FWR NEWSLETTER
. . . from the Foundation for Water Research
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Welcome to the winter issue of the FWR Newsletter

After several rounds of consultation, the new River Basin Management Plans are due out any day soon. In our feature article, Clare Rodgers from Royal HaskoningDHV guides us through the next stage of River Basin Management Planning, as the second cycle of the WFD begins (2015–2021). She explains what has changed between these and the first set of plans produced in 2009, including new levels of reporting, the updating of assessment methods, and the instigation of the Catchment Based Approach.

In his final edition of *Wastewater Matters* Tim Evans delves into the thorny issue of working in silos as opposed to taking a pragmatic approach. We say hello to our new Wastewater section co-ordinator, Steve Bungay of Helix Environmental Consultancy Ltd – read about him on page 7.

Finally, thank you to Mike Waite who tells us about the recent conferences *Drinking Water 2015* and *UV Disinfection for Cryptosporidium Control.*

For information on events and news highlights please go to our website *www.fwr.org.* You can also contact us via email *(office@fwr.org.uk)* or telephone (01628 891589).

Maxine Forshaw - Editor

THIS ISSUE

A New Phase of RBMP

RIVER BASIN MANAGEMENT PLANNING - a new phase

Clare Rodgers
Senior Catchment Management Specialist, Royal HaskoningDHV

THE BEGINNING OF 2016 marks the start of a new phase in managing the water environment.

Building on the lessons learned and progress made since the first River Basin Management Plans were published in 2009, the Environment Agency, Natural Resources Wales and the Scottish Environment Protection Agency have produced a new set of plans for the next six years. These statutory strategic plans are issued to the EU on a six-yearly basis as part of the UK government's commitments under the Water Framework Directive (WFD), and the objectives set out in these plans are legally binding. As such, River Basin Management Plans are one of the best available information sources regarding the views and priorities of the UK government and its agencies for the water environment in the future.

This article highlights the main changes that have occurred since the production of the first River Basin Management Plans and discusses how the information provided by these plans can be useful for a range of end-users, from local catchment partnerships to national and international policy organisations.

WHAT HAS CHANGED?

From national to local level, River Basin Management Plans set out the UK government's views on the state of the water environment (rivers, lakes, groundwater, estuaries and coasts) and how this will be improved between 2016

and 2021. The plans cover the current health of individual water bodies (classification), the targets for their health in the next planning cycle and beyond (objectives), the issues that adversely affect water body health (pressures), and the activities that will be carried out to address these issues (measures and actions). This information is broken up into twelve large regions or River Basin Districts which are managed either individually or jointly by the Environment Agency, Natural Resources Wales and the Scottish Environment Protection Agency.

The new River Basin Management Plans revise and update those produced in 2009. Differences between the two sets of plans reflect the changing environmental conditions on the ground (including improvements delivered as a result of actions carried out under the first round of plans) and changes to the ambitions and mechanisms for tackling environmental issues. However, some of these differences also reflect changes in how the health of the water environment is measured, processed and reported. It is important to understand this second set of changes in order to understand the new information and interpret changes in water body status between the two periods of River Basin Management Planning appropriately.

Based on a review of the Environment Agency plans for 2016–2021, made available last year, the main changes are:

- How the health of the water environment is measured and assessed.
- How the health of the water environment is reported (including new scales of working).
- Who is involved in making and reporting changes in the water environment.
- How data are being made available.

These main changes are described in further detail below.

ASSESSMENT METHODS

The methods by which water body status is assessed have been updated to include revised standards for nutrients, new chemical standards, new biological classification tools, and alterations to some water body designations and/or boundaries.

Revised standards are being used to assess the status of water bodies in terms of nutrients and some chemical substances, alongside a second generation of biological classification tools to ensure biological classifications are better at reflecting local conditions *(http://www.wfduk.org/)*.

