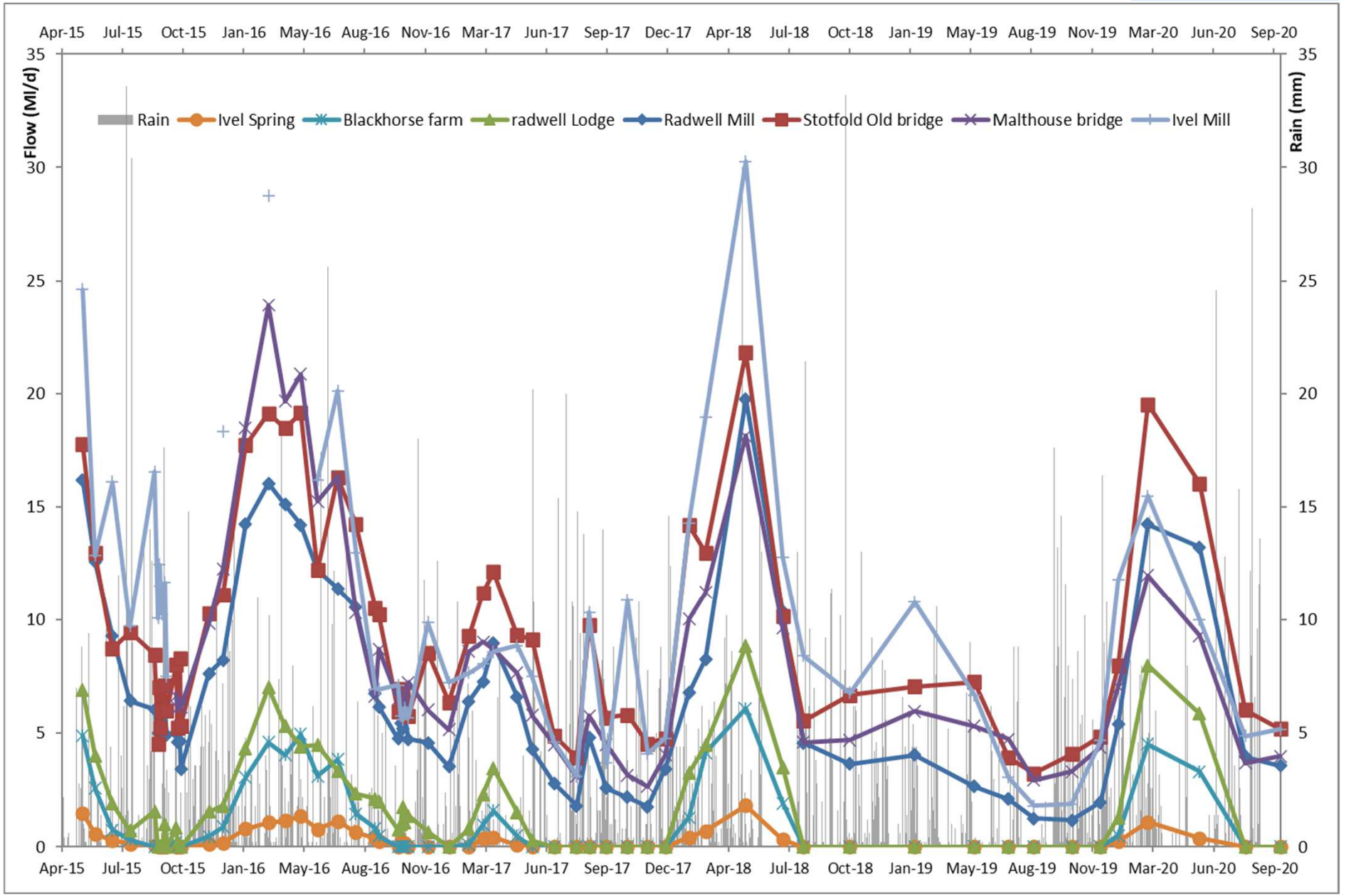




5 years of spot flow gauges confirm river gaining from the Chalk aquifer between Ivel Spring and Radwell; further DS it loses in dry periods and gains in wet periods;

Surface water flow trend

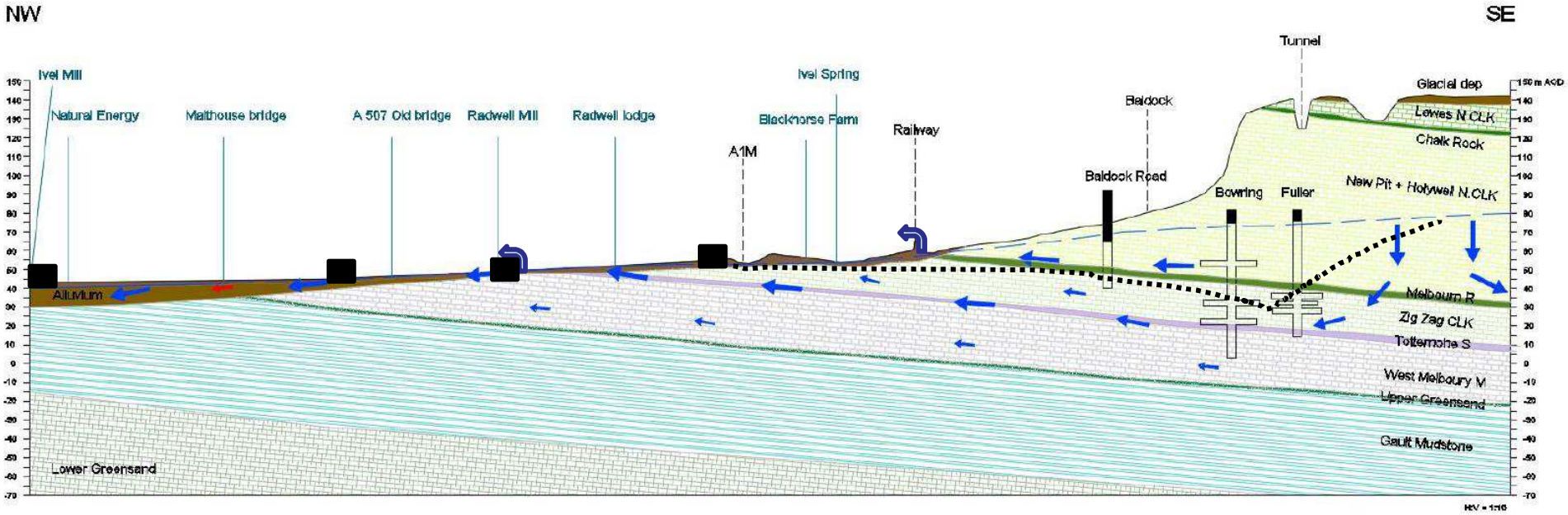
updated to
1st Oct 2020



Spot flow trend consistent with GW fluctuation; it shows periods when spring area remained dry;

