Daylighting Moselle Brook: understanding risks to public health

A briefing note by the Engineering Exchange for Haringey Rivers Forum

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Scope and purpose

This briefing note is intended to inform further discussion and research. It refers to peer-reviewed literature but has not itself been reviewed by independent experts. It's findings and recommendations are therefore of limited wider relevance in its current form. This note should not be quoted as a definitive scientific source.

Key points

1) The EU Bathing Water Directive (BWD) standards are an inappropriate planning condition for river restoration in general and for the Moselle Brook in particular. The application of the BWD is inconsistent with the intention of the Directive and the epidemiological evidence it is based upon.
2) Urban surface waters, of similar quality to the Moselle Brook, present low risk to public health from incidental exposure.
3) Managing public health risk, including microbiological risk, should be included in the design and management of urban river restoration schemes. Quantitative microbial risk assessment may be a useful methodology to inform design and decision-making in the Moselle Brook and in other urban river restoration projects.

Background

A proposed development at Clarendon Gasworks in Wood Green has been granted planning permission (ref: HGY/2017/3117) by the London Borough of Haringey (LB Haringey) under the condition (29) that the developer submits a plan for de-culverting of the Moselle. The current planning condition requires the water quality of the de-culverted Moselle to be achieved 'in accordance with Annex 1 of the Bathing Water Quality Directive forming part of the Water Framework Directive or any future equivalent standard' (according to the minutes of the Haringey Planning sub-committee 12/02/2018).

The Haringey Rivers Forum (HRF) is concerned that the requirement to meet the EU Bathing Water Directive (2006/7/EC) (BWD) at a given point in time is too stringent for an urban stream and that this may put at risk the achievement of the de-culverting project. No other rivers in London meet this standard. As provided for with the definition of Water Quality Standard contained in the S.106 Agreement attached to the planning permission, the HRF would like to explore alternative water quality benchmarks (i.e. "such other water quality standards to be agreed between the Council and the Developer in consultation with the Environment Agency") that allow for public safety and management of health risk from periods of poor water quality, while allowing for river restoration, as envisaged by planning condition 29 and London Plan policy 7.24 .

Objectives

1) Identify case studies of urban river restoration in new developments;

2) Evaluate the water quality standards that were applied by local planning authorities; and

3) Outline a method for assessing the health impacts and risks of the new development with and without restoration of the Moselle.

Methods

This briefing note is based on:

- A preliminary review of the scientific and policy literature;
- Informal consultation with professionals and academics active in public health, sustainable drainage, urban planning, microbiology, engineering and ecology;
- Analysis of background information relevant to the planning decision, namely -
    - 'Moselle Recognition and Restoration Campaign (MRRC) DRAFT 3' by Haringey Rivers Forum dated April 2019
    - Materials submitted to Haringey Council (Planning reference HGY/2018/2487) for 'Approval of details pursuant to condition 29 (Moselle Feasibility Study) attached to planning permission HGY/2017/3117'
    - Materials submitted to Haringey Council (HGY/2017/3117) for the full hybrid application

It also reviewed published case studies of urban river restoration in London, with particular reference to water quality standards.

Findings

Microbial water quality and health risk

It is widely agreed that the EU Bathing Water Directive (BWD) standards are an inappropriate planning condition for river restoration in general and for the Moselle Brook in particular. This is evident in the email from the Environment Agency to LB Haringey dated 16 October 2018, recommending against applying the BWD and in favour of applying the Water Framework Directive (WFD). It was also the unanimous opinion of all the relevant experts we consulted.

The microbial water quality standards in the BWD are based on epidemiological studies of exposure to water when swimming (EU 2006). Typically, this involves immersion of the bather for 10 minutes, with the head fully submersed at least three times (WHO 2003; WHO 2018; Wiedenmann et al., 2006). Most studies compare bathers with non-bathers, who provide the baseline cohort (WHO 2018). Non-bathers include people who visit water bodies but do not go into the water, which would be a similar exposure profile for the public associated with the restored Moselle Brook, assuming the approved details pursuant to condition 29 (Moselle Feasibility Study) are followed. That is, the risk associated with the proposed Moselle restoration is the baseline assumed for public health studies that underpin the BWD. The BWD is not intended to address risk associated with non-bathing uses of recreational or environmental waters.