The size and shape of some water bodies have changed to become more logical management units. In particular, many small surface streams near the coast have been subsumed within adjacent coastal water bodies, in line with EU guidance on minimum water body size.

The designation of some rivers as Artificial or Heavily Modified Water Bodies has been reviewed and updated in the new plans (courtesy Royal HaskoningDHV)

Those water bodies designated as Artificial or Heavily Modified Water Bodies have been reviewed. Some water bodies have changed in terms of whether they are considered to be Artificial or Heavily Modified, some have been newly designated as Artificial or Heavily Modified, and some de-designated as a result of this review. The biggest change is that over 150 water bodies have been de-designated and are now no longer considered to be Artificial or Heavily Modified.

In England, the Environment Agency has also invested in a new ecological monitoring programme and new chemical monitoring. The aim is for the network to improve coverage of biological surveys and to have a greater emphasis on fixed sampling locations, making it easier to identify and report environmental improvement.

The impacts of climate change on the water environment have started to be considered in the second round of River Basin Management Planning through initial risk assessments at the management catchment scale. This is likely to become an increasingly important aspect of these plans in subsequent iterations, alongside closer integration with Flood Risk Managements Plans produced to meet the requirements of the EU Floods Directive.

NEW LEVELS OF REPORTING

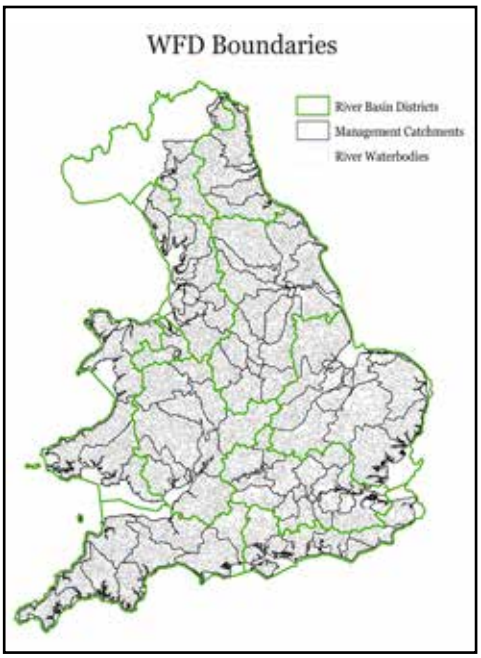
In the first round of River Basin Management Plans there were three scales of detail: River Basin Districts, for the overall plans; water bodies, for detailed local information; and management catchments between the two (broadly aligned with catchments used for flood risk management planning). A new scale of detail, operational catchments, has now been introduced between the existing management catchment and water body scales for reporting purposes. Groundwater bodies are considered in separate operational catchments to the overlying surface waters.

Local economic cost-benefit assessments have been carried out by the Environment Agency at operational catchment level, reported in the catchment summaries. The economic analysis sets out five investment scenarios for each operational catchment (surface water and groundwater) in England, from 'do nothing' to full investment of all technically feasible options, and looks at costs and benefits for each. These have been used to inform high-level investment scenarios and outcomes in terms of likely improvements in water body status across England as a whole.

THE CATCHMENT BASED APPROACH

In November 2012, I wrote an article for this newsletter regarding the development of Defra's new approach to improving the water environment through catchment-level engagement and planning. Three years on, the Catchment Based Approach has grown into a network of over 100 catchment partnerships representing the interests of local stakeholders and delivering improvements on the ground. The Catchment Based Approach is now embedded in the new round of River Basin Management Plans, and catchment partnerships have contributed local information to the catchment summaries as well as providing feedback through the consultation process.

The growth in the number and size of catchment partnerships across the country is a very positive indication of a move towards bringing about sustainable and effective long-term improvements in the water environment. Catchment partnerships harness the knowledge, skills, interests and enthusiasm of local stakeholders to develop appropriate solutions to local catchment problems and to share their experiences with others.



