
Evaluation of California Water Fix Groundwater Modeling

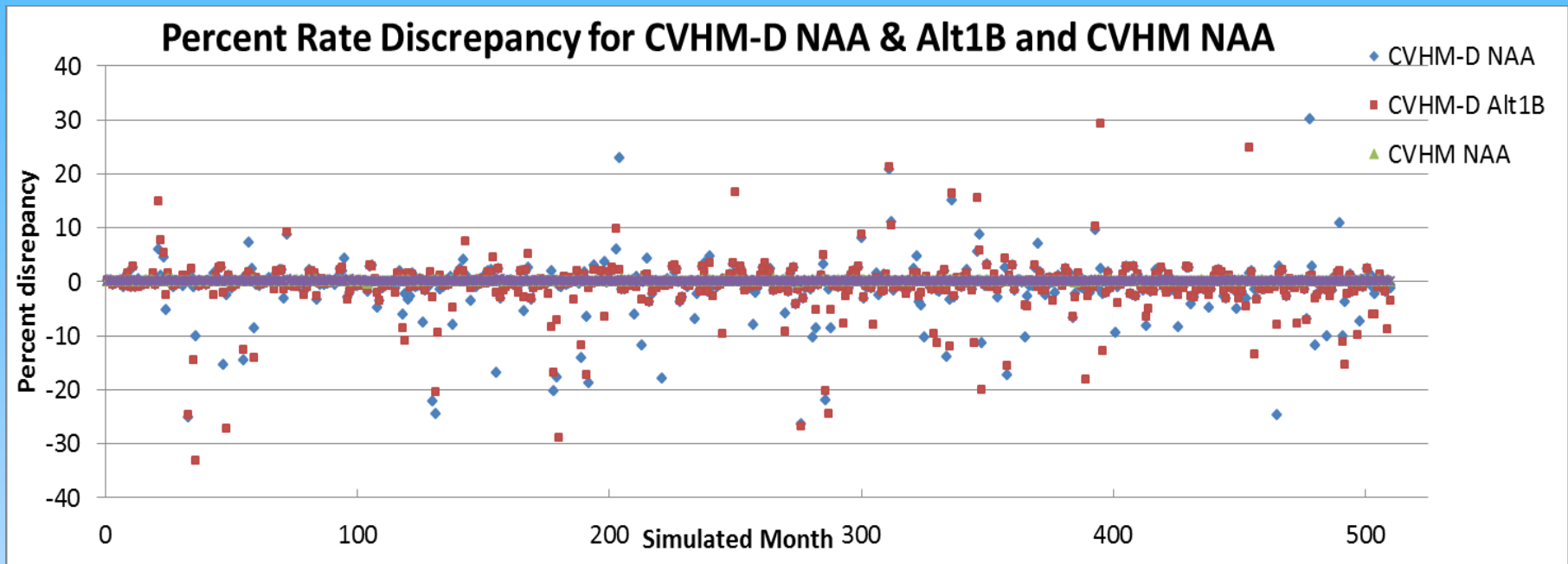
CA Water Fix Proceeding

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Exhibit SCWA – 205

Petitioners' Rebuttal Re: Alt 1B

- Petitioners assert that Alternative 1B was adequate to assess California Water Fix operations impacts under Alternative 4A
- I evaluated CVHM-D Alt 1B and NAA to consider whether they accurately represent groundwater impacts in the South American Subbasin
- My testimony highlights numerical issues with the CVHM-D model
- I also provide a qualitative assessment of the potential impact on stream leakage in the South American Subbasin



-The water budget is an accounting of the flow of water into and out of the system, which should balance at each simulated time step