Catchment Conceptualisation and Investigation findings

= - + + + + + SG points flow trend



- Ivel is groundwater fed from few spot points (springs) likely coinciding with Melbourne Rock and Totternhoe Stone Chalk horizons
- Affinity Water abstractions at Bowring and Fuller impact groundwater levels in the Spring; at Verge Layby (Radwell) the impact is negligible
- No impact in flow was recorded during signal test, possibly due to low groundwater levels not reaching the spring elevation and putty Chalk confining the aquifer along several stretches of the spring area
- Flow is heavily controlled by man made structures and mills
- Ecology is also affected by structures and poor morphology of the channel and water quality

Cycle 2 classifications

Download as CSV

Classification Item	2013	2014	2015	2016	2019
Overall Water Body	Good	Good	Good	Poor	Moderate
Ecological	Good	Good	Good	Poor	Good
Chemical	Good	Good	Good	Good	Fail

Reasons for not reaching Good status:
- Pollution from rural areas
- Physical modifications

- Though not linked to the initial WFD drive, AW and EA decided to take actions in AMP7 to mitigate the effects of the abstraction at the Spring

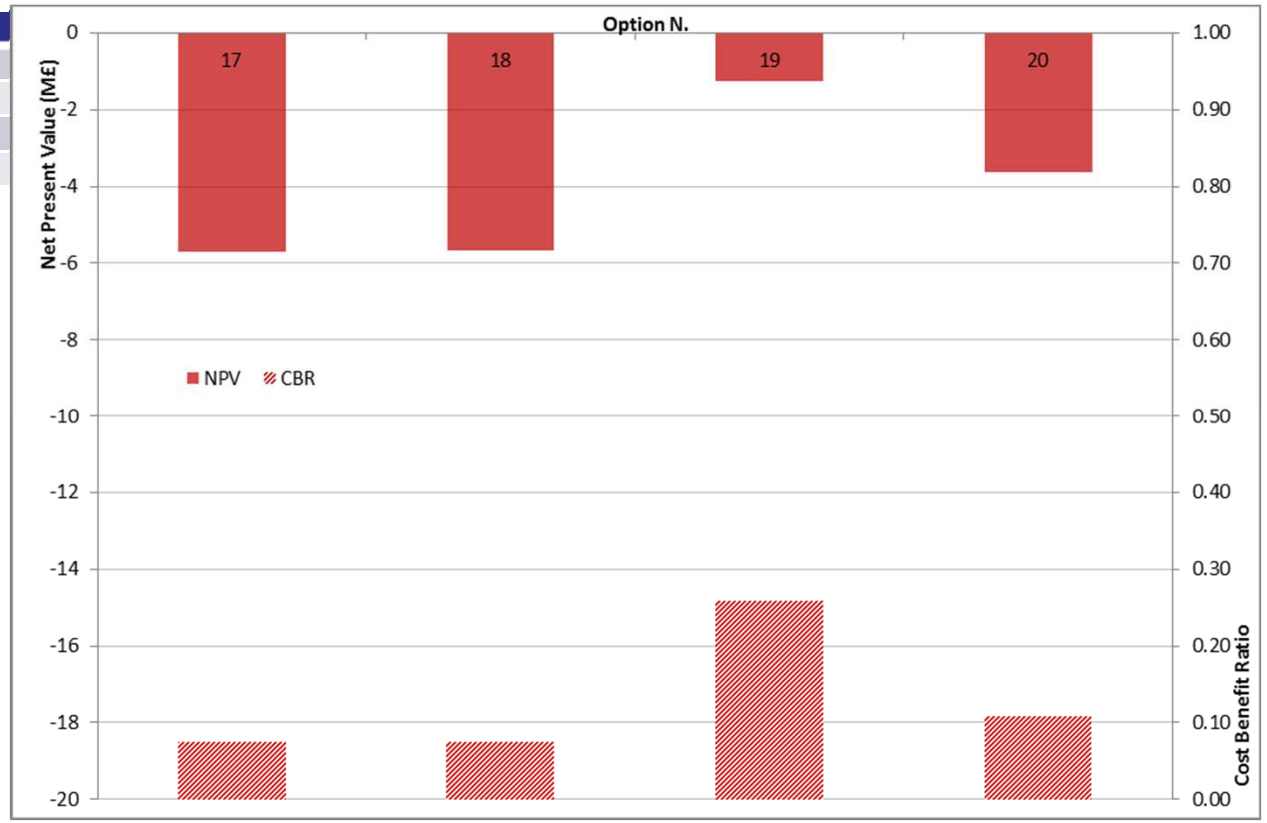
Options appraisal

Option	Unique Identification Name
17	FullerAugm3
18	BowringAugm3
19	ABH Augm3
20	STW Augm3

Annual costs: £ 55 to 240 k
Capital costs: £ 0.5 to 3.2 M

BCR = 0.07 to 0.26
NPV = £ -5.7 to -1.3 M
annual costs very high / moderates
capital costs very high / moderates

Constrains: new infrastructures to implement - NHDC permission (op.19)
Potential issues: water quality issue (op.20)
Risk of failure: Moderate/Low for the spring area
Length of the river benefitting: depending on the barriers



