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March 2, 2018

Keith Maruya, PhD
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Dear Dr. Maruya:

Subject: Comment Letter – Monitoring Strategies for Constituents of Emerging Concern (CECs) in Recycled Water

The Los Angeles Department of Water and Power (LADWP) would like to thank the Southern California Coastal Water Research Project (SCCWRP) and the State Water Resources Control Board (SWRCB) for the opportunity to comment on the Science Advisory Panel Recommendations for the Monitoring Strategies for Constituents of Emerging Concern (CECs) in Recycled Water (Draft Final Report) released January 31, 2018. We look forward to participating in future SWRCB workshops during the development of the amendments to the Recycled Water Policy.

LADWP is currently making significant infrastructure investments to address environmental impacts, such as long drought periods due to climate change. Utilizing recycled water can offset potable water demands, which is a key component in reducing overall potable water usage, especially during water shortage periods. LADWP plans to increase recycled water use in its service territory to 59,000 acre-feet per year (AFY) by 2025, and has set a long term goal to reach 75,000 AFY by 2040. As part of reaching this goal, LADWP is always looking for opportunities to expand recycled water use and has developed its Recycled Water Master Plan which has been updated to include other uses such as the use of recycled water for groundwater replenishment and surface water augmentation.

LADWP commends the SCCWRP and the SWRCB on its continued work on this Draft Final Report and supports the improved data management put forth by the Draft Final Report. LADWP especially appreciates the development of the Quantitative Microbial Risk Assessment (QMRA) tools and the transition to electronic, paperless submittals for greener reporting. LADWP also appreciates the clarification of agency roles between the Division of Drinking Water, the SWRCB and the Regional Water Quality Control Boards, particularly with regards to the issuance of drinking water permits for potable

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reuse projects, and LADWP supports public transparency with the hope of greater public acceptance regarding the use of recycled water through the development of resources and information to be provided to the public on recycled water use.

To this end, LADWP provides the following comments on the Draft Final Report:

1. Bioanalytical screening methods

As detailed in the Science Advisory Panel's (Panel's) Final Draft Report, there appears to be little to no threat for most chemicals in recycled water. LADWP appreciates the Panel's transparency regarding the conservative assumptions used to perform the risk-based CEC selection process to assess known CECs. However, even under these conservative assumptions, the Panel found that "The very small percentage of CECs that are recommended for monitoring (3 of 489 or < 1%) reinforces the inherent low risk of CECs in recycled water to human health currently attributable to most Title 22 uses and potable reuse surface water augmentation under current regulatory practices" (Final Draft Report at p. 98). Given that CECs in recycled water present low risk to human health, and further given the uncertainties/limitations highlighted in the comments below regarding the use of bioanalytical screening methods, it appears premature to prescribe bioanalytical screening methods as a routine monitoring tool. Indeed, the Panel concludes that "The Panel acknowledges that a significant amount of work remains before a useful collection of assays is ready for regulatory compliance application" (Final Draft Report at p. 71). LADWP believes that more research is essential to provide cost-effective, standardized approaches and transparent interpretation guidelines.

2. Estrogen receptor (ER) and aryl hydrocarbon receptor (AhR) bioassays

The Panel found that <1% of 489 CECs require monitoring in recycled water (i.e., the measured environmental concentrations [MECs] of more than 99% of compounds are consistently below monitoring trigger levels [MTLs]) and concluded that there is a "low potential risk of CECs in recycled water to human health currently attributable to water reuse applications..." (Draft Final Report at p. ix) Thus, the Panel's basis for recommending the use of time- and labor-intensive bioassays to further monitor recycled water is unclear. The Panel found that many chemicals that would be detectable using the estrogen receptor (ER) and aryl hydrocarbon receptor (AhR) bioassays (e.g., E2, EE2, TCDD, etc.) have concentrations that are well below MTLs and are not problematic in recycled water. Additionally, detecting a chemical or suite of chemicals in recycled water is only one component of determining potential harm: determining exposure to the chemical is also essential to assessing risk. Although bioassays show more utility than some conventional analytical techniques for assessing risk, simply detecting "activity" with the assay does not necessarily indicate that the recycled water will pose a threat to the environment or human health.

Additionally, LADWP believes many laboratories will be unable to absorb the estrogen and aryl hydrocarbon receptor assays screening requirements that are being

recommended. LADWP recommends that the Panel include a typical range of current costs (Q1 2018) associated with a single bioassay analysis.

3. Bioassays for recycled water applications

LADWP believes that using bioassays (in their current state) for recycled water applications can result in a lack of standardization and difficulties associated with interpretation of results. These issues were in fact succinctly summarized by the Panel itself: “Although dozens if not hundreds of *in vitro* assays exist for chemical screening applications, few are standardized and routinely applied to water quality monitoring. One of the greatest challenges for the successful application of bioanalytical tools is the development of a robust set of assays that show value and utility in screening for classes of chemicals that are relevant for recycled water applications, and that protect against the specter of deleterious human health effects” (Draft Final Report at p. 77). In Chapter 7, the Panel acknowledges that the Direct Potable Reuse (DPR) Expert Panel was critical of the bioanalytical tools, particularly regarding this lack of standardization, challenges associated with interpretation of results, and potential regulatory applications (Draft Final Report at p. 65). The Science Advisory Panel then claimed it “addresses these concerns one by one” in the remainder of Chapter 7. However, the critiques presented by the DPR Panel were not fully addressed by the Panel, and several of their responses contain significant flaws. For example:

a. Regarding standardization of bioassays: the Panel stated that “while standardization of bioassays is possible and has been achieved for multiple endpoints, the commercial availability of test products (e.g. cell lines and/or kits) is limited, and the number of commercial service labs that offer bioanalytical testing for matrices of interest to the recycled water community remains small” (Draft Final Report at p. 67). The Panel indicated that these tools are in an experimental phase by stating that “commercial laboratories are willing to prepare recycled water sample extracts using procedures recommended by the Panel for bioanalytical screening” (Draft Final Report at p. 67). As described above, the Panel found that <1% of CECs require monitoring, and there are few commercial test kits and labs capable of conducting bioassays. This indicates there has been no market for these bioanalytical tools to date, and few in the labor force are knowledgeable about proper use and application of these tools, particularly on a commercial scale. Any expansion of the use of bioanalytical tools and analyses in recycled water applications needs to be pursued with caution. Additionally, new methods should be standardized by organizations such as ASTM or the EPA; this will ensure that methods have an appropriate scientific basis and will avoid a situation whereby a specific firm has a competitive advantage over other firms because it has developed a proprietary method.

b. Regarding standardization of sample extraction: the Panel noted (Draft Final Report at p. 69) that the bioassay “extraction process can be quite labor intensive as compared to targeted analysis and NTA [non-targeted analysis], which are quickly moving towards automated on-line and direct injection analyses (see

Chapter 6). In addition, during the extraction and concentration step, some compounds will become immiscible (precipitate), bind to glassware, and/or volatilize. Therefore, QA/QC procedures are critical to understand the true recovery of potential agonists and antagonists within a particular extraction/concentration procedure and bioassay.” Care must be taken so that the CEC’s bioavailability does not change as part of the extraction process, or so that any changes in bioavailability are taken into consideration when test results are interpreted. The Panel’s response indicates only that well-characterized compounds, such as estrogenic hormones, dioxins, and PCBs, have robust standardized analytical bioassay methods. It should be noted that these chemicals can be quantified via more conventional analytical methods, and therefore, the utility of bioassays for these compounds is unclear.

Furthermore, the Panel did not appear to establish defined action levels (ALs) for the interpretation of bioassay results (see Draft Final Report Section 7.5.3) or provide a clear basis for doing so. It is unclear what the process would be for establishing those levels and who or what organization would be charged to do so. The Panel did not provide any substantive guidance, except for calling to “clearly define the thresholds” (Draft Final Report at p. 68). While the Panel discussed “water quality professionals... assess[ing] the potential hazards of recycled water” (Draft Final Report at p. 68), there is no clear discussion regarding who, on a practical level at the water utility, will be interpreting these analytical results and their implications.

Additionally, it is unclear from the Panel’s recommendations what the appropriate course of action would be after a bioassay result exceeds a predetermined threshold or action level. The Panel appears to recommend further targeted and/or non-targeted chemical analyses of the recycled water (Sections 7.4 and 7.5.3 of the Draft Final Report). However, targeted analyses would not identify unknown transformation products or account for additive effects of multiple chemicals—indeed, this is the Panel’s justification for proposing the use of bioassays in the first place. And as noted by the Panel, non-targeted analyses are cost and time-intensive and extremely complex. Significant resources would be required to identify the chemical(s) that caused a bioassay test to exceed an action level, and ultimately there is a low probability of success in identifying the causative agent. It is thus not clear what the advantage of a bioassay is over chemical-specific monitoring.

4. Implementing bioanalytical screening methods

LADWP believes it may be unnecessary to apply bioanalytical screening methods to secondary or tertiary treated wastewater effluent rather than at the point of exposure, because the advanced treatment processes that would be applied after secondary/tertiary treatment and before direct potable use further reduce CEC concentrations. As the Panel points out on p. 48: “attenuation of CECs during advanced water treatment was not given any credit but these processes (including SAT, integrated membrane systems or advanced oxidation processes) represent very effective barriers against a wide range of CECs. As a result of dilution and dispersion,

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CEC concentrations will be further reduced in an environmental buffer. Post-treatment after abstraction either at the well-head (for GWR) or at a regular surface water treatment plant (for SWA) provide additional barriers to some CECs. Finally, blending with other drinking water sources might occur either prior to or in the drinking water distribution system before this water reaches the point of exposure." Further, as stated on p. 73, "In a potable reuse demonstration pilot project in Altamonte Springs, FL, six *in vitro* assays were used to demonstrate effective treatment with biological aerated filter, GAC and UV AOP effluents (i.e. finished water) confirming that the pilot treatment train eliminated most, if not all bioactivity represented by the assays, and by association eliminated chemical pollutants associated with these bioactivities (Carollo Engineers, 2017)."

5. CEC data collection and monitoring

LADWP supports emphasis on the risk-based framework and the addition and removal of CECs from monitoring lists as conditions change, and understands the need to collect CEC data for the development of a database. However, as data collection can be costly and intensive, LADWP suggests that data collection be a voluntary effort. Additionally, LADWP suggests that the SWRCB work with stakeholders when developing the CEC monitoring program.

6. Antibiotic resistance

LADWP recommends further research on antibiotic resistance before creating new policies on the matter. The Draft Final Report mentions that the causes for antibiotic resistance are still not well known and the current studies do not show that antibiotic resistance transmission is a consequence of water reuse practices. However, the Draft Final Report states that the SWRCB should encourage the collection of data in reclaimed water and sites within California. If there is no indication that dischargers are the source of the problem, the burden of monitoring should not be placed on them. Further research should be conducted first.

In closing, LADWP appreciates the opportunity to provide comments on the Draft Final Report and looks forward to working with SCCWRP and SWRCB in the process of amending the Recycled Water Policy. Should you have any questions regarding this letter, please contact Ms. Katherine Rubin of my staff at (213) 367-0436.

Sincerely,



Mr. Mark J. Sedlacek
Director of Environmental Affairs

CG

c: Ms. Felicia Marcus, Chair, SWRCB
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