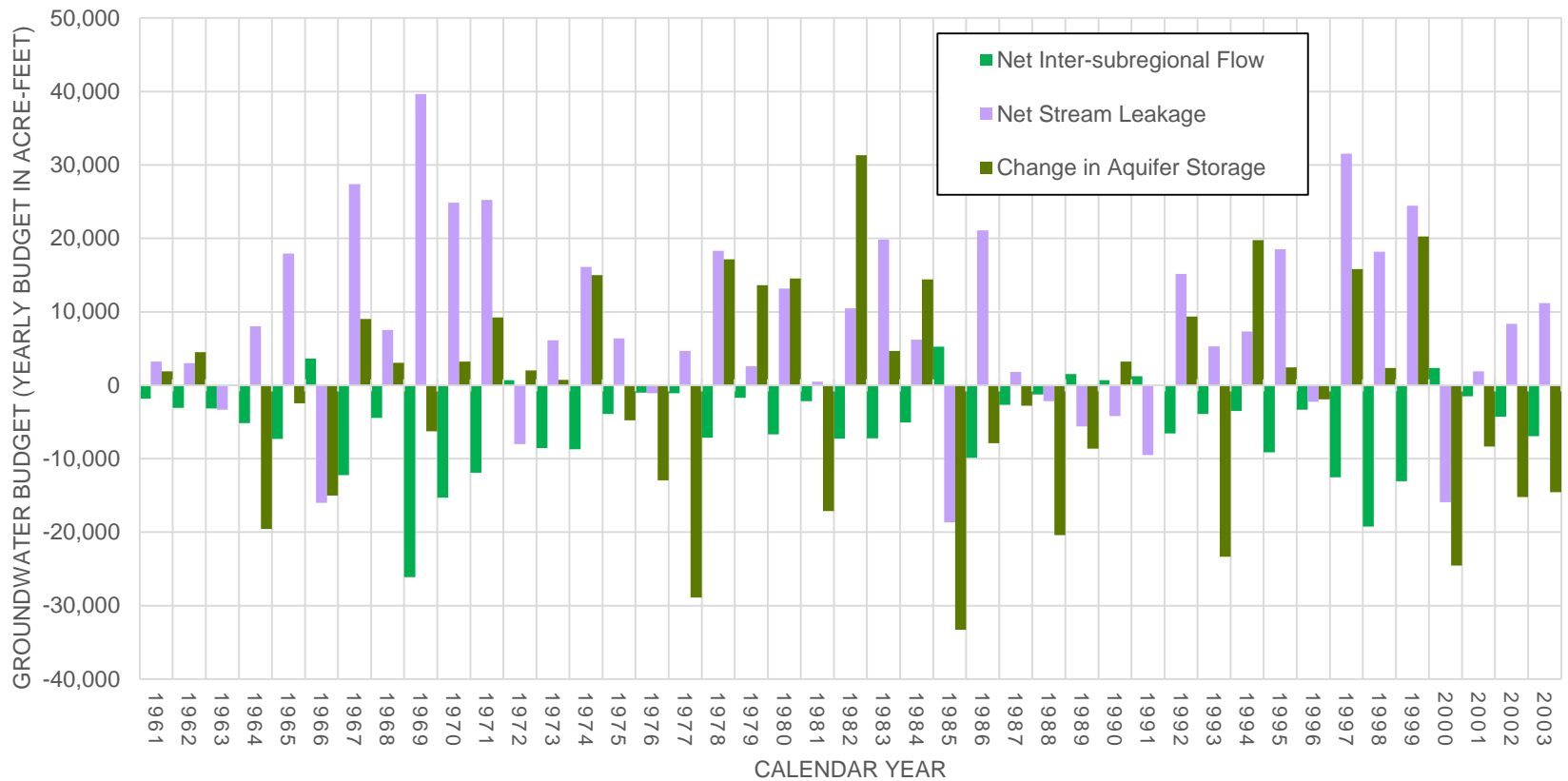
-This discrepancy is an indicator of how precisely the governing mathematical equations in the models were solved

-The CVHM-D NAA & Alt1B scenarios exceed the 1% budget error threshold 57% and 59% of the time, respectively

-Simulations with discrepancies between inflows and outflows greater than 1% indicate issues with model precision and/or design, and the reliability of the results

Comparison of the water budget components in the No Action Alternative (NAA) and the Alternative 1B scenarios correspondent to the South American Subbasin