We did an options appraisal (with a flow target of 3 Ml/d at the spring which was assigned at the bottom of the catchment by the EA); it included the abstraction reductions and morpho works, but the only workable solutions were linked to the augmentation scheme of option 19. Option 19 had BCR < 0.3 (less than 1 in theory non beneficial according to the EA criteria) and net present value negative (-1.3 Millions). The option to augment the river from Bowring was costed around 5 Millions with CBR <0.1

AMP7 planned interventions

1. Licence capping to prevent deterioration of the waterbody WFD status

Source Name	Licence No.	Date issue	Licence Daily (Ml)	Group average (Ml/d)	Group daily peak (Ml)
Baldock Road	6/33/14/9	1966	4.54	14.8	20
Bowring	6/33/14/10	1966	7.96	14.8	20
Fuller	6/33/14/11	1966	7.96	14.8	20

Current licence conditions

Source Name	Licence No.	Date issue	Licence Daily (Ml)	Group average (Ml/d)	Group daily peak (Ml)
Baldock Road	6/33/14/9	1966	4.54	14.14	20
Bowring	6/33/14/10	1966	7.96	14.14	20
Fuller	6/33/14/11	1966	7.96	14.14	20

From Dec 2024 licences capped at 14.14 Ml/d

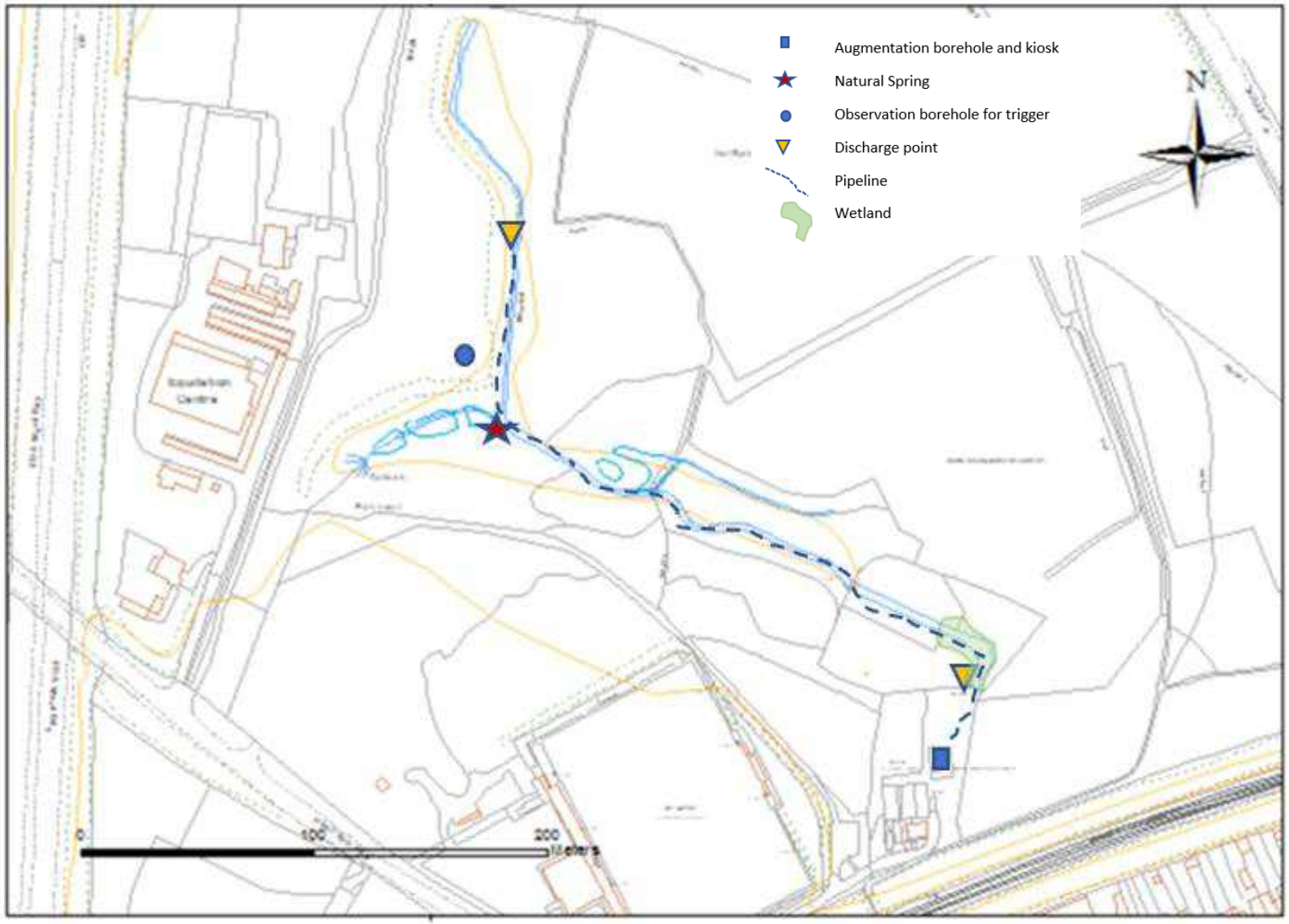
In addition to the regulatory interventions, our GW abstraction BHs in the catchment are equipped with an automatic trimmer software to decrease the abstraction rate when GW levels decline below certain threshold; in practical during late summer-autumn we operate at reduced rate c 10-11 Ml/d

Augmentation scheme & River restoration

AMP7 planned interventions – Draft (design phase tbc)