Three spatial scales used during the first round of River Basin Management Plans. An additional scale, operational catchments, has been added in the new plans between the existing management catchment and water body scales. (courtesy ccmhub.net)

DATA AVAILABILITY

At the time of writing, the finalised River Basin Management Plans are due to be published shortly. It is anticipated that the overall structure and content will align with the plans published for consultation in October 2014, updated with the more recent data and amended to reflect, as far as possible, the consultation responses received.

Draft River Basin Management Plans made available to date include a wide range of freely and publicly available information about the health of the water environment, which is explained through the accompanying *Accessing Data and Information Guide*.

The data available is spread across a range of spatial scales, with different scales suiting the needs of different users. For example:

- Local data at the water body scale and below are useful for practitioners working on the ground, including local catchment partnerships and other voluntary organisations.
- Data at the operational and water body level are useful for assessing the impacts of a new development and identifying suitable mitigation measures (WFD Compliance Assessments are now a key part of the Environmental Impact Assessment process for any scheme likely to affect the water environment).
- Management and operational catchment scale data are useful for Local Planning Authorities in making high-level decisions about land use planning, support Strategic Environmental Assessments, and can help local stakeholders to contextualise their work in relation to the spatial trends in pressures, objectives and measures across the region.
- Regional data at the River Basin District level are useful for strategic planning by water and wastewater companies in terms of where to focus resourcing to tackle particular types of issue.
- National data can help both government and national stakeholders make appropriate policy decisions and inform priorities for research and investment.

The River Basin Management Plans have been updated to reflect improvements in the water environment, such as the restoration of this former culverted channel under Wandle Park in Croydon (courtesy Royal HaskoningDHV)

Based on a review of those draft River Basin Management Plans for 2016–2021, made available by the Environment Agency last year, the following new information sources may be particularly helpful to practitioners seeking to improve the health of the water environment on the ground:

- A new tool, the Catchment Data Explorer *(http://environment.data.gov.uk/catchment-planning/)*, is now available as a searchable web-based map portal similar to the *What's in your backyard?* tool. It provides information on current and historic WFD classification, objectives and actions for each water body, in map and table form.
- Catchment Summaries produced by the Environment Agency and local catchment partnerships are available for each management catchment. These set out more detailed information about the catchment, including economic assessments of relevant measures and details of the local partnerships active in this catchment.
- River Basin District maps have been made available in 'GeoPDF' format (allowing users to select and deselect layers of information within the map) for wider context.

In addition to the information already available in these plans, the Environment Secretary Elizabeth Truss announced last year that over 2015/2016 most of the data held by Defra will be made freely available to the public through the department's 'Open Data' strategy. This will build on the data already available through the sources listed above and the Environment Agency's 'DataShare' portal (and equivalents in other parts of the UK). The strategy potentially has significant benefits for those seeking to improve the water environment, by making data held by Defra in connection with the health of local water bodies much more readily available.

THE NEXT SIX YEARS

River Basin Management Plans are one of the best available information sources regarding the views and priorities of the UK government and its agencies for the water environment to 2021 and beyond. The documents produced as part of this planning process are not only government policy – they provide helpful information for all those working to improve the water environment, including local catchment partnerships, water companies and local authorities.

As statutory strategic plans, River Basin Management Plans may appear to lack relevance at the local level; however, this article has argued that there is a range of information available through these plans at different spatial scales. Ultimately, in order to influence funders and decisions makers it is invaluable to understand their concerns and priorities; and understanding the wealth of information available through the River Basin Management Planning process is an invaluable first step towards engaging effectively with the organisations that wrote them.

Clare Rodgers (née Black) is a senior environmental scientist at Royal HaskoningDHV. This article is based on the Royal HaskoningDHV briefing note 'What's new in RBMP2?' For further details contact clare.rodgers@rhdhv.com. All views expressed are the author's own.

FWR Wastewater
the information centre for water, wastewater and related environmental issues

WASTEWATER MATTERS

Silos or Pragmatism?