DIFFERENCES IN GROUNDWATER BUDGET: NAA - ALT 1B

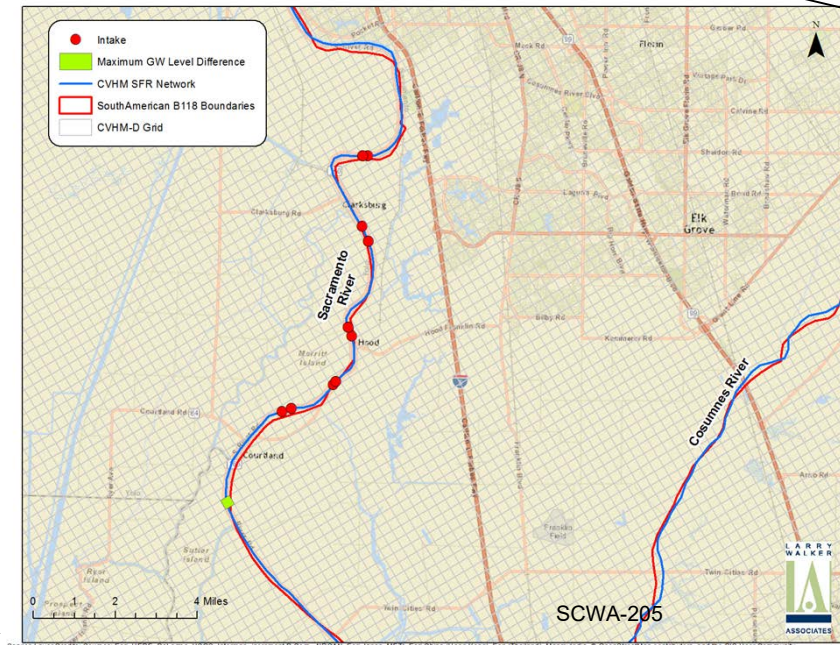
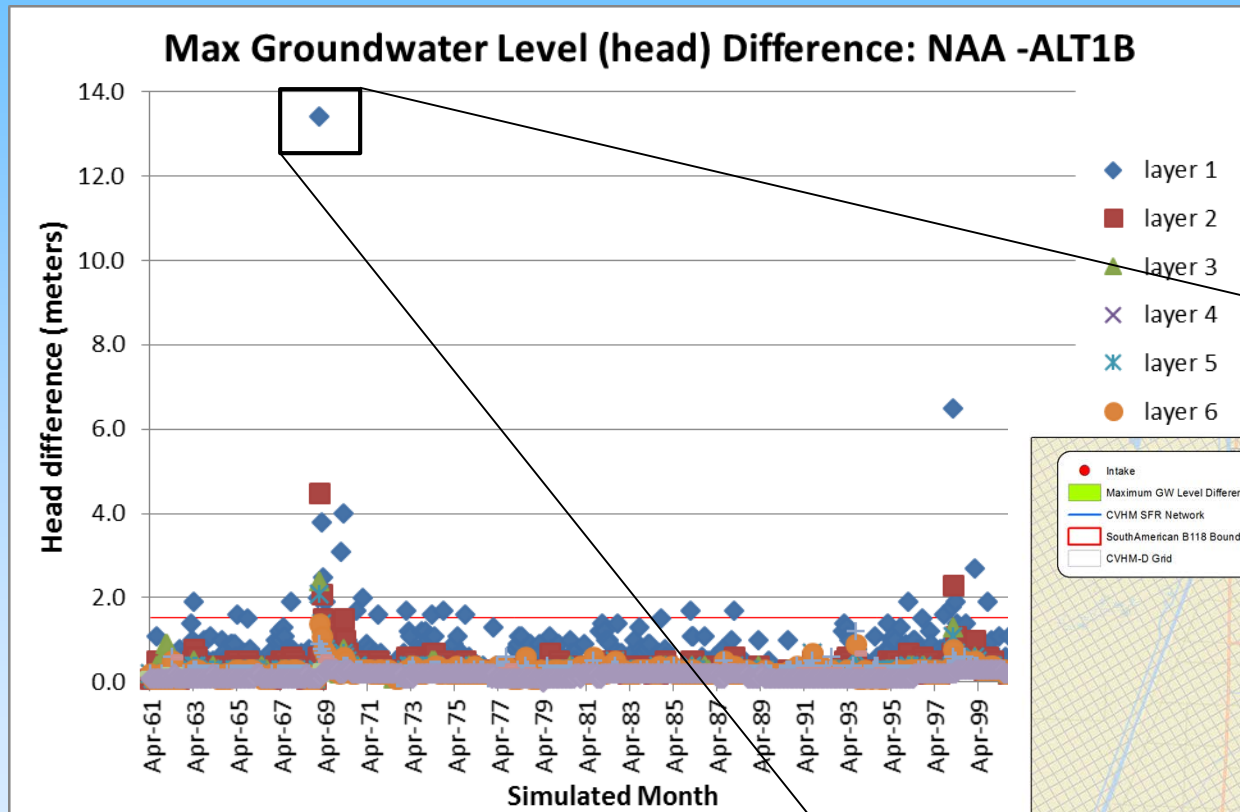


