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REPORT ON 'FRAMEWORK FOR DIRECT POTABLE REUSE'

A CRITIQUE ON THE CHAPTERS ON SOURCE CONTROL AND WASTEWATER TREATMENT

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INTRODUCTION

The report, *Framework for Direct Potable Reuse*, released in mid-2015 by the WateReuse Research Foundation in conjunction with the American Water Works Association, the Water Environment Federation and the National Water Research Institute in the US, will be of great interest to those planning for, or considering, direct potable reuse (WRRF, 2015).

However, it is considered that there are aspects of the report that should be viewed with caution, in particular Chapters 5 and 6 covering Source (or Trade Waste) Control and Wastewater Treatment respectively. This paper offers a critique on these two chapters that in effect challenges the notion that Direct Potable Reuse (DPR) drives the necessity for more rigorous Source Control Programs (SCPs) and wastewater treatment plant (WWTP) design – over and above those necessary for all high-end reuse applications, such as Indirect Potable Reuse (IPR) and domestic non-potable reuse, as well as discharges to the environment.

SOURCE CONTROL PROGRAM – THE FIRST BARRIER (CHAPTER 5)

Chapter 5 addresses the Source Control Program (SCP). Quite understandably, it only addresses the SCP from a US perspective, discussing both the National Pretreatment Program and the Federal Pretreatment Standards and how they relate to DPR.

The following points are drawn from sections of the report:

- Section 5.1 states that *'… an important preventative approach to consider when pursuing and planning for DPR is the implementation of a rigorous source control program in conjunction with the National Pretreatment Program to eliminate or control the discharge of constituents that might impact the production of advanced treated water (ATW)'*.
- Section 5.4 states that '*Although not all POTWs are required to implement federal pretreatment programs, any municipality, utility or agency pursuing a DPR project, regardless of size, should consider the impacts of industrial and commercial contributions on the wastewater supply*'.
- Section 5.5 states that *'Although the National Pretreatment Program provides a strong foundation, the focus of that program is not on potable reuse; therefore it is recommended that additional elements be incorporated into a source control program for DPR projects*'.

The impression gained from the above is that having a rigorous SCP in place only really becomes important when DPR is contemplated. Surely a rigorous and functional SCP should be in place for *all* applications – be they DPR, IPR, non-potable reuse or discharge to the environment? It is considered that there should be little to no difference in Source Control rigour for both DPR and IPR applications.

In addition, little reference is made to the fact that the SCP is the first barrier in the 'multiple barrier' concept in that it protects the second barrier, the biological treatment step, from toxic upset, allowing this barrier to function optimally and produce an effluent that is safe for discharge to the environment and/or to a downstream advanced water treatment plant (AWTP) for recycling and reuse applications.

WaterReuse currently has a project underway – WRRF-13-12 – that has the title *'Evaluation of Source Water Control Options and the Impact of Selected Strategies on Direct Potable Reuse'*. This project provides an opportunity to clarify the role of Source Control and highlight the fact that an effective and rigorous SCP is required for all forms of wastewater treatment and water reuse applications, not just in DPR applications.

Source Control In Australia

The importance of having a rigorous SCP in place to protect the collection system, the biological treatment plant and the quality of effluent produced has been long recognised in Australia.

A *National Wastewater Source Management Guideline* was published by Water Services Association of Australia (WSAA) in July 2008. This Guideline provides a preventative framework for managing risks to the collection system and also provides a process for establishing wastewater quality criteria relevant to wastewater collection, transfer, treatment, recycling and disposal.

Tertiary treatment at Melbourne Water's Eastern Treatment Plant, 2012.

In June 2012, WSAA replaced this 2008 document with the *Australian Sewage Quality Management Guidelines*, which guide utilities through a 12-Element Risk Framework to ensure the protection of collection system assets and all treatment processes, ensure compliance with environmental legislation, and reduce hazards and odours for workers and the community while also supporting utilities to better control recycled water and biosolids quality.

The 12-Element Risk Framework covers the following items:

Element 1 – Commitment to Sewage Quality Management;

Element 2 – Assessment of the Hazards;

Element 3 – Risk Assessment and Control;

Element 4 – Operational Monitoring and Control Points;

Element 5 – Verification and Monitoring;

Element 6 – Management of Incidences and Emergencies;

Element 7 – Employee Awareness and Training;

Element 8 – Stakeholder Management;

Element 9 – Research and Development;

Element 10 – Documentation and Reporting;

Element 11 – Evaluation and Audit;

Element 12 – Review and Continual Improvement.

