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Review of the proposed total maximum daily loads for indicator bacteria in the Lower Tijuana River

Prepared by

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This document is a review of the draft report titled "Total maximum daily loads for indicator bacteria (*E. coli* and Enterococci) and trash in the Lower Tijuana River", submitted in June 2023 by the California Regional Water Quality Control Board (San Diego Region), along with its appendices and the relevant scientific and regulatory references.

Based on my expertise and experience, I am reviewing the findings, assumptions, or conclusions I agreed I could review with confidence:

1.a. Are the proposed numeric targets in the draft staff report reasonable and adequately protective?

2.a. Are the seven transboundary flows the significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River?

3.a. Are the proposed TMDLs and load/wasteload allocations reasonable and adequately protective?

3.b. Are the reductions in indicator bacteria concentrations that are required to attain water quality standards calculated appropriately?

In view of my relevant expertise, my response to these queries is restricted to issues relating to indicator bacteria and not to trash.

Review highlights

- The proposed numeric targets of the maximal allowed indicator bacteria in the river water are reasonable and adequately protective.
- These targets are probably unattainable unless the inputs from across the Mexican border are substantially curbed.
- The report fails to provide the expected numeric TMDL, LA and WLA values, which are essential in order to attain the above targets. Instead, we are presented with the same target maximal allowed indicator bacteria concentrations in the receiving

river. In my view this is unjustified and does not fulfill the declared objective of the document, the quantification of the allowed loads.

- Even though the contributions to the total microbial pollution load from sources within the US border are insignificant in comparison to the transboundary inputs, they should nevertheless be treated to the levels dictated by their respective LAs and WLAs.

Response to specific queries

1a. Are the proposed numeric targets in the draft staff report reasonable and adequately protective?

In general, numerical targets for microbial loads allowed to enter a receiving water body (for example, as a Total Maximal Daily Load, TMDL) need to be calculated based on two data sets: (i) the hydrological properties of the water body (volume, flow characteristics etc.); (ii) regulatory limitations of the final allowed bacterial concentration in the water. The latter values are established based on pre-determined acceptable risks (mostly health-related) to human populations and wildlife in contact with that water. **TDML calculations, which determine how much pollution can the river absorb without exceeding the allowed indicator bacterial concentrations, are therefore independent of the magnitude and nature of existing microbial inputs.** The different input sources only come into play when the load and wasteload allocations (LAs and WLAs) are calculated: what fraction of the microbial TMDL is allocated to each identified pollution source.

In the current case, the starting point of the calculations is the risk considered to be acceptable to a human population with the most intimate contact with the river water, i.e., those involved in "Contact Water Recreation" (REC-1). The value adopted by the authors of the report is a health risk of a maximal number of 32 illnesses per 1,000 exposed individuals, a recreational water quality criterion (RWQC) recommended by the US Environmental Protection Agency[1]. The US EPA has determined that in order to ensure a maximal predicted rate of 32 illnesses per 1,000 exposed individuals, the allowed indicator bacterial concentrations in the receiving water (as colony forming units, CFU, per 100 mL) should not exceed a geometric mean of 30 enterococci (marine and freshwater) or 100 *E. coli* (freshwater), with statistical threshold values (STV)[2] of 110 and 320, respectively. These values were wisely adopted "as is" by the authors of the current Lower Tijuana River draft report. **The proposed numeric targets for the maximal allowed indicator bacteria concentrations in the river water are thus reasonable and adequately protective.**

[1] USEPA. 2012. Recreational Water Quality Criteria. EPA-820-F-12-058. U.S. Environmental Protection Agency, Office of Water, Washington, DC.
[2] The STV approximates the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded by more than 10% of the samples used to calculate the GM.

This is not the case, however, for the target TMDLs expected to be proposed in the report. A TMDL for a given water body/pollutant combination, as correctly defined in the report, "is based on the amount of pollutant the water body can receive without experiencing impairments…with a margin of safety applied to account for any uncertainties". The key phrase here is "**the amount of pollutant**": the maximal **total bacterial biomass** which may enter the river in a defined time period without exceeding the allowable indicator bacterial concentration limit in the river water.

Regretfully, this is not what we get in the report, in which no numeric TMDL, LA or WLA values are provided. Both in the Executive Summary and in section 6 of the report, the numbers provided (see the excerpt below) reflect the target microbial water quality limits, **but not the maximal loads that should ensure that these limits are maintained**.

