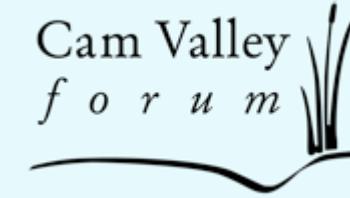




Our best local chalk Stream: in good times



Why all is not well with the River Cam : 2

Stephen Tomkins



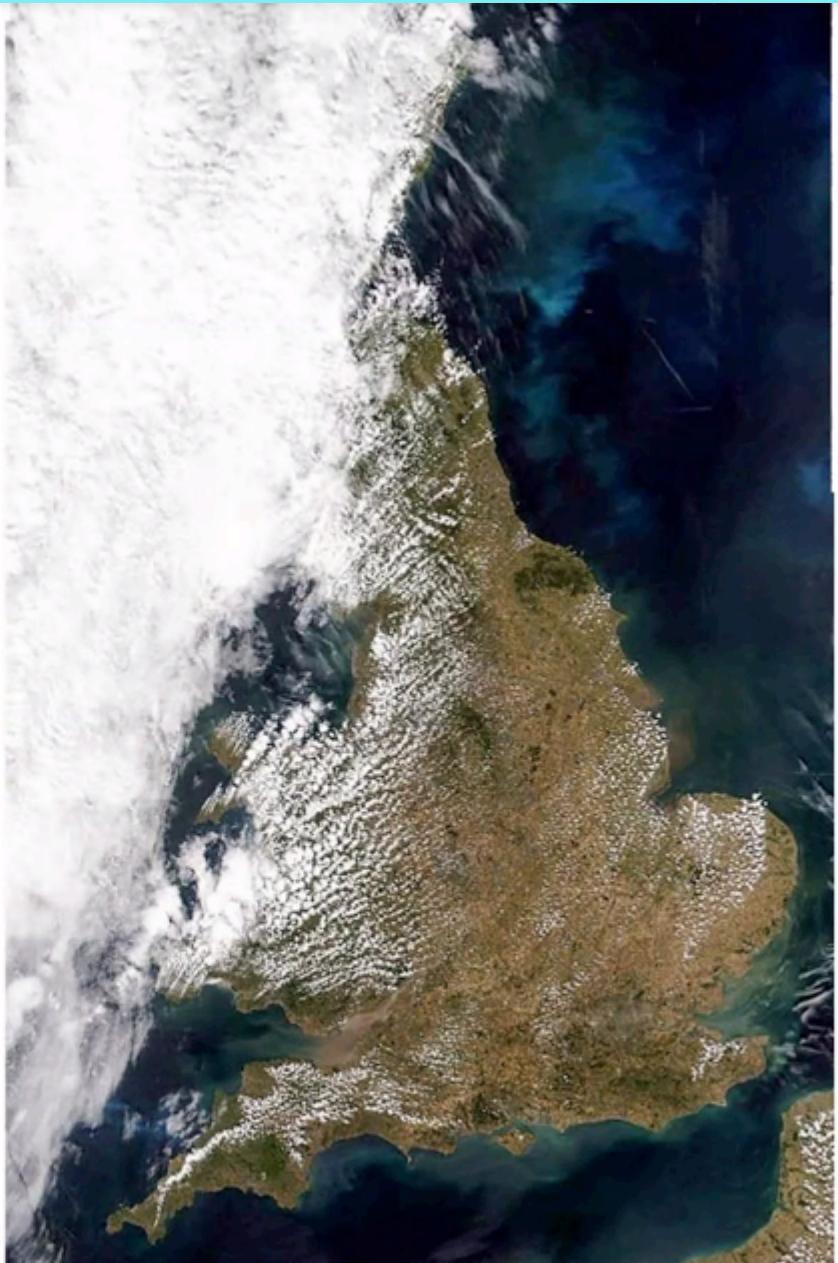
The empty Granta: in bad and dry times

Part 2 (of two parts)

- Climate and climate change
- Drought and Augmentation
- River Pollution
- Why were we are is an unsustainable position
- What water we are taking from the environment
- Why we certainly do have a groundwater crisis
- Saving Water
- What we can all do and the need to be future positive



Early May 2018



16 July 2018

Climate Change



University of Cambridge Botanic Garden

John Kapor

Katie Martyr

25th July 2019 Britain's hottest day ever 38.7° C

Hotter summers ?

Local Cambridge evapotranspiration has risen by only 5% during the last 120 years.

Stantec



Droughts and Augmentation: a good idea at the time

During the mid 1970s drought, the Cambridge Water Company (unusually) had no restrictions, but Nine Wells dried up for the first time in its recorded history and possibly for the first time since the last Ice Age. Wetland SSSIs were then threatened.

1991 saw a 'three year drought'. The **Ground Water Support scheme** was initiated. It was in place by 1996.

"This river support scheme is now under construction. It has been possible to manage the water resources of the area in ways to benefit all concerned. The provision of increased water for public supply will not be at the expense of low flows in rivers, streams and wetland conservation areas."

Hydrological Basis of Ecologically Sound Management of Soil and Groundwater
(Proceedings of the Vienna Symposium, August 1991). IAHS Publ. no. 202, 1991.