Adoption of the 12-Element Risk Framework for Source Control aligns these guidelines with both the *Australian Drinking Water Guidelines* (ADWG, 2011) and the *Australian Guidelines for Water Recycling* (AGWR, 2008).

The five key objectives of managing inputs to the collection system are identified as:

1. *Safety of people* – elimination of uncontrolled discharges that could impact on sewer workers as well as the community;
2. *Protection of assets (pipes, plant and equipment)* – through appropriate trade waste regulations;
3. *Protection of treatment processes* – to ensure optimum treatment and, thus, quality of effluent discharged;
4. *Facilitation of regulatory and licence compliance* – utilities must meet licence conditions for discharge to the environment, as well as all products generated with reasonable certainty and with acceptable risk;
5. *Facilitation of recycling* –

wastewater is no longer viewed as a 'waste'; utilities are producing recycled water, biosolids and energy using the risk management framework as laid out in the 2012 guidelines.

WSAA members (all of Australia's significant utilities) were benchmarked against these five key objectives in 2012/13 to encourage improved performance in the area of wastewater quality management. The exercise provided a means for member utilities to identify and share practices that encourage efficiency and avoid duplication of effort.

Each objective was measured against the 12 elements listed in the guidelines.

A second round of benchmarking is proposed for 2016 to assess progress made in the last few years (Bartle-Smith, 2016).

WASTEWATER TREATMENT – THE SECOND BARRIER (CHAPTER 6)

Chapter 6 of the report covers the role that Wastewater Treatment plays in the production of high quality reclaimed waters, noting that it is the second barrier, with Source Control being the first, as discussed above. Quite appropriately, it states that wastewater treatment is the most cost-effective means of removing a number of constituents of concern (CoCs).

It is stated in Section 6.3 of the Report that *'… the role of the WWTP in a DPR project is to provide a consistent, high quality effluent'* and again in Section 6.4 that *'… higher quality secondary and tertiary effluent will improve the overall performance of these advanced water treatment processes'*; these statements are correct, but they relate not only to DPR applications but also to all high-end uses (such as IPR and domestic non-potable reuse), as well as discharges to the environment.

The report describes the different formats that the WWTP can take and it does differentiate between typical effluent qualities (Table 6.2 refers) produced from these different formats. However, what is missing is a discussion on the impact that salient operational parameters, such as Solids Retention Time (SRT), can have on effluent quality and, hence, the operation and performance of downstream process units.

For example, early work clearly showed that as the SRT was increased from five to 25 days in an activated sludge plant, so the fraction of low molecular weight, soluble organic material in the effluent decreased, and that the removal of soluble biodegradable material increased with SRT up to approximately 12 days, whereafter the removal remains practically constant (Kim & Snoeyink, 1976; Roberts, 1978; Water Research Commission, 1984). As the SRT is increased, so the ability to remove nitrogen (N) is achieved and Section 6.4.2 in the report correctly highlights the benefit of achieving low N levels in the WWTP effluent on the operation of a downstream membrane plant – a factor well known in Australia, as most WWTPs are designed and operated to achieve high levels of N removal.

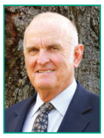
It is suggested that there is clear operational evidence in terms of residual soluble organic material and nitrogen levels to show that in order to achieve optimum operation and performance of process units in a downstream membrane-based AWTP, WWTPs operating with low SRTs and in a non-nitrifying/denitrifying mode should not be contemplated in such instances.

CONCLUSIONS AND RECOMMENDATIONS

A rigorous and functional SCP, together with an appropriately designed WWTP, is a crucial element in any high-end reuse scheme – not just for DPR applications. There is an opportunity to clarify the Source Control discussion in a current WRRF project (WRRF-13-12), but nonetheless it is recommended that an addendum to the report should be released that clarifies or amends the discussion on both Source Control and Wastewater Treatment.

The usefulness of the *Framework for Direct Potable Reuse* report would be enhanced considerably, both within and outside of the US, by 'internationalising' it and presenting a comparison of SCPs applied at reuse facilities around the world (DPR, IPR and other forms), including the principles involved, and the legislation that covered their development.

THE AUTHOR



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