Tim Evans, FWR Wastewater Section Co-ordinator

As was mentioned in the November newsletter, Steve Bungay has taken over from me so that I can devote time to my house in the UK and in France, the land associated with them both, and bicycles, etc. This will be my last *Wastewater Matters*.

November saw three conferences, which got me thinking about a particularly difficult theme: silos. Silo development is staying within one's comfort zone but it means that development will be uneven with disproportionate attention to some silos compared with others. For example, focussing on point sources and neglecting misconnections or worrying about 'emerging contaminants' but ignoring the condition of the buried infrastructure. We shall not achieve a resilient, sustainable future until we break out of the silos.

The International Year of Soils ended on World Soil Day, 5th December 2015, which was the weekend that Storm Desmond hit the UK and which also occurred whilst COP21 (2015 Paris climate conference) was taking place, as well as being my birthday. Soils are dynamic and complex; conclusions are likely to be wrong unless consideration is given to the interaction of chemistry, biology (micro and macro), physics, mineralogy, weather, additions, etc. It is folly to look at soils just from the depths of one particular silo.

The Queen remarked in her speech in reply to addresses from both Houses of Parliament in the year of her Golden Jubilee (2002) "We are a moderate, pragmatic people, more comfortable with practice than theory" but somehow, institutionally, we seem to have supressed pragmatism and evolved a culture of box-ticking. I think that box-ticking can be a substitute for good management, avoiding accountability, as does the syndrome of 'too many people having too many meetings making too few decisions'. When I had bosses (pre 2000), I was lucky that most gave me autonomy; as quid pro quo I was willing to get the sack if I screwed up too often; that never happened!

There are many examples around the world of integrating water into cities by retrofitting blue-green infrastructure for dealing with surface water, but too many practitioners in the UK have been too slow to 'just do it' until they have a 'theory' (preferably not based on foreign data). Of course, measurement and quantification are important (Lord Kelvin) but there is sufficient experience of practice elsewhere that we do not need to suffer paralysis by analysis.

Pooley bridge, Cumbria, stood from 1764 until being washed away by floods in December 2015 (Courtesy Peter McDermott)

4th – 6th November 2015 saw the ever-excellent CIWEM Urban Drainage Group (formerly WaPUG) conference *Sharing best practice & innovation to support delivery of outcomes* where hints of green shoots of change could be seen. There was talk of 'proactive over-reactive transformation' regarding drainage and wastewater management. There is a world of difference between 'if it ain't broke don't fix it' and 'wait until it breaks/collapses/blocks and then react'; proactive management should see more maintenance, condition monitoring and fewer breakdowns, and lower Totex (total expenditure). I expect it will also result in greater job satisfaction and self-esteem.

The 20th European Biosolids & Organic Resources conference was held on 10–11 November 2015. Despite the similarities and the potential synergistic benefits of linking the biosolids and other organic resources silos, it remains difficult in the UK and is becoming more entrenched because of legislation, regulation and vested interests. Ofwat and the OFT concluded [correctly] that there was potential benefit from introducing competition in the sludge management area but didn't recognise that, until the regulatory blockers are removed, the opportunities are trivial – footling at the edges. The WaSCs (Water & Sewerage Companies) have developed their largest sites as STCs (sludge treatment centres). Currently, more than 80% of sludge is treated by anaerobic digestion with the biogas being used as renewable energy; by 2025 it could be 96%. Certainly, there could be economies if WaSCs could transport sludge from small outlying works to a neighbouring company if that had a STC, but savings would be small because the quantities involved are small. The big prize would have been to have co-digested other organic residuals in the STCs (possibly retrofitted with thermal hydrolysis to increase capacity and provide sanitisation). But under UK legislation that would have taken the digestate out of the Sludge Regulations and into Waste Regulations. The environmental and health protection would not have been any better but the permitting costs and bureaucratic delays render it not even worth considering. If there is no sludge, digestate from other organic residuals can qualify for 'end of waste status', which obviates the permitting costs and bureaucratic delays but not if there is any sludge in the feed. So, two silos have developed; the situation is not moderate or pragmatic, it is more expensive for society as a whole and offers no additional environmental or health protection compared with co-digestion.