Groundwater support of stream flows in the Cambridge area, UK

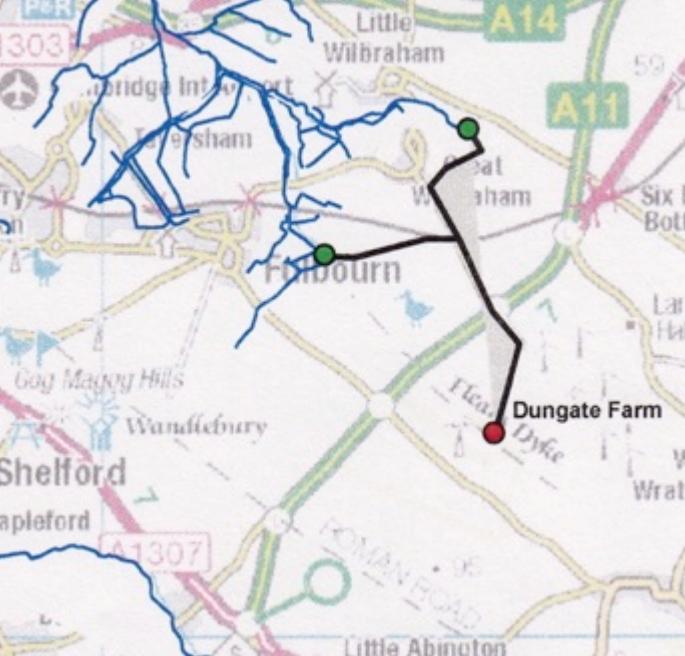
K. R. RUSHTON

School of Civil Engineering, University of Birmingham,
Edgbaston, Birmingham B15 2TT, UK

N. P. FAWTHROP

National Rivers Authority, Anglian Region, Peterborough
PE2 0ZR, UK

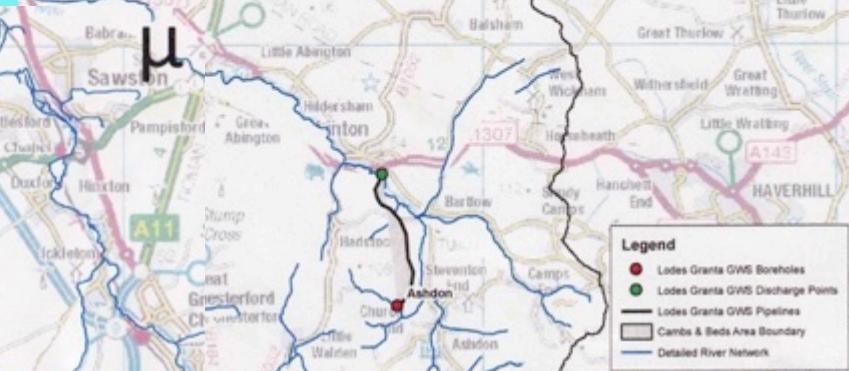
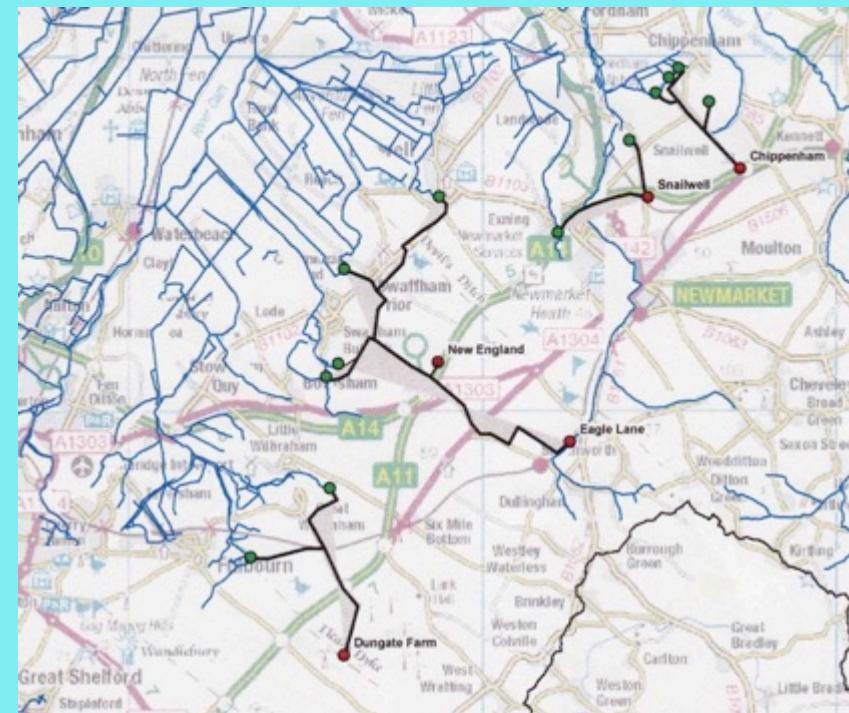
ABSTRACT This paper describes a feasibility study for the maintenance of stream flows during dry summer months in an area of Cambridgeshire. Groundwater pumped from boreholes is used for augmentation. A mathematical model was used to represent the study area and led to an improved understanding of the aquifer flow mechanisms. Groundwater flow within horizons of high hydraulic conductivity is controlled by rapidly fluctuating head gradients. The model was subsequently used to aid the design of a river support scheme.