2. Augmentation scheme

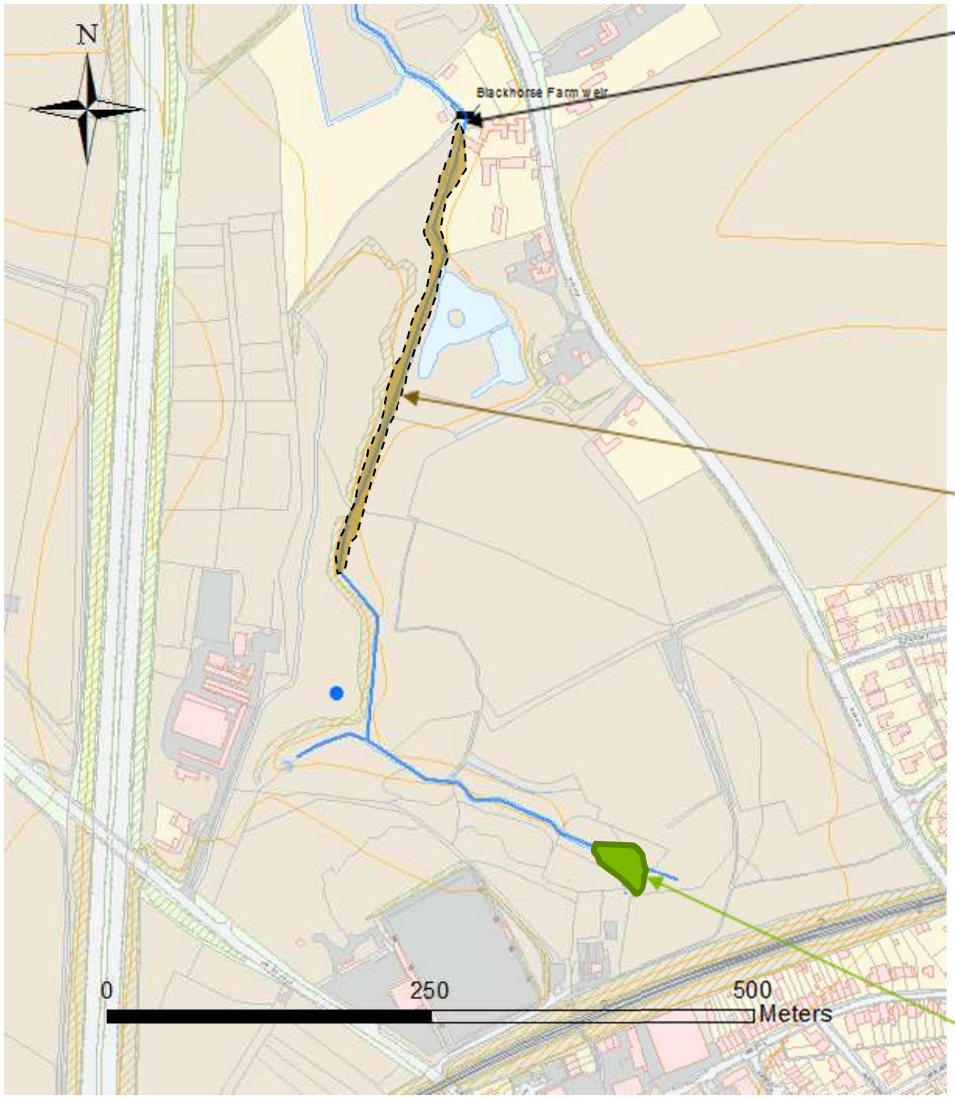
Consisting of a stand alone ABH discharging around 0.4 Ml/d with n.2 discharge points



AMP7 planned interventions – Draft (design phase tbc)

3. River restorations

Consisting mainly of creation of a wetland, channel narrowing, small barrier removal, weir bypass and permanent flow gauge