We were told that only three of the ten WaSCs have performance commitments on sludge quality, as part of outcomes such as 'protecting the environment' or 'reliable wastewater services'. Apparently sludge is not high priority for customers but it should be a priority for WaSCs because it is business-critical as I discussed in the last newsletter (Nov 2015). By contrast, nine of the ten companies made commitments to reduce carbon, increase energy self-generation or increase energy from renewable sources, but methinks that is really the siren call of cash registers rather than environmental altruism.

The organiser of *Codigestion et valorisation du biogas: quells leviers pour developer la filière? (Codigestion and biogas: what levers to develop the sector?)* on

The street outside Ecole de ingénieurs de la ville de Paris, the conference venue on 12 November 2015

12 November 2015 in Paris heard my paper *Is there a free lunch in food waste?* at the 19th European Biosolids & Organic Resources conference and asked me to present the subject again at this conference. In the paper I analysed the benefits and impacts of under-sink food waste grinders. It was based on published research and international experience. They are alternatives to kerbside collection with a better participation rate. They do not result in significant extra water usage and do not impair sewer performance. They do not increase the load on secondary wastewater treatment but they do increase biogas generation (roughly twice the amount per participating household). Under UK regulation, everything that comes down a sewer is sewage so the digestate is sewage sludge but the renewable energy incentive is only a fraction of that for food waste digestion. Different silos again!

To my surprise there was more pragmatism in Paris than I am used to in the UK. Several speakers described large scale applications of co-digestion. If there was any sewage sludge in the mix, the digestate was classified as sewage sludge. I am not sure that the legislation permitted it explicitly but it worked in practice, it was beneficial and the regulators turned a blind eye. Pragmatism also prevailed concerning under-sink food waste grinders; strictly they are not permitted but they are available for sale widely and a French author also spoke about them. Considering the small size of apartments, heights of buildings, absence of multiple rubbish chutes and narrowness of pavements, etc in much of Paris, multiple bins are not the most likely of solutions (see image of Paris street). Indeed there does not seem to be much evidence of domestic food waste recycling. It appears that Paris has recognised that it has a problem and needs many tools in the box in order to solve it. However, not everything is rosy: missed opportunities for retrofitting blue-green infrastructure for surface water are at least as prevalent in France as they are in the UK.

Nature does not work in silos, everything is connected to everything else. Increasing CO_2 warms the planet, up to a limit it will increase photosynthesis, and it is acidifying the oceans which changes their ecology. Melting the permafrost will release methane and melting the icecaps will decrease reflectance. The interconnectedness and feedback make modelling imprecise. Bridging the silos and retrofitting blue-green infrastructure would not have dealt with Storm Desmond but, integrated with upstream adaptation and designing for exceedance, it would have helped, and blue-green infrastructure would have provided the multiple other interconnected benefits (air quality, urban heat island, etc) demonstrated so abundantly elsewhere.

Key to a circular economy is reducing the amount of waste by extracting the maximum resource out of that waste. In the USA they are talking about Water Resource Recovery Facilities. Next news we shall have a drought! 'Tout-à-l'égout' was linear economy thinking, managing surface water on the surface; recovering as much resource as possible from used water will be the circular economy paradigm. To accomplish it will require working across silos, and pragmatism.