There has been very little research on microbiological public health risks from non-bathing exposure to surface water. A cohort study of recreational water users (n=7,710) in the Chicago area found no relationship between microbial water quality and gastrointestinal illness (Dorevitch et al., 2015). The study addressed incidental exposure during recreational activities such as boating, fishing, rowing and paddling, and included effluent dominated urban waters. The water quality in effluent dominated water bodies in the Chicago study could be considered worse than the Moselle, and exposure-higher than the likely uses of the restored river.

The application of the BWD to the Moselle restoration has been justified in the absence of any other appropriate standard for microbial water quality associated with urban surface water. We have not found any other cases of urban river restoration that have applied a microbiological water quality standard, with most falling under the EU Water Framework Directive goals of improving ecological status (see Appendix). River restoration has been assumed to represent a very low risk to public

health. This is based on experience of human exposure to existing urban streams, which are of a similar or lower water quality, and supported by the Chicago study by Dorevitch et al. (2015).

Risk assessment for river restoration

Exposure to microbiological hazards from urban streams has not been a significant concern for public health. We have found no evidence of health risks or disease outbreaks associated with exposure to urban surface water, including restored streams, in the UK or similar countries. Nonethe-less, public health risk assessment may be prudent as part of proposals for river restoration. This should not be restricted to monitoring water quality in the channel, but should include assessment of pollutant sources and evaluation of river sediments (Scholes et al., 2008). Scholes et al. (2008) note the potential for conflict between river restoration and public health risk, and recommend risk assessment, including sediments and catchments, to be integrated into the design and feasibility studies for river restoration. Rather than preventing river restoration or setting strict water quality standards, this approach manages risk through pollutant source and process control, and includes risk mitigation as part of the design and implementation. Design of the restoration scheme should consider exposure pathways to reduce public health risk, including water and sediments (Sear and Newson, 1995; Seyfried et al., 1985; Taylor and Owens, 2009).

Any potential health risks associated with surface water and sediment should be considered in the context of health benefits associated with river restoration. Wetlands, rivers, ponds and other waterways – or 'blue spaces' – bring positive associations and may appear aesthetically attractive for residents (Völker and Kistemann, 2011). These qualities can offer restorative and therapeutic value for users. In a study of green and blue spaces it was found the blue spaces were more healthenhancing (Völker and Kistemann, 2015). More blue spaces can lead to lower psychological distress and promote happiness (Grellier et al., 2017; Nutsford et al., 2016). Nevertheless, there is still a need for more research into the relation between blue spaces and mental health so the risks and benefits can be balanced against one another (Gascon et al., 2015).

There is a wide agreement that restoring rivers is of benefit for water management purposes and urban drainage. Restored rivers have a potential to support and enhance ecosystems and health, resulting in multifunctionality of projects (Douglas, 2012). Ecosystems do not operate in isolation but are interconnected with society (Everard and Moggridge, 2011). An example of this is by creating new wildlife habitats, the local tourism is also expected to increase, supporting the enhancement of public realm. Overall, river restoration should aim to solve environmental problems and be designed in such a way that they are self-sustained and resilient to avoid public health risk, minimise maintenance requirements and support ecosystem services.

Health Impact Assessment for the Moselle

Assessing the risks and benefits of river restoration could form part of a Health Impact Assessment for new developments. However, conducting further health impact assessment (HIA) is not recommended at this stage. The original hybrid planning application (HGY/2017/3117) did not contain an HIA. Decisions on which water quality standard to apply were not necessarily based on HIA methods (see documents submitted with application HGY/2018/2487).

Conclusions and further work

The planning condition agreed for the Haringey Heartlands Clarendon Gasworks development demonstrates concern by the local authority and developer about the public health risks associated with microbial water quality in a deculverted river. The application of the BWD is highly risk averse and is inconsistent with the intention of the Directive, the epidemiological evidence it is based upon and the advice of the Environment Agency. Further discussion with LB Haringey, St William and the Berkeley Group, residents, the Environment Agency and other stakeholders should be encouraged to agree a risk assessment framework that will allow for the multiple benefits of restoration of the Moselle whilst ensuring public safety.

Further research may be helpful in developing appropriate protocols for assessing public health risk associated with the Moselle Brook and with deculverting in general. This work would need appropriate funding and may be best undertaken in partnership with LB Haringey and St William or the Berkeley Group. Three main areas for future work are:

1) Detailed literature review

Our preliminary investigations indicate that there is no evidence of significant risk to public health by exposure to urban surface water of a similar quality to a restored Moselle Brook. A more thorough review of the literature would provide a stronger evidence base. This could take the form of a rapid evidence appraisal or a systematic review. It could also review international standards for surface water quality in urban environments.