14 pumped
borehole
sources

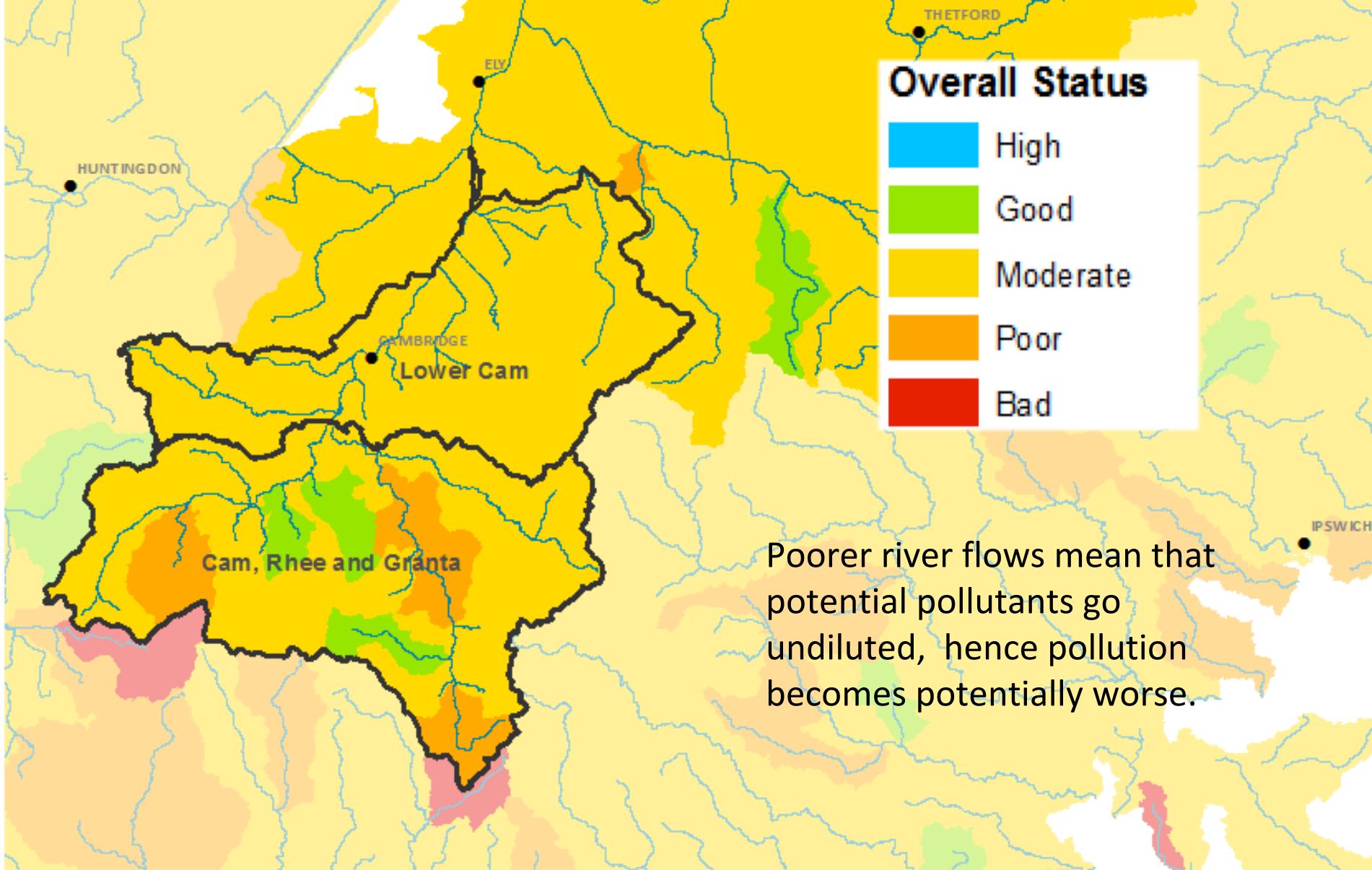
28 'spring'
outfalls to
chalk
streams

The Groundwater Support Scheme



Augmentation may save our rivers in a drought - but relying upon this scheme is to deny the reality of our present over-abstraction.

Robbing Peter to pay Paul



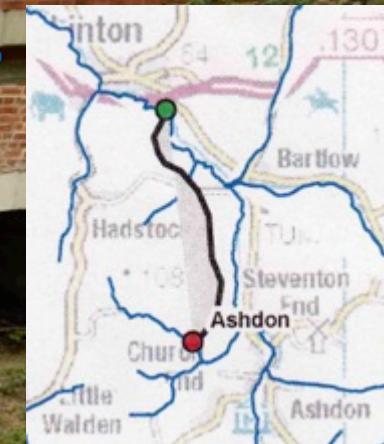
The Water Pollution Status of the River Cam

(last full survey by Environment Agency was 2016)

Pollution

- The EA data on this is quite superb but is little known by the public. The Environment Agency has been cut back relentlessly in the past 6 years.
- With reduced river flows insufficiently treated sewage and septic tank leakage is not diluted. The Cam, from Saffron Walden, south of Byron's pool has **poor water quality** largely for this reason.
- There are still small sewage works not removing phosphate sufficiently.
- Milton Sewage Works (Anglian Water) is now greatly improved and can fully process 1276 litres of sewage per second. But it's not perfect.
- Cam river flows at Baits Bite may be > 40% treated sewage by volume , at low flow times. Upstream Haslingfield STW suffers massive storm overflows.
- **Biodiversity:** Cambridge has already **lost 23 species of water plants** out of 66 species once recorded here. This is largely attributed to historic water pollution.