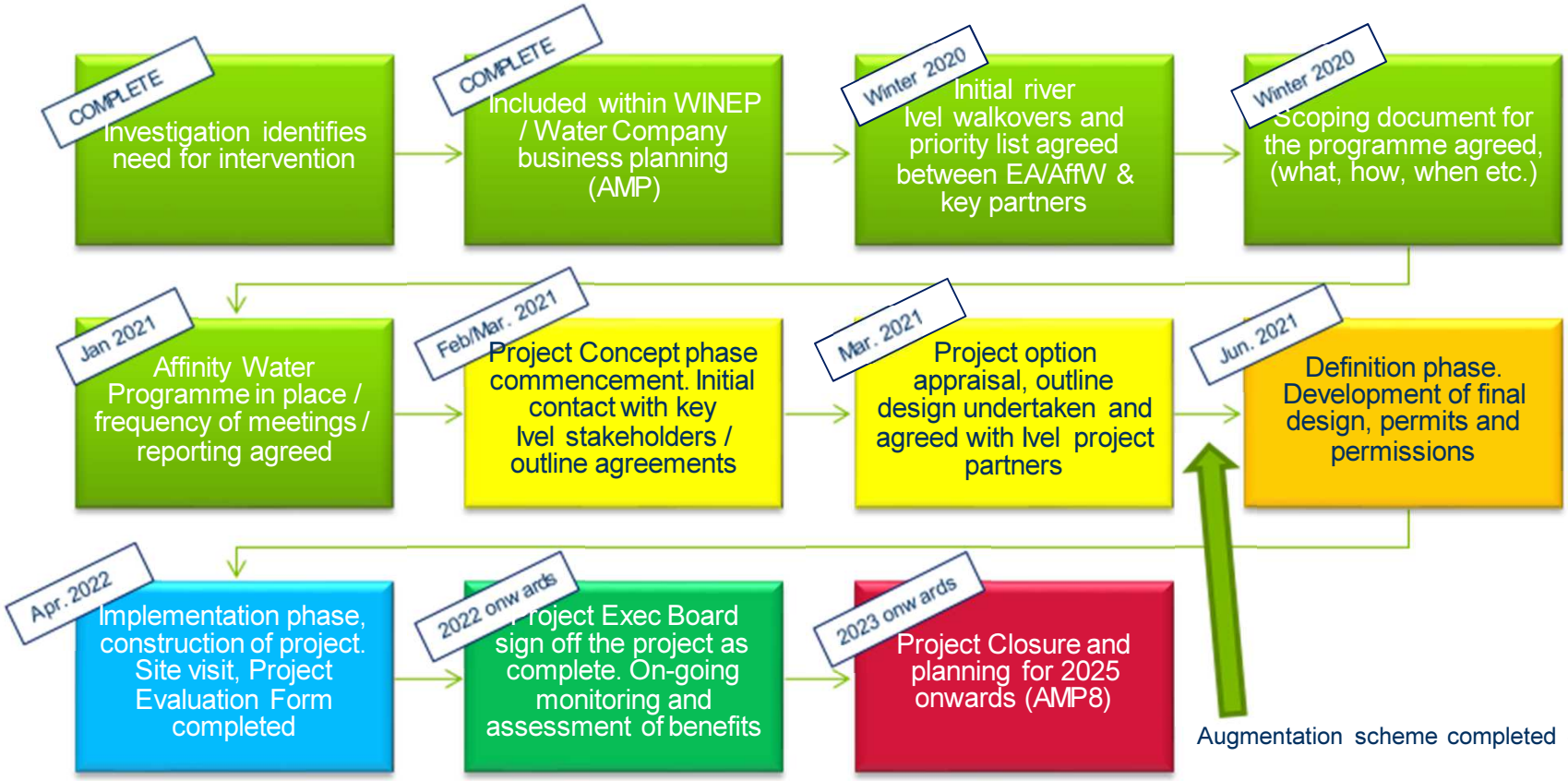


Weir bypass, flow gauge installation

Channel narrowing to improve ecology and approach Chalk stream features

Wetland to mitigate contaminated storm water and silt entering the channel; maintenance to be undertaken by HCC and FBGS

AMP7 planned interventions – River Ivel Restoration Timescales



Before… *during…* *after…River Restoration at Noake Mill*

Environment Agency Water Industry National Environment Programme (WINEP) Requirements for AMP7

- Why 0.4 Ml/d augmentation discharge rate was proposed:

Affinity Water spot gauged the Ivel on 30th January 2018 and found it flowing from the spring (0.4 Ml/d at the spring SG point). It is believed it was groundwater as the temperature in the water was around 10 degrees Celsius and the air temperature was 0 degrees Celsius. The total abstractions had not changed during December and January (December = 10.73 Ml/d January 10.81 Ml/d). Last time the Ivel spring spot gauging point was flowing was Feb-Apr 2016.

It is proposed that 0.4 Ml/d is the likely quantity needed to support the flow of the spring. This quantity has been put forward in the bid for AMP7 in the WINEP spreadsheet dated March 2018. This figure is for planning purposes only and the actual figure needed for river support will need to be finalised and agreed during AMP 7. There is uncertainity whether groundwater levels are still recovering from the dry period and therefore 0.4 Ml/d might be an underestimate. Once the groundwater model has been recalibrated using the information from the field investigation, the groundwater model could be used to gain a better assessment. The groundwater model currently gives EFI Q95 as 0.54 Ml/d.

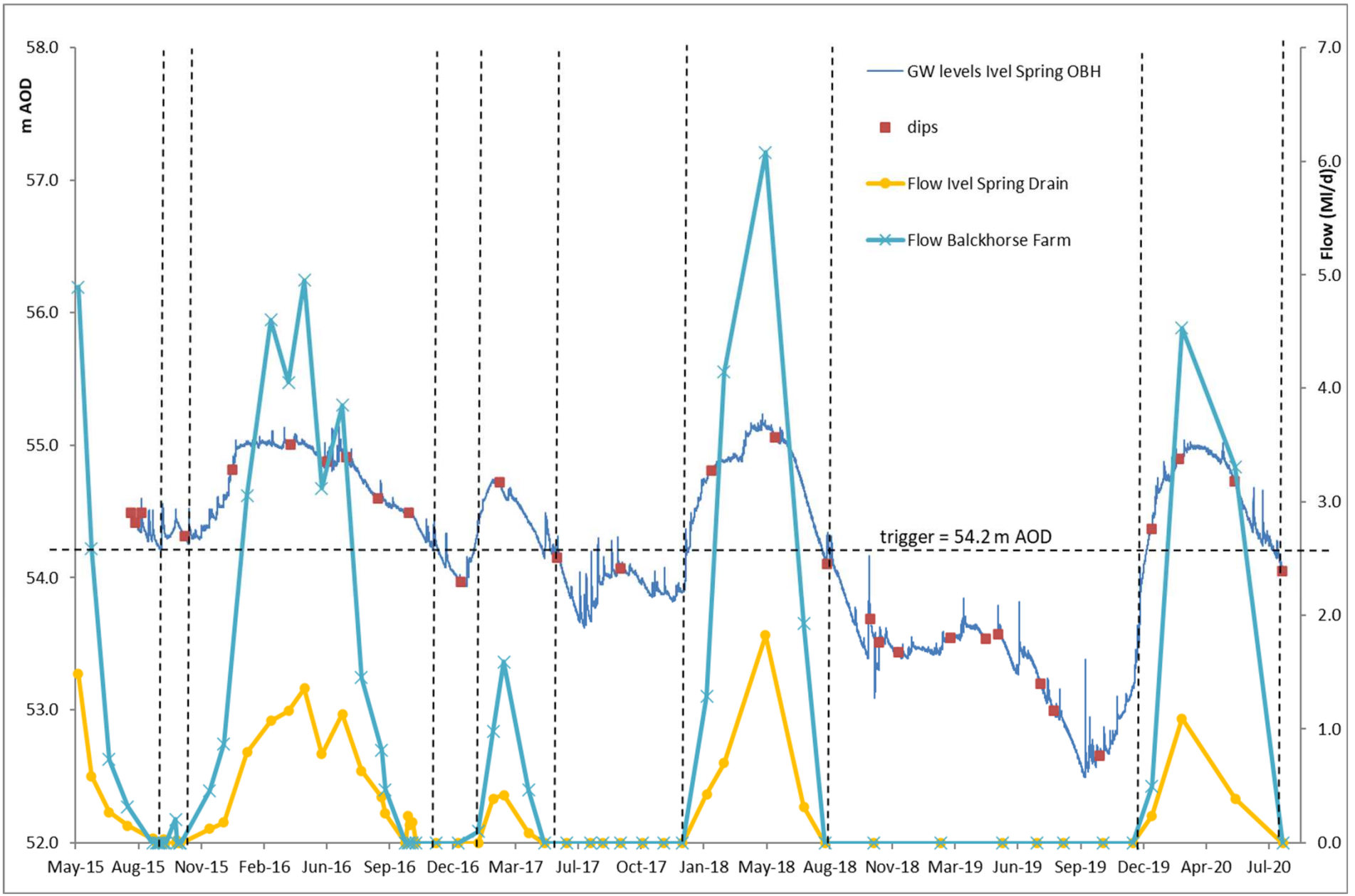
Spring Flow conditions before and after rainfall recharge effect