FWR Water Supply
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DRINKING WATER 2015:
Developments in Water Quality, Treatment and Distribution

18 November 2015

Mike Waite
FWR Water Supply Co-ordinator

THERE WERE MANY INFORMATIVE PAPERS PRESENTED AT THIS MEETING, on a broad range of topics, and only a flavour can be given here. My full account is available on our website – see details at the end of the article. Tim Latcham described Bournemouth Water's use of a floating solar-powered ultrasound source with internal quality monitors to **control algal blooms**. The ultrasound is said to prevent algae from getting to the reservoir surface, thereby reducing access to light, and will also cause some cell disruption. Results to date have been inconclusive but the company has been able to increase the proportion of River Stour water feeding the works.

John Fawell (Consultant Toxicologist) bravely attempted to cover ***current and future developments in drinking water quality regulation and advice*** in 20 minutes! There is a WHO Guidelines addendum due in 2016, with a 5th edition expected in 2020. The Guidelines strongly influence EU regulation and there are proposals for a full revision of the EU Directive to start in 2016. The Annexes to the Directive have already been amended to include the concept of Water Safety Plans. WHO will lead on the revision of Annex 1 and a long list of regulated parameters is not anticipated, but it is recognised that as well as health considerations there will be political pressures. WHO is considering improved advice on operational monitoring with a new background document on turbidity, plus the implications of mixtures. Other parameters and substances being reassessed include nitrate/nitrite, chlorate, chromium VI, bromate, barium, nickel, manganese, perchlorate, alternative disinfectants, cyanotoxins, and also a new approach to pesticides. Some parameters such as cyanide, which is only found in incidents, are likely to be removed. Rather than proposing standards for individual endocrine disrupting compounds, it is likely that screening for groups of these will be recommended.

Robert Pitchers (WRc plc) provided an update on ***microbial risks.*** These fall into two groups: faecal/oral pathogens and opportunistic pathogens. Many agents have been suggested as possible drinking water threats including MERS (Middle East Respiratory Syndrome), mycobacteria, anti-biotic resistant bacteria, and pathogenic amoebae. While *Toxoplasma* can be found in source waters, treatment effective against *Cryptosporidium* would deal with any risk. Addressing the future approaches to standards and compliance, Robert said that although indicator bacteria such as coliforms and *E. coli* remain in general use for compliance, WHO is pushing towards targets for microbial safety assessments. While the USEPA rules are based on a 1 in 10,000 risk, WHO favours the use of disability-adjusted life years (DALYs) and this approach is becoming more widely accepted. It is not practicable to look for a single virus in 1 mgd but it is possible to provide treatment which will reduce any viruses to this level. Regarding opportunistic pathogens, he reported that premise plumbing was seen as being at most risk and pointed out that *Legionella* is now being monitored in households in Germany. Techniques for pathogen detection are continually improving and he drew attention to changes in regulations facilitating the use of alternative disinfection techniques.

Tom Bond (Imperial College) provided a summary of research on ***disinfection by-products*** (DBPs) over the 40+ years since they were first recognised, before describing results of two research projects carried out by Imperial. A Defra/DWI sponsored project looked at various nitrogenous DBPs in 20 English drinking water supplies. Brominated species are reported to be more toxic than the related chlorine-containing compounds and it was significant that while median concentrations of haloacetonitriles and haloacetamides were lower in chloraminated water than chlorinated waters, bromine substitution was twice as high in chloraminated waters than in chlorinated waters. The second project looked at DBP production when making various teas and coffees. Using water spiked with chlorine it was shown that only 5–19% of chlorine was lost during boiling. The project nevertheless concluded that THM (trihalomethane) concentrations in tea made using tap water were likely to be insignificant.

Stuart Trow (Independent Consultant) referred to recent *EU publications on leakage management* and the *CIWEM Policy Position Statement* and described the difficulties in ***leakage estimation***. There is a top-down approach which deducts known usage from total system input, or a bottom-up approach based on district metering area inputs. While total elimination of leakage is not feasible there is a sustainable economic level of leakage (SELL) to be aimed for. Background leakage (ie that which can't be seen) accounts for 50–70% of leakage in England and Wales and most of this is on the service connection. Overall leakage is increasing and half of all companies have shown no reduction over the past five years. Under Ofwat ODIs, companies have received rewards of £228 million but suffered penalties of £510 million. A Consumer Council for Water survey revealed that the major concerns of consumers were leakage and infrastructure maintenance. Stuart outlined recent improvements in leak detection technology, including use of satellite imagery, and described benefits ensuing from Southern Water's move to universal metering. Improvements in detection technology, the use of novel techniques for fixing leaks, and benefits from better pressure management concluded the afternoon session and the day's informative conference.