In summer 2019 the River Granta had a continuous augmentation from the chalk water aquifer, added above Linton, 15 km upstream from this bridge. This was piped into it for 4 months (June to Sept).



Downstream of Linton all the treated sewage effluent from the villages of Linton, Haslingfield, Abington, and Babraham was added to the River Granta.

At Stapleford the river was dry

Where did all that water go?

The Inconvenient Truths again

We all value our own drinking-water supply. We all flush the loo. We all waste it!
So do we need to own more of the responsibility for our water resources?

This is already a water stressed region: Chalk streams are dying across south east England.

The rainfall is unpredictably variable, year on year. There will be greater 'droughts' than 2018 -2019 in the years ahead.

The summers may well be hotter (> 38.7 C again ?) In hotter weather more water is used by both green plants and people (5-10% up in hot summers).

The autumns are now greener for longer, therefore winter recharge time is lessened.
The winters may be drier (a 40 year trend ?) or wetter, but there is already not nearly enough water for environmental well-being.

There are very big projected human population increases for the Cambridge region. There is a greater need for better and 'greener' environments for all people NOW, and if we are to 'double nature' it certainly cannot be done without water.

Is this sustainable ?

How do we fix it?

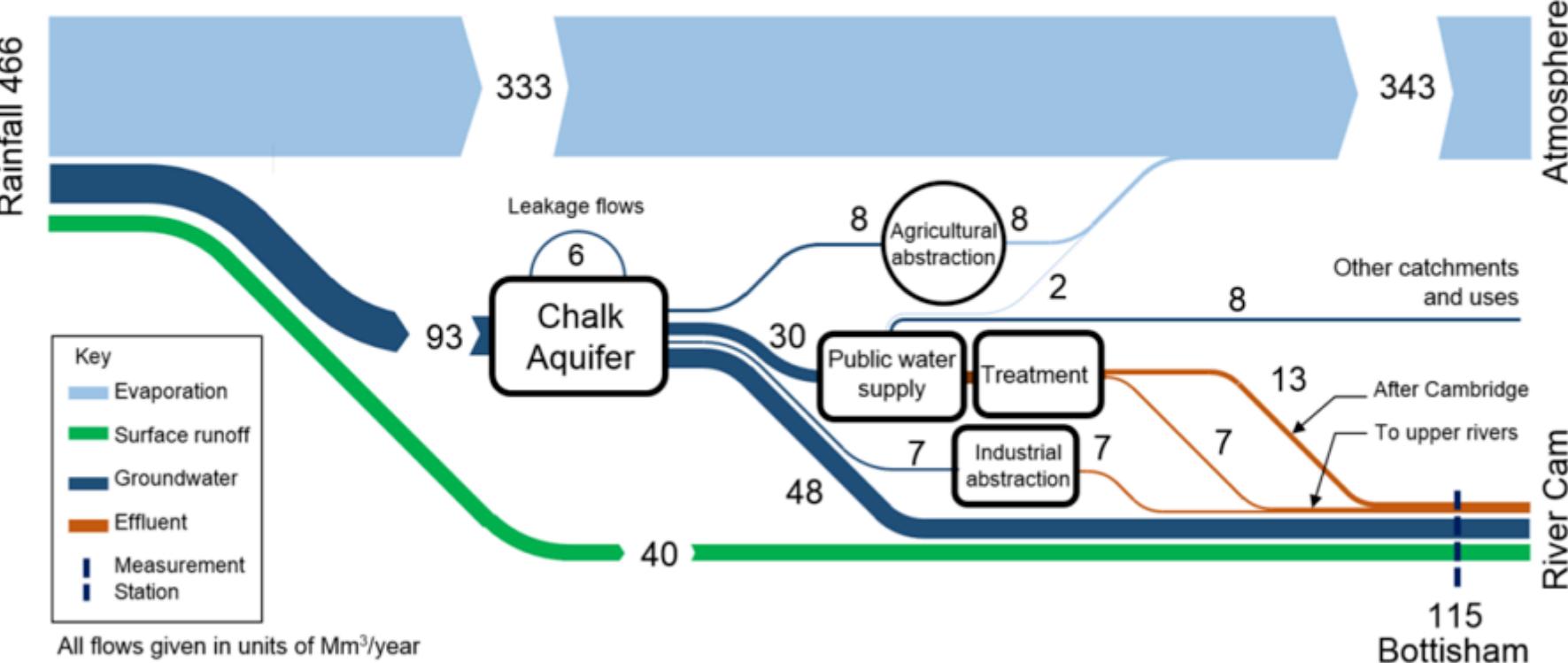


Figure 4: Average flows of water within the river Cam catchment, in units of $Mm^3/year$

Modeling the problem. On average, half the ground water that might have gone into the river Cam is abstracted for industry, for domestic use and irrigation.

In a drought time there may be nothing flowing from springs into the river at all, except for water recycled from sewage treatment works.