22 Dec 2017 Total Abstr = 10.9 Ml/d - Dry

31 Jan 2018 Total Abstr = 10.9 Ml/d Flow = 0.4 Ml/d

9 Dec 2019 Total Abstr = 12.9 Ml/d - Dry

9 Jan 2020 Total Abstr = 13.0 Ml/d Flow = 0.2 Ml/d

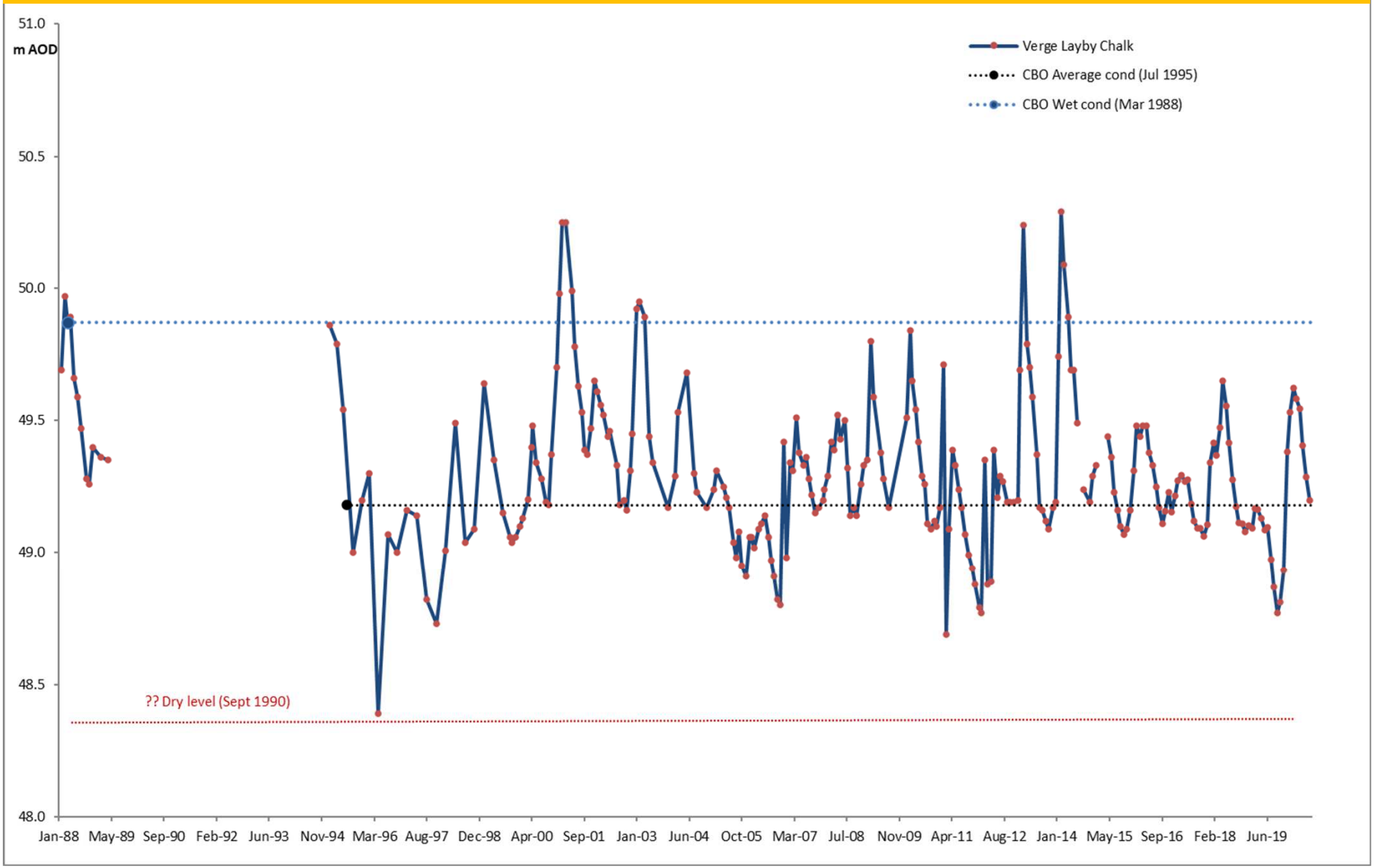


This graph shows that the spring (yellow line) goes dry when GW levels at the OBH go below 54.2 m AOD. The proposal is to act ivate the trigger for GW levels below that threshold; alternatively a flow trigger could be identified once the proposed gauge station at Blackhorse F arm is established and calibrated