Petitioners' Assessment of Maximum Difference in Modeled Groundwater Levels

- Ms. Buchholz states that “groundwater adjacent to the Sacramento River between Intake 1 and Rio Vista would decline up to 5 feet.” (DWR-80, 20:15-16.)
- On cross examination, Ms. Buchholz emphasized that the model revealed changes from zero to five feet. (April 25, 2017, Vol. 36, 60:12-14, 63:9).

Modeled differences in hydraulic head between NAA and Alternative 1B

- Maximum difference of approximately 44 feet
- Head differences larger than 5ft occur 34 times throughout the simulation period
- Cited differences are within the noise of the model and thus have questionable reliability

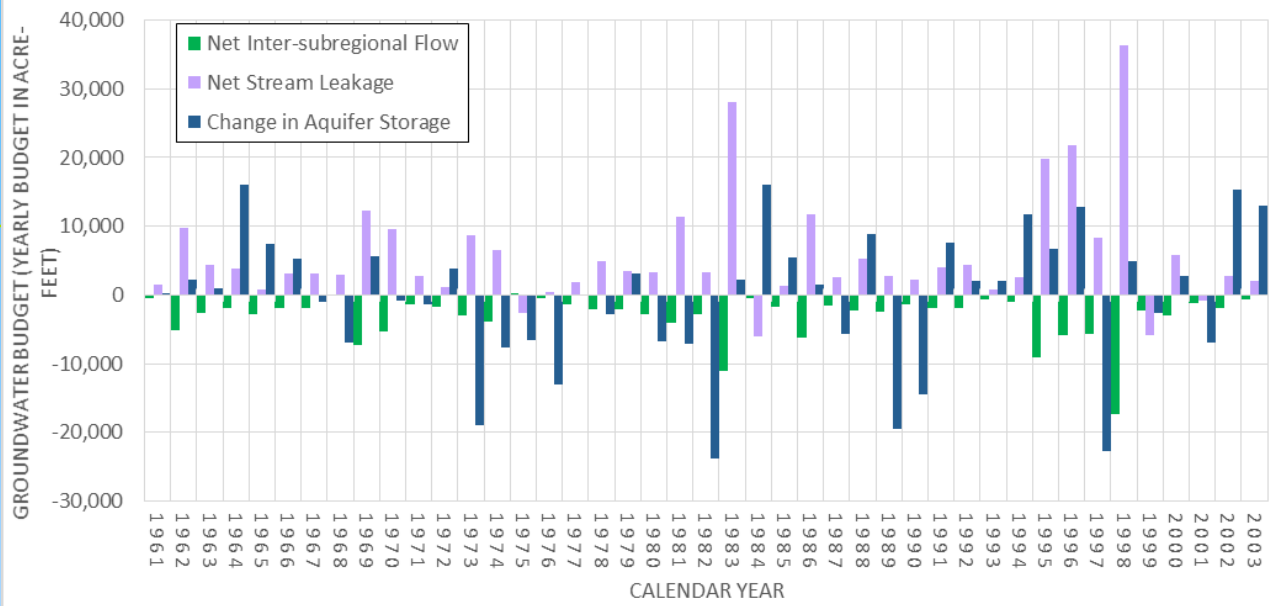