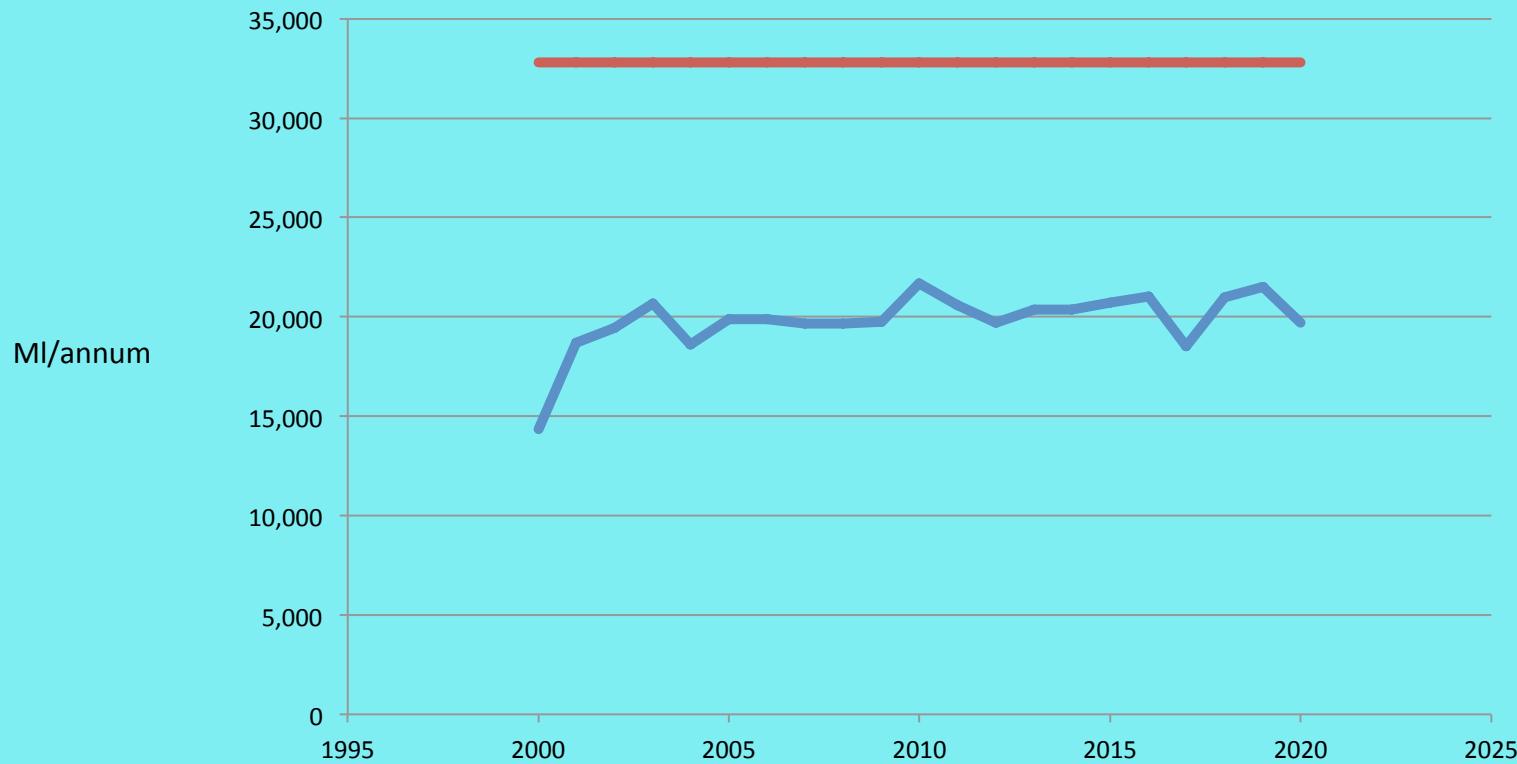
2.5 megalitres in an
Olympic Swimming pool

The Cam catchment's groundwater Chalk, just upstream of Cambridge, is supplying **22** Olympic Swimming pools of water daily to the two local water companies - Affinity Water (35%) and Cambridge Water (South Staffs) (65%). This is largely for drinking water.

Cambridge Water Company is licensed to abstract (82 megalitres) 33 Olympic Swimming pools daily from its full catchment. Currently they are well within these set limits.

Anglian Water, Cambridge Water and Affinity water abstract **42 Olympic Swimming pools** in total, every day. This is the measure of the River Cam loss of flow.

Affinity Water and Cambridge Water's licensed , and actual total abstractions
From the Chalk aquifer of the Cam, Rhee and Granta - upstream of Cambridge.
(Annual totals are megalitres/annum)



The licensed (ceiling) total has been unaltered since they were first allocated in 1960s and 70s.



The Groundwater Crisis

Cambridge City initiated a Climate Strategy in 2016.

This was stepped up to a ‘Climate Crisis’ in 2019.

Because of the state of the River Cam in Sept 2019, highlighted by the *River Cam Manifesto*,

Councillor Katie Thornborrow held a ‘Water Forum’ in November 2019. At this the EA staff admitted that the Water companies were indeed “over-licenced”.

‘Our groundwater model suggests reductions in overall abstraction in the Cam catchment of 60-70% would be necessary to meet environmental flow targets, and hence contribute towards achieving good ecological status under the Water Framework Directive (WFD).’