> In the case of indicator bacteria in the lower Tijuana River, the loading capacities and corresponding TMDLs are set equal to concentrations of *E. Coli* and enterococci concentrations that represent currently acceptable health risks in recreational waters.
>
> 1. For *E. Coli*, the LA and WLA is a six-week rolling geometric mean (GM) of *E. Coli* not to exceed 100 colony forming units (CFU) per 100 milliliters (mL), calculated weekly, and a standard threshold value (STV) of 320 CFU/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.
> 2. For enterococci, the LA and WLA is a six-week rolling geometric mean of enterococci not to exceed 30 CFU/100 mL, calculated weekly, with an STV of 110 CFU/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

(*Copy of a segment from page 4 of the Executive Summary*)

In other words, although the terms TMDL, LA and WLA are correctly defined, the interpretation of these definitions seems to be skewed. **The numerical values of these parameters should indicate loads and load allocations (for example, in total CFU/day), and not target bacterial concentrations in the receiving waters (in CFU/100 mL, as in the example above).**

Furthermore, in the unnumbered table in section 6.1, there are no numerical values in the column titled "Indicator Bacteria LAs and WLAs". Instead, we are told for each discharge source that "WQOs are the LAs and WLAs" for that source. Such statements are meaningless and uninformative.

A comment on the safety margins for the target load values: it is common practice to introduce safety factors to the calculated allowable loads. The authors of the report indeed address this issue, but instead of adding a safety factor to their own calculations they appear to be satisfied (section 6.1) with the safety margins already configured into the US EPA calculations. This is fine as far as the target allowable bacterial concentration in the river water are concerned, but the numerical TMDL, LA and WLA values should include safety margins of their own. In view of the significant damage already caused to the water quality of the Lower Tijuana River, such site-specific safety factors should be seriously considered.

2a. Are the seven transboundary flows the significant sources of anthropogenic indicator bacteria and trash in the lower Tijuana River?

Based on the detailed data provided, the answer is a clear "yes" with regard to anthropogenic indicator bacteria. While there are also numerous sources of such bacteria within the US border that may contribute to the bacterial load at the Lower Tijuana River, their contribution is masked by that of the transboundary flows.

3a. Are the proposed TMDLs and load/wasteload allocations reasonable and adequately protective?

As indicated in response to query 1a above, no workable TMDL or LA/WLA values are provided in the report. It is therefore not possible to conclude whether they are reasonable and protective.

In the Executive Summary it is stated that "San Diego Region (San Diego Water Board) staff propose TMDLs in this report to address impairments in the lower Tijuana River caused by indicator bacteria"; we are further told that "this staff report identifies LAs and WLAs to enable the San Diego Water Board and responsible parties to take appropriate control actions to attain water quality standards in the lower Tijuana River". These commitments, however, are not kept, as no TMDLs are proposed and no LAs or WLAs are identified. Instead, we are informed that "the loading capacities and corresponding TMDLs are set equal to concentrations of *E. coli* and enterococci concentrations that represent currently acceptable health risks in recreational waters". This approach is unsuitable and the latter statement is meaningless, since, as stated above, no TMDL nor LA/WLA values have actually been proposed.

It should be added, however, that even if proper TMDLs would have been presented, and even if these loads would have been properly allocated to the different pollution sources, their implementation would have been questionable in view of the lack of control over the transboundary sources. Until these pollution inputs are curbed, even adequately calculated TMDLs would probably only be numbers on paper, completely ineffectual in practice.

3b. Are the reductions in indicator bacteria concentrations that are required to attain water quality standards calculated appropriately?

The numbers in Appendix B present the reductions required to bring the microbial water quality in each of the input sources to the desired target level of indicator bacteria in the receiving river. While it may be claimed that if microbial concentrations in all inputs adhered to that standard, the microbial concentration in the receiving water body would naturally be below the target level, this approach is basically incorrect. The necessary reductions (and hence the TMDLs and the load allocations) should be calculated based on flow volumes from each source and the relative contribution of this source to the total load. It should also be mentioned that reduction values defined as ">99%" may be

meaningless in cases where the bacterial loads are very high, and a reduction by several orders of magnitude is required.

Additional comments

1. The authors of this report should be commended on the thorough and meticulous preparation of the background materials, including the historical outlook, the different regulatory frameworks involved, and of course for the assembly of water quality data from over the last two decades. I believe, however, as explained above, that they have failed to take the necessary steps in order to calculate the TMDL for the Lower Tijuana River, as well as the derived LA and WLA for each of the input sources. Without numeric values for these parameters, the calculations of the required reductions in indicator bacteria concentrations have no practical implication.

2. Having said that, it should also be mentioned again that it is evident from the data presented that without an effective solution of water quality issues in the transboundary inflows, water quality in the Lower Tijuana River cannot be expected to improve.

3. This unfortunate conclusion, however, does not alleviate the responsibility from all relevant government bodies to take all steps necessary to minimize pollution inputs into the river from internal US sources.