

EXECUTIVE SUMMARY

This Technical Memorandum (TM) presents a peer review performed by MKN & Associates, Inc. (MKN) of a Feasibility Study for the Mission Ranches Company (prepared by Wallace Group expanding on previous work by North Coast Engineering) related to mitigation of nitrate-related potable water quality violations and concerns within the community of San Lucas, California.

The community of San Lucas has experienced historical water quality issues including salinity, nitrate, iron, manganese, and sulfate contaminants violating California drinking water standards, and the existing treatment system is no longer adequate to mitigate these constituents. This TM presents background information on the San Lucas County Water District (SLCWD or District) water system and peer review commentary on the two alternatives proposed by Wallace Group and North Coast Engineering:

- Alternative 1: Transmission Line

This alternative would involve using the District's existing water storage tank as a modified dilution tank to buffer nitrate spikes in the water supply. When a nitrate exceedance is detected at the well discharge, raw water would bypass the existing distribution system and be conveyed to the existing storage tank to be diluted by the water contained within the tank. If nitrate concentrations in the storage tank exceed the nitrate concentration alarm set point, high nitrate water would be prevented from being served to the customers and a "Do Not Drink" notice would be served.

- Alternative 2: Wellhead Treatment Using Ion Exchange (IX)

This alternative would involve constructing a modified ion exchange treatment system to remove nitrate from the source water (Well 3) before it is pumped to the District's distribution system. The modified IX system would only be used when nitrate levels in Well 3 exceed a threshold of 8 mg/L (as Nitrogen) through a continuous online nitrate analyzer connected to the well discharge line. In the event that the raw water nitrate concentration exceeds the threshold, the nitrate analyzer would send a signal to a controller that would isolate the complete well flow to be treated through the IX system. The IX system would run until the analyzed nitrate concentration falls below the set threshold or for the minimum IX equipment run-time, whichever is longer.

Following peer-review commentary of the presented alternatives, MKN presented the following conclusions:

- The original and modified iterations of the Transmission Main Alternative (Alternative 1) described in the Feasibility Study are not technically feasible approaches for short- or long-term mitigation of nitrates. Nitrate spikes appear to last for weeks (in some cases, months), making blending through a new transmission main technically infeasible.
- Wellhead Treatment Using Ion Exchange (Alternative 2) appears to be the only technically feasible alternative. However, the suggested operation method is not anticipated to be efficient in reducing nitrates nor permitted by the Division of Drinking Water (DDW).
- Alternative 2 should be investigated further, but it is anticipated that this alternative will likely not be the most effective method of addressing all the water quality challenges experienced by the District.

The following investigative measures and next steps were recommended to address the District's water quality issues. It was recommended that the District implement each of these recommendations concurrently.

- Evaluate Feasibility of Biological Denitrification Treatment

MKN recommends evaluation of the feasibility of implementing biological denitrification treatment as a potential solution to the District's nitrate issues.

- Evaluate Feasibility of Reverse Osmosis Treatment

MKN recommends evaluation of the feasibility of implementing reverse osmosis treatment as a potential solution to the District's nitrate issues.

- Monitor Total Dissolved Solids

MKN recommends that an online total dissolved solids (electrical conductivity/salinity) analyzer be installed at the same site as the online nitrate analyzer to better understand how seasonal trends in salinity would impact conceptual membrane-based treatment systems.

- Optimize Existing Iron and Manganese Treatment System

MKN recommends that the District continue to monitor performance of the existing iron and manganese treatment system. It is recommended that the District or an authorized representative work with the iron and manganese treatment system manufacturer (ATEC Systems) to evaluate optimization and/or rehabilitation to bring the treated iron and manganese concentrations back into compliance with State-mandated secondary MCLs.