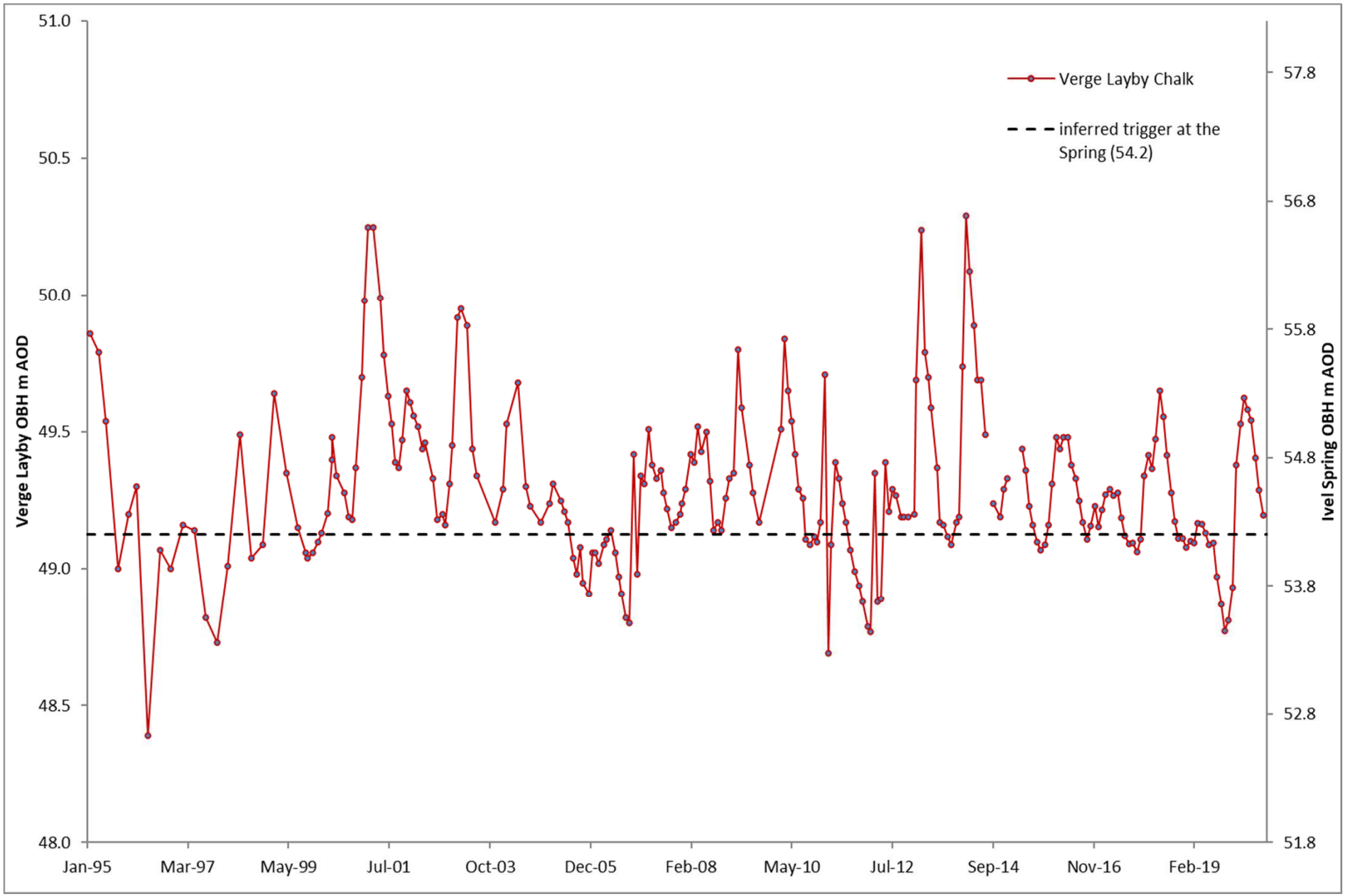
updated to
3rd Aug 2020

Reference historic OBH for the catchment

This hydrograph represents the GW levels in the Chalk at Radwell (Verge Layby OBH); the only historic existing OBH in the cat chment, used for GW model calibration; The OBH is not influenced by the abstractions pattern. Tt shows that currently GW levels are currently at average conditions and 2019 was similar to other dry periods (2012, 2006, 1997) whilst 1996 drought was worse; the reference dry period of the GW model is Se pt 1990 (assumed even worse)



Reference historic OBH for the catchment and proposed trigger



This graph gives you an idea how often the proposed trigger at the spring would be active and the augmentation discharge implemented

Summary

- River restoration works aim to improve the ecology and the riparian habitat of the Spring and mitigate the effects of the urban storm water discharges

- The augmentation scheme aims to mitigate the effect of abstractions on GW levels at the spring and consequently the impact on spring flow, shortening / preventing dry periods events

- 5 years of **monitoring data suggests** that even in absence of PWS abstractions, for droughts more severe than 2019, the spring would have been dry; this is based on extrapolation of AMP6 signal test data, because no long term full outage has occurred and monitored adequately in the past

- The proposed 0.4 Ml/d augmentation rate is close to the calculated EFI and is going to be refined during the implementation phase testing

- From the 1800s until 1960, reedbeds existed at the top of the Spring to treat and discharge Baldock effluent into the river, effectively closing the catchment water cycle (e.g. the water abstracted was also returned back into the same catchment). After 1960 Anglian Water relocated the STW in Letchworth and stopped discharging; only urban storm water and emergency sewerage overflow are kept in Baldock

- Anglian Water currently does not intend to reinstate treatment process at Baldock PS. The implications of the proposed development (north of Baldock) have been considered but not included in AMP7 investment plans, as planning permission is yet to be granted? The most likely investment option would include upgrading of the storage / pumping capacity, although this is yet to be confirmed

Strategic Resource Options (SRO)