To access Mike's full account of the conference please click here: *http://www.fwr.org/drnkwatr/water2015.htm*

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Welcome Steve Bungay, our new Wastewater Section Co-ordinator

STEVE BUNGAY is the owner and Director of Helix Environmental Consultancy Ltd, which is an independent process-lead consultancy. He is a scientist with a BSc (Hons) in Environmental Science from the Brighton Polytechnic, an MSc in Air & Water Pollution Control from the University of Westminster, and an MSc in Water and Wastewater Engineering from Cranfield University. He has over 25 years process science and engineering experience in water quality, wastewater and sludge treatment.

Steve has a wealth of experience of wastewater treatment, anaerobic digestion, advanced anaerobic digestion, reject water treatment, and commercial food waste digestion. He has worked on the design, commissioning, and operation of numerous anaerobic digestion plants, including a number of enzymatic and thermal hydrolysis plants, and a number of wastewater treatment plants treating high-strength ammonia liquors.

He is still a practising scientist, dividing his time between desk-based design work, on-site fieldwork, and site-based laboratory work. His special areas of interest include foaming in anaerobic digesters and nutrient treatment and recovery from sludge and effluent streams.

He is a Chartered Biologist, a Member of the Society of Biology, a Member of CIWEM, and an Associate Member of IChemE. Steve is a guest lecturer at Cranfield University and chairs CIWEM's Wastewater Management Panel. He is also a member of the UK Chapter of the Select Society of Sanitary Sludge Shovellers, and works as an expert witness in the field of wastewater and sludge treatment.

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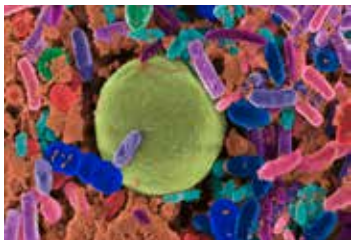
UV Disinfection for *Cryptosporidium* Control

Mike Waite
FWR Water Supply Co-ordinator

7 December 2015

THIS HALF-DAY SEMINAR WAS A JOINT EVENT between CIWEM and the International UV Association, focusing on important considerations when considering UV (ultraviolet) disinfection, together with some case studies. The delegates enjoyed several detailed presentations aimed at persons already well-versed in the subject.

Michael Templeton (Chair of CIWEM Water Supply and Quality Panel) presented a detailed **introduction to the basics of UV disinfection**. He pointed out that prior to 1998 it was thought that UV was not effective against *Cryptosporidium* because it did not eliminate oocysts when assessed by staining or PCR (polymerase chain reaction). However, when infectivity is determined, oocysts can be shown to be inactivated by UV. In the 2007 UK Regulations amendment SI 2007/2734 the disinfection requirement was amended to include 'or render harmless to human health' and reference to oocyst numbers was removed. He spoke about the various factors affecting UV disinfection, in particular UV transmittance, turbidity, and lamp and sensor fouling. All new reactors must now be validated by the manufacturer but the user must then ensure that they remain within the validated range. The



Cryptosporidium protozoan (courtesy Science Photo Library)

DWI Guidance Document issued in 2010 is a useful reference source.

Christy White (MWH Global) spoke about **what constitutes a UV dose** and described the two main validation protocols: the DVGW developed by Germany and the UVDGM developed by the United States. Validation in either case requires definition of the target pathogen and the level of inactivation required. DWI's guidance recommends the UVDGM (Ultraviolet Disinfection Guidance Manual) validation. Validation uses dosimetry. She explained that UV can be used before or after

filtration or even after service reservoirs, depending on many factors and pointed out that UV can degrade chlorine residuals and can promote bromate formation.