2) Comparison with similar sites

The water quality monitoring undertaken as part of the planning condition for the Clarendon Gasworks development could be compared with monitoring data in similar sites in London. UCL has undertaken preliminary monitoring of microbial water quality in other locations. Together with data from other London stakeholders, this could inform judgement of the relative risk associated with daylighting the Moselle.

3) Quantitative microbial risk assessment

In the absence of water quality standards, quantitative microbial risk assessment (QMRA) methodologies may be applicable to deculverting rivers and to the Moselle Brook. These methods are well established, and provide rigorous assessment of public health risk. They have been applied to flood waters and bathing waters, but we have not found studies that use these methods in river restoration or typical urban surface water (de Man et al., 2014; Soller et al., 2016). QMRA would provide a more suitable evaluation of risk to public health and potential mitigation measures than the current application of the BWD, and would provide an opportunity for innovation in integrating health protection and environmental restoration objectives at the local and development scale.

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Appendix: River Restoration Case Studies

Name/ Site	Scope	Water Quality	Design	Sources
Brent River Park (Tokyngton)	Originally a sewage farm. Underground ponds for flood protection. Now, recreation space. Partnership with Environment Agency.	No information	Flood alleviation scheme. Underground ponds for flood protection.	http://londongardensonline.org.uk/gardens-onlinerecord.php?ID=BRE036
Mayes Brook	"Climate change park", focus on wellbeing, and educational value for the community and flood storage. Tourism and recreation supported – great cost benefit expected.	Restored to meet EU water framework directive "Good Ecological Potential" – reedbed treatment	Energy efficient design, reusing of materials such as timber. Renewable energy sources installed and fuelled by leftover park material.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291020/scho0610bsow-e-e.pdf http://publications.naturalengland.org.uk/publication/11909565
Ravensbourne River, Norman Park, Sundermead estate / Cornmill gardens	Local community involved in process, de-culverting. It was a culverted open channel. New open public space in town centre.	"Heavily modified" design WFD	Concrete wall replaced with natural material. Wooden platforms for river bank access. Flow restored with puddle clay liner. River bed lined with gravel, enhancing/supporting wildlife. "retention"/storage basin built in	https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3369/Summary https://www.therrc.co.uk/sites/default/files/projects/p45.pdf https://www.therrc.co.uk/sites/default/files/files/case_studies/cornmill_gardens.pdf

Name/ Site	Scope	Water Quality	Design	Sources
River Quaggy, Sutcliffe Park	De-culverting, restoration, flood management, "wildlife enhancements"/attractive open space	Water quality: *"No information available, as the NWRM scheme started prior to WFD implementation, and information from the Environmental Assessment is not available. "* *"2009 WFD data indicates that the River Quaggy is of Poor Ecological Potential."*	De-culverted, Weigall Road detention basin for flood management (65000m^3) – 1 in 70 year. Flow control designed to be maintenance free at Sutcliffe Park – 1 in 30 year flow	http://nwrm.eu/sites/default/files/case_studies_ressource s/cs-uk-02-final_version.pdf http://nwrm.eu/casestudy/restoring-river-quaggylondon-uk https://www.therrc.co.uk/sites/default/files/files/case_studies/sutcliffe_park.pdf
River Wandle at Watermeads Island, Morden	Restore biodiversity value for reintroduction of water voles. Recreational space for public. Part of larger Wandle project Chalk stream	Must meet Good Ecological Potential (no deterioration risk)	Excavated 900m sediment ditches. Earth banks and shelves. To control water levels, sic control structures were built in. Platforms for visitors were constructed at the mill pond.	https://www.therrc.co.uk/sites/default/files/files/case_studies/watermeads_island.pdf https://www.wandletrust.org/wp-content/uploads/2014/10/WCP_Section_5__Water_Quality.pdf
Wandle Park	Park redeveloped to create tranquil space in Croydon. New channel through the park to treat road runoff going into window river. The river flows through park.			https://www.croydon.gov.uk/leisure/parksandopenspaces/parksatoz/wandle/wandlepar k https://www.wandletrust.org/
Wandle Purly way	Site was heavily contaminated and bed level dropped to manage flood waters through Croydon town centre.		Created a faux naturalised channel that took water from the river, raised it 1.5m up into created channel.	https://www.london.gov.uk/sites/default/files/gla_migrate_files_destination/AF08%20Wandle%20Valley_2014update.pdf