However, ‘reductions in abstraction to secure Good Ecological Status under the Water Framework Directive are subject to a cost-benefit assessment’

Some Solutions to the Groundwater Crisis

- Substantial reductions in Ground water abstraction
(Affinity Water have begun cuts!)
- Fixing the Leaks
- Metering of all water use
- Managing demand better
- Investment in alternative sources: a Fen Reservoir
- Investment in greater water re-use and recharge
- Investment in rainwater harvesting and grey water recycling

Groundwater in the Chalk has a resilience of its own against drier winters. Chalk streams should run all year and every year whatever the weather.

Over-abstraction has pushed it further and further into being a smaller resource.

The licensing system is a nonsense if the river is the loser.

The Greater Cambridge partnership (City + South Cambs) commissioned STANTEC in 2019 to report on 'future water resources'. The preliminary report in Nov 2020 stated:

'There is no capacity to increase groundwater abstraction from the Chalk aquifer. Future water demand and supply will need to be balanced in other ways', including 'major new regional water supply reservoirs, transfer schemes and land use change.'

THE WATER SUPPLY
OF
CAMBRIDGESHIRE,
HUNTINGDONSHIRE,
AND
RUTLAND

FROM UNDERGROUND SOURCES.

BY
WILLIAM WHITAKER, B.A., F.R.S.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HIS MAJESTY'S TREASURY.

More than 100 years ago

The gaugings were taken on March 29th by Wm. Fox, and the levels by HAROLD WARREN.

Melbourn Springs	-	-	77 feet above Ordnance Datum. 4,000,000 gallons a day.
Shepreth Springs	-	-	72 feet above Ordnance Datum. 4,400,000 gallons a day.
Thriplow Springs	-	-	75 feet above Ordnance Datum. 1,100,000 gallons a day.

Glossop & Sowerby - 71 to 74 feet above Ordnance Datum.

In 1920 the Shep had 14 Cubic metres of water per minute.
In 2020 it was much less, yet now augmented as well.

Fixing the leaks

At present there is **23%** leakage from abstraction to supply delivery.



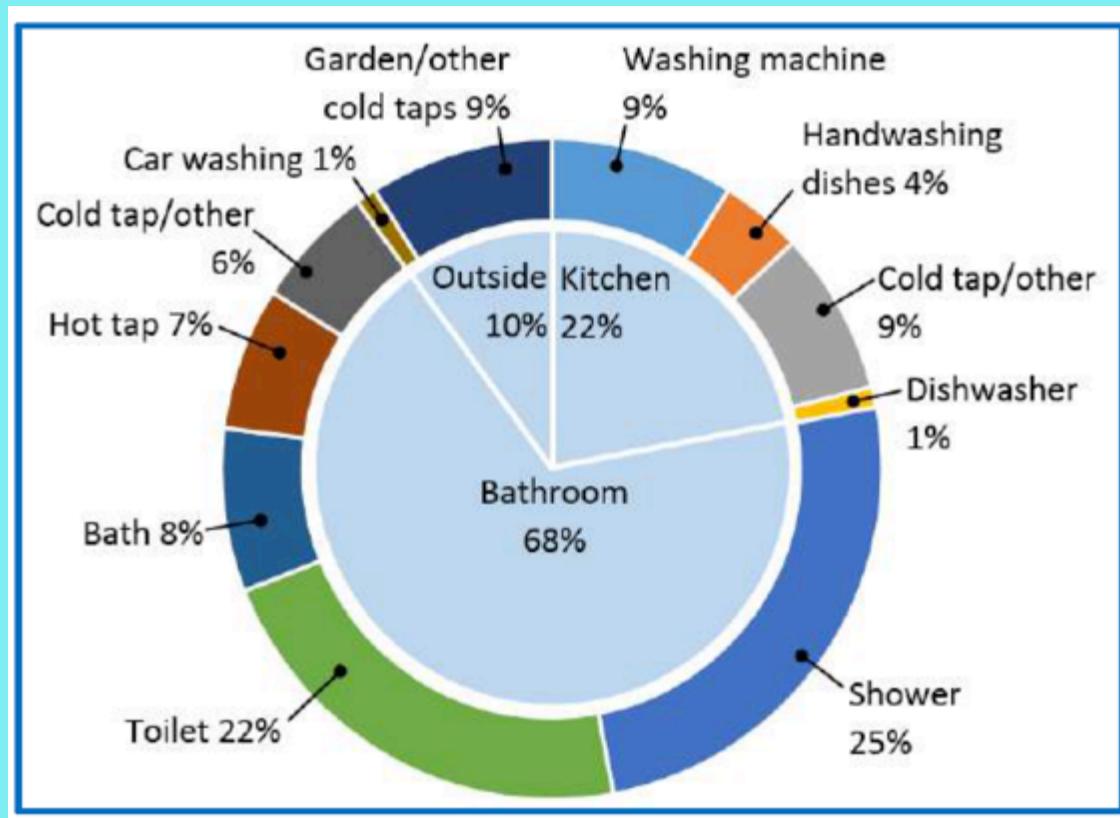
Cambridge Water recently stated ‘By 2024/25, we will reduce total leakage on our network by 15% from 2019/20 levels.’

That is a saving of 2 megalitres/day from 13.5 megalitres/day

These leakages are over the entire supply area: the remedy is long and hard and expensive. Leaks matter more in some places than others.

Domestic Water Saving and the price of water.