Affinity Water

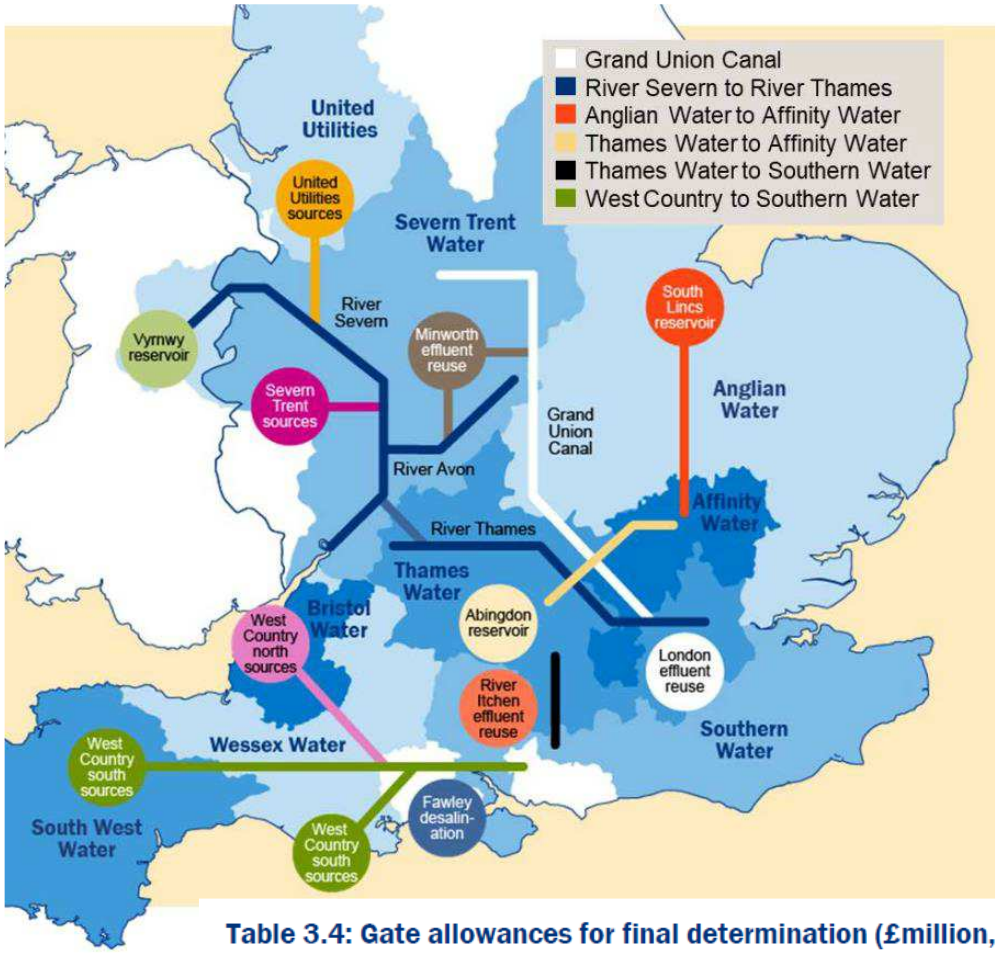
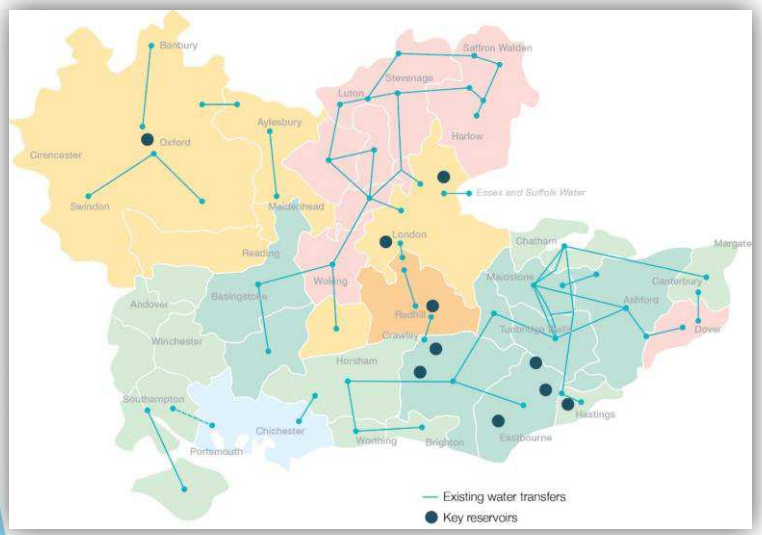
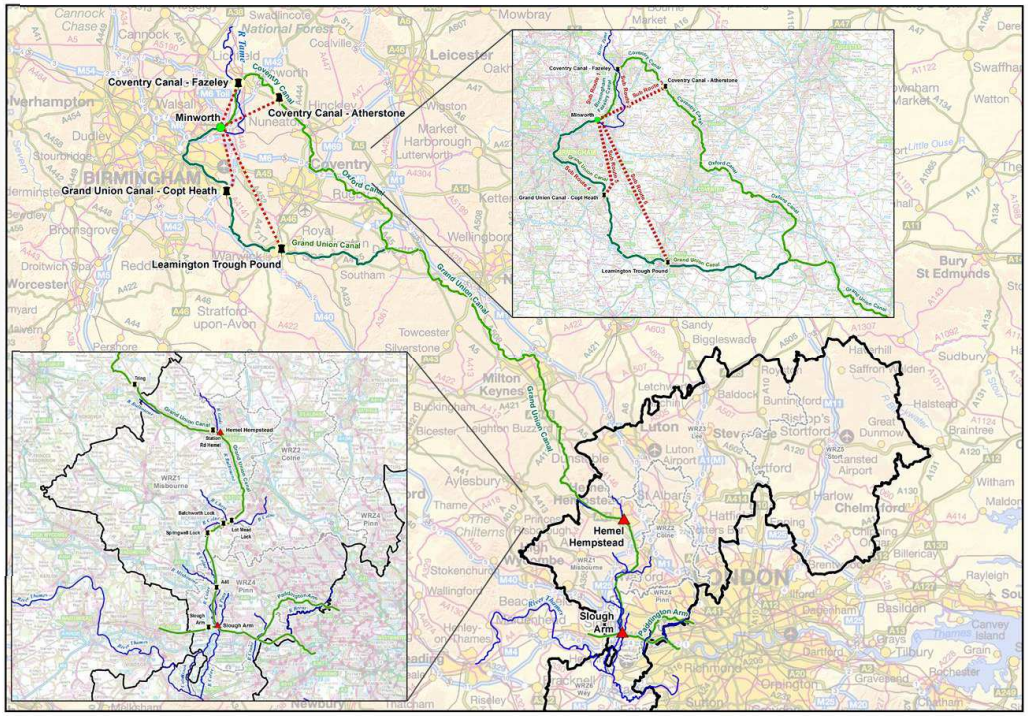


Table 3.4: Gate allowances for final determination (£million, 2017-18 prices)

Gate	Proportion of maximum development allowance (%)	Maximum development allowance (£million)
Gate 1	10	46.9
Gate 2	15	70.4
Gate 3	35	164.2
Gate 4	40	187.6
Total	**100**	**469.0**

Affinity Water





Affinity Water

Any Questions ?