Closure Criteria Larger Than Recommended

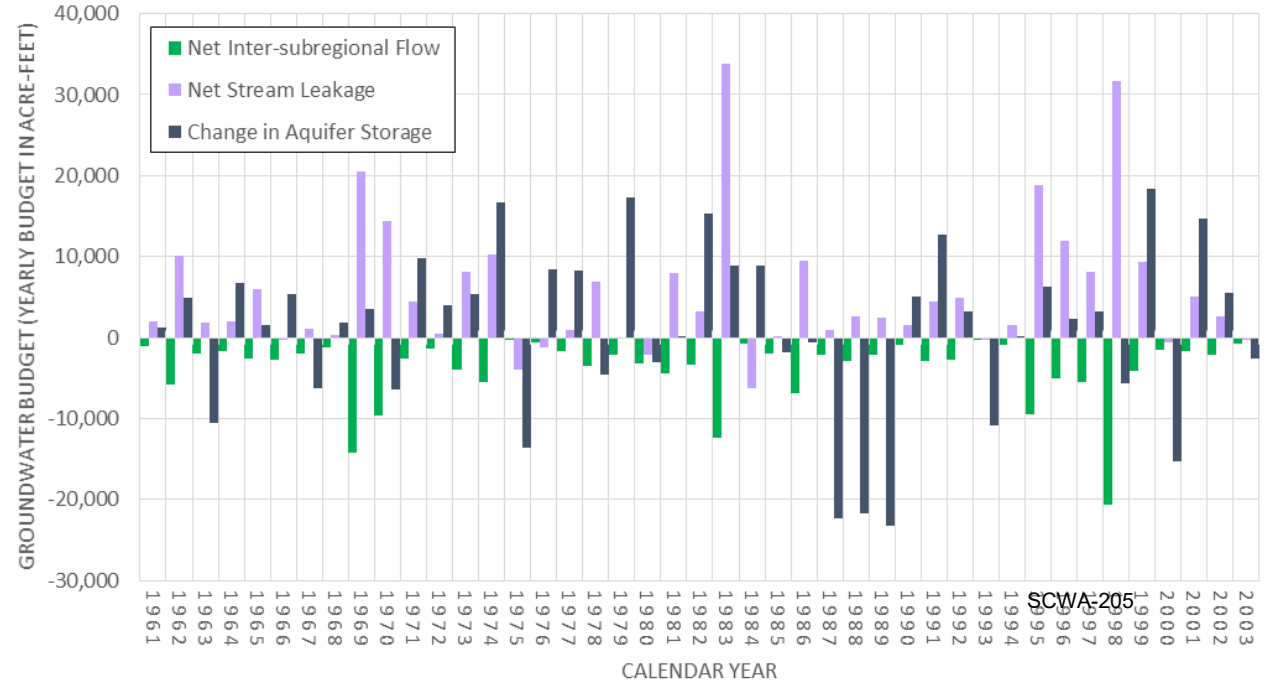
- Substantial number of budget errors exceeding the standard threshold of 1% and the large head differences in 1969 and 1998 indicate numerical instabilities in the model and call into question the reliability of the simulated results
- I checked the closure criteria (precision to which the CVHM-D model is simulated) used for heads and river discharge, which can cause the budget convergence issues mentioned above
- The closure criteria used in the CVHM-D model is much larger than what is recommended, which can compromise the fidelity with which the model can simulate stream/aquifer interactions.