Water that has been abstracted, stored, treated to drinking water standards and distributed through water mains to homes and businesses is a valuable high-quality resource.



Your domestic supply costs you around £0.88 per 1,000 litres.
Its price contrasts markedly with that of petrol at £1,100 per 1,000 litres

Should we change the pricing? Ask OfWat

The Cambridge Water Company Water Saving Campaign

It's easy to save water, energy and money

Find out how and where you use water in your home and discover easy ways to reduce your use, small steps at a time.



How to save water, and the Cam

- Don't flush every time you pee
- Reduce quantity of water in WC cisterns; if dual flush, use the lesser flush when appropriate.
- Fit aerators to taps.
- Have brief showers instead of baths.
- Don't run the tap when brushing teeth.
- Use a bowl when washing-up and only use the dishwasher and washing machine when full.
- Install water butts with drain downpipe connectors
- Wash the car with a bucket and sponge, rather than a hose.
- If your water supply is not metered, apply to have a free smart meter installed.
- Act promptly to repair or replace any leaky appliances, dripping taps or overflowing cisterns

Table 2. Water saving tips. Source: [Cam Valley Forum](#)



How much do people really care about water shortages?

The majority of people say that they are not concerned about water shortages, but most think that they, as the customer, have the responsibility to save water.

Scarcity does not seem to drive frugality

Metering is effective in reducing demand, but the 78% of people (nationally) who don't have a meter don't want one.

Our Challenges to the water companies and OfWAT

- Should we not now have compulsory metering ?
- Should we not have progressive water pricing through OfWAT?
- Should OfWAT not be more concerned with Environmental welfare as well as equitable water pricing to consumers?

Restriction measures	Restriction Level				
	Water wise	Level 1	Level 2	Level 3	Emergency response
Watering: hosepipe / sprinklers	Allowed (before 0900 or after 1800)	1 hour (Tuesdays and Saturdays)	1 hour (Saturdays)	Not allowed	Not allowed
Watering: drippers/drip line/soaker hose or bucket / watering can	Allowed	Allowed	Allowed	1 hour (Tuesdays and Saturdays)	Not allowed
Sports fields / parks (sprinklers)	Allowed	1 hour (Tuesdays and Fridays)	1 hour (Tuesdays)	1 hour (Tuesdays)	By exemption only
Swimming pools	Allowed subject to conditions (e.g. must have a cover)	Allowed subject to conditions	- Topping up allowed subject to conditions - No filling / refilling	- Topping up allowed subject to conditions - No filling / refilling	No topping up No filling
Car washing (privately)	Allowed	Bucket or high pressure/ low volume cleaner	Bucket only	Not allowed	Not allowed
Informal car washes	Allowed	Bucket or high pressure/ low volume cleaner	Bucket only	Bucket only	Not allowed
Commercial car washes	Allowed	Allowed	Allowed	Allowed	Not allowed
Water features	Allowed	Allowed	Not allowed	Not allowed	Not allowed
Other (e.g. no hosing down of paved areas with potable water)	-	-	-	-	Additional emergency restrictions may be determined
Targeted water pressure (bar)	>2.4	>2.4	>2.4	>1.2	>0.5
Dam level trigger points	>80%	70%-80%	60%-70%	45%-60%	<45%
Water use target per person per day		120		105	100-70-50

Who tells you to save water ?

Once in about 20 years CWC has a hosepipe ban.

In water stressed **Capetown** it is the local government that holds the whip hand.



In Cambridge, local government has little or no say.

What else can we do?

Change Building Regulations to reduce water consumption

Requiring all homes in England to be built to 110 litres per person per day is possible, under Part G of regulations, and would be no additional cost. However, in order to help alleviate future supply-demand deficits much tighter standards are required.

Water efficiency labeling of appliances

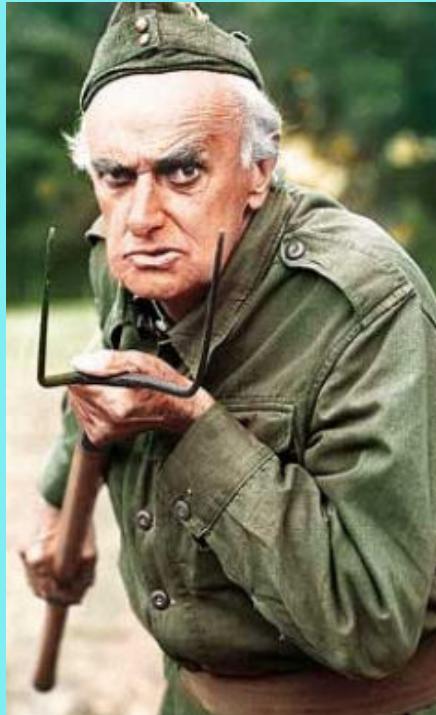
Annual hose-pipe bans could be mandatory

Compulsory metering has been shown to reduce water use and helps to identify leaks. Metered customers do use around 33 litres (24%) less water per day than unmetered customers.

Smart Metering leads to more efficient and more accurate leak detection and fixing, and it can help customers track and understand their consumption.

None of these address the existing unsustainability of our present practice

Increased demand is by any ecological measure unsustainable.



The River Cam's Future?