Carl Faisely (Anglian Water) described a number of **case studies**. The first, in 2008, involved oocyst detection in the final water at a large treatment plant which necessitated emergency installation of UV within 7 days, plus the taking out of service and cleaning of all affected service reservoirs. The cost to the company was over £6 million. Subsequently, the company has developed six UV mobile rapid response units which can be rapidly installed as a temporary facility wherever needed. UV adds an additional treatment stage and allows chlorination to be reduced to marginal.

Jonathan Leech (Trojan UV) **compared the DVGW and UVDGM protocols** and pointed out that while UVDGM requires much more data than DVGW, it can result in a lower power requirement for the unit when installed. Paul Buijs (Berson UV) looked at **the development of UV from a UK and global stance**. Following the discovery of THM (trihalomethane) as a by-product of chlorination in 1976, the Netherlands abandoned chlorination in favour of a multi-barrier approach including UV. The DVGW validation protocol was then developed, not for *Cryptosporidium*, but as a performance measure. He described the global areas where each protocol was preferred and his final conclusion was that UV is used in the UK as a 'patch' rather than as part of a disinfection strategy.

The meeting ended with a presentation by Ian Crossley (Hazen and Sawyer) on the **development of the Catskill/Delaware water supply system** which feeds into New York. The system does not use filtration, relying on the high quality of the raw water and UV treatment using Low Pressure High Output lamps. In operation the lamps are tuned to flow rate and water quality to minimise power use.

You can access delegate notes and the presentations by visiting CIWEM's website at:

http://www.ciwem.org/events/events-outputs.aspx

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An update on the activities of the FWR

Caryll Stephen
Chief Executive of the Foundation for Water Research

2016 seems to have started as busy as the end of 2015.

The WFD Information Centre area of our website has been updated in a number of sections and we remain busy with our work on catchment matters. Our Reviews of Current Knowledge (ROCKs) and Guides continue to be popular and a further five have so far been commissioned for the year. These include a ROCK on *Sediments in the Marine Environment*, a revision of *Legionella in the Environment*, plus a guide to *Clean water storage/use and waste water disposal for leisure boats and caravans.*

We are also currently planning our exhibition activities for the year which, as ever, will aim to include a mixture of technical and public interest. As previously promised we include a briefing on Steve Bungay, our new Wastewater Section Co-ordinator following the retirement of Tim Evans (who writes his final *Wastewater Matters* in this issue).

So, all in all, I anticipate and look forward to another full and active year for FWR.

Raised bed raingarden, Taylor Wimpey show-house (courtesy B J D'Arcy). Raised bed raingarden units with free-draining soil need plants able to cope with wet or dry conditions.

ERRATUM:

Page 2 of November 2015 issue

– amendment of the wording below the image of the raingarden.

RAINGARDENS ARE DESIGNED TO CAPTURE RAINWATER. Small units can be designed to take runoff from roofs and driveways (or as street-side features for road runoff, or as modular units across a car park). A small raingarden can be retrofitted and take roof runoff, discharging back into the drain at a slow rate, using integral storage capacity to attenuate peak flow. The soil layer is free draining and plants are *not* usually typical bog vegetation, but rather are species which can adapt to thrive in periods of wet and dry weather.

A 'natural raingarden' by contrast, has been suggested for gardens in the west of the UK: a wet back garden can be drained to a natural low point away from the building, and a shallow depression dug out. The earth can be disposed of by application around the perimeter, stopping ingress of runoff either into your garden or from it to cause problems with a neighbour. The unit in the ground is sized to provide temporary storage during periods of minimal evapotranspiration; bog plants are suitable.

www.enviroexperience.co.uk

Design Agency - http://www.connellmarketing.com

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