Testing different convergence criteria

DIFFERENCES IN THE WATER BUDGET: ALT1B DLEAK 100-25



DIFFERENCES IN THE WATER BUDGET: NAA DLEAK 100-25

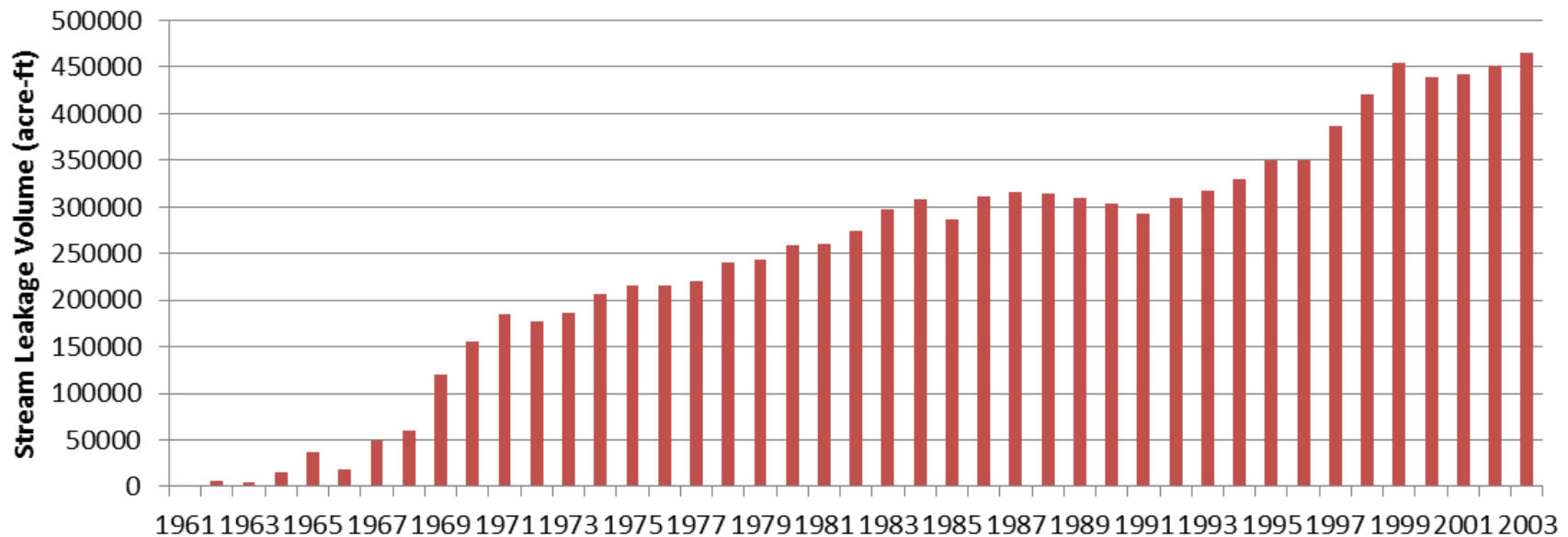


Petitioners' Rebuttal Re: Recharge

- Ms. Buchholz states that “[o]verall, based on information prepared for Zone 40 groundwater conditions and results from groundwater monitoring presented in the BDCP/CWF EIR/EIS, it does not appear that operations of the North Delta Diversions would substantially affect groundwater recharge in Zone 40.” (DWR-80, 20:27-28 -- 21:1-2.)
- Ms. Buchholz acknowledges, however, that “groundwater in the groundwater basin that includes Zone 40 is recharged from rivers (Cosumnes, American, and Sacramento rivers).” (DWR-80, 19:14-16.)
- Thus, a change in stream/aquifer interaction between these rivers and the South American Subbasin has the potential to adversely impact Zone 40.

Qualitative Assessment of Stream Leakage

Cumulative Difference in Sac. River Leakage Volume in S. Am. Subbasin: CVHM-D NAA-Alt1B



-Given the evidence in the record indicating the Sacramento River serves as a source of recharge to the Central Basin (Zone 40), it is possible that this significant cumulative change in stream leakage could adversely affect Zone 40 groundwater resources