The choice

Private Frazer

or

Professor Andrew Balmford

"we're
doomed"



"we are
doomed if
we lack
Earth
optimism"

Being Future Positive

- Cambridge could have better water quality and the best Chalk streams in East Anglia – if we lived more ecologically.
- We have a great River heritage to value and protect.
- We have keen volunteers who will work for these ends.
- We have a relatively wealthy public who might pay more for their natural environment and its well-being.
- We have wonderful wildlife which will provenly bounce back if we give it a chance.

References: on line at <https://camvalleyforum.uk/>

Cam Valley Forum Web pages:

- ‘*The River Cam Manifesto*’ (2019)
- ‘*Let it Flow!*’ (2020): an important paper.
- CVF submissions to EA, CWC, WRE and OfWat

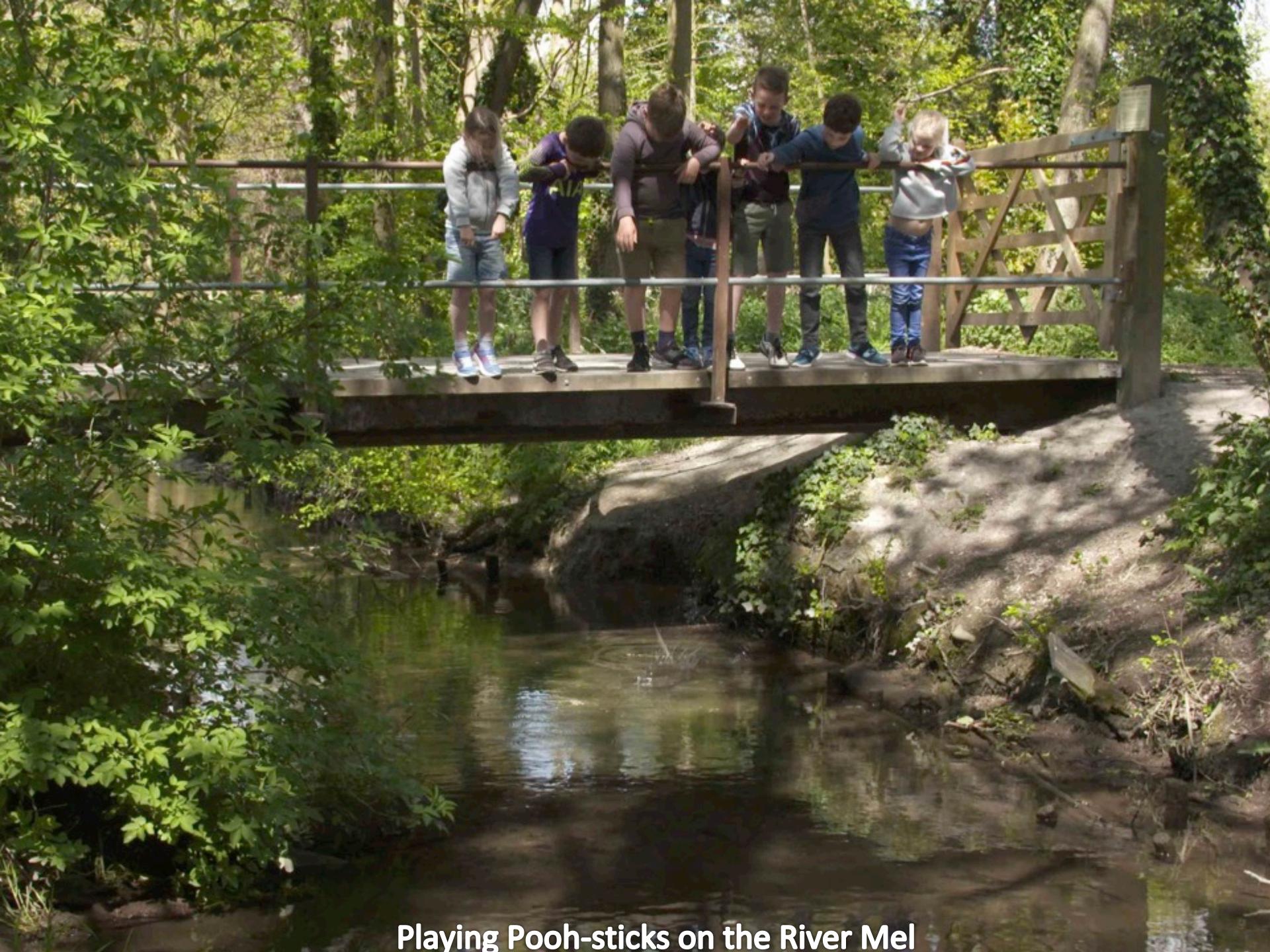
Water Resources East

Cambridge Water Company Reports

OfWat publications.

Acknowledgements:

Cam Valley Forum committee members, notably Dr Alan Woods, Dr Joe Stallard, Rob Mongovan, Ruth Hawksley, Dr Bob Evans, and Michael Goodhart, and Dr Steve Boreham of the Hobson’s Conduit Trust .



Playing Pooh-sticks on the River Mel

Part 1 (of two parts)

- The Cam
- Why all is not well with the river (summary)
- Some history of where our water supplies come from
- Water shortage, Low river flows, Pollution & Loss of wetlands
- All about Chalk streams and why they matter
- Rainfall and river flows
- Winter rainfall is key aquifer recharge
- Climate and climate change