

10/17/2016

To: SacWAM Team

On behalf of the SacWAM Independent Review team, please consider the following initial questions as we move forward with our review:

1) Model Utilization

- a) Most models fail because they are eventually used for purposes beyond their reasonable use. Without some improved understanding from the Board of the intended use of the model results, the panel will be hindered in its ability to clearly spell out the limitations of the model. Therefore, can the panel receive more specific instruction as to the scientific and management questions being answered by SacWAM model runs?
- b) Clearly development of the model is ongoing. Can the panel receive an outline of what developments are expected to be completed in different phases of this work? Specifically, what additional enhancements/ refinements will be completed before the analyses for the SED? Is there a timeline for a static version of the model which will be used for all analysis or will developments be ongoing throughout the planning process?
- c) A purported benefit of SacWAM is its ability to use a “prescribed” hydrology using historical estimates of inflows at major reservoirs to better mimic CalSim II behavior as well as the ability to use the inherent rainfall-runoff modeling capabilities of WEAP to produce a “headwater” hydrology for simulating changing hydroclimatic conditions; can the panel be provided more information on what types of analyses the Board anticipates using the prescribed hydrology and how the Board anticipates using the version with headwater hydrology?
- d) It would be fair to assume that the model will be used for environmental flow planning, yet the monthly time step used in SacWAM negates most if not all uses in this regard. How does the Board intend to reconcile this shortcoming?

2) Model Parameterization and Performance

- a) Given that management plans will be most scrutinized in in dry and critically dry years, will additional analysis of SacWAM model performance be evaluated for specific low flow years not just long term averages?
  - i) Secondly, will SacWAM performance be formally evaluated against historical data – not just CalSIM II comparisons?
- b) Often water demands are aggregated into groups, which limits transparency. Are there plans to provide users with a comprehensive list of water demands by aggregated group?

- c) Can the developers explain the rationale for using a composite of two  $K_c$  values  $K_{cb}$  (Basal Crop Coefficient) and  $K_e$  (Crop coefficient for evapotranspiration)?
  - d) When is the bias correction used or not used (i.e., alignment with CalSim II at Freeport)?
  - e) It appears that there are two options to represent channel depletions in the Delta (time series data and accretion arcs); which is used when and why?
- 3) Model to Model Calibration
- a) Given that most of the model comparisons were focused on the agreement between CalSim II and SacWAM – and that one of the purposes of developing the SacWAM model was to provide detailed simulations of some areas not covered by CalSim II – will additional comparisons between SacWAM and historical observations for important locations not covered by CalSim II made available?
- 4) Unimpaired Flows vs. Full Natural Flows
- a) Throughout the documentation it appears that Full Natural Flows and Estimates of Unimpaired Flows are being used interchangeably. Can we receive specific definition of each term and specific guidance to any computational differences in SacWAM?
  - b) A purported benefit of SacWAM is the ability to simulate unimpaired flows, and documentation indicates that the Soil Moisture Model within WEAP is used to achieve this purpose, and further that these results are calibrated to unimpaired flows measured or calculated. The latter component is confounding (i.e., calculated from what exactly?), but also unclear as to what components from SacWAM actually utilize the Soil Moisture Model and which components do not. Can a more elaborate description be provided on the inclusion and/or calculation of Full Natural Flows, Unimpaired Flows, model usage and calibration?
- 5) Sensitivity Analyses
- a) The argument that biases in the model will be cancelled out if the analysis only relies on differences between scenarios is predicated on the assumption that the sensitivity of the model is correct. Will a formal sensitivity analysis of the model be performed, and how does that performance compare to historical sensitivity?
  - b) Given that model logic includes rules of operation based on the SVI four-river index water year type (WYT), has a formal sensitivity analysis been conducted of SacWAM performance under the various WYTs?
    - i) Given that SJI is independent and occasionally asynchronous from SVI, has any simulation been conducted to determine how San Joaquin inflows may vary out of sync with SVI operations?

- ii) It appears that state agencies may be moving away from water year typing via SVI and SJI four-river indexing methods, yet surface water deliveries are still largely a function of this typology. How will SacWAM incorporate future typologies?
  - c) To what extent has SacWAM been tested to determine if node and/or priority aggregation results in substantive changes in model performance?
  - d) Do trends exist in the accretion and depletion terms used to adjust the model at Freeport?
- 6) Groundwater Characterization
- a) The potential bias found in SacWAM for not accounting for seasonal changes in accretion/depletion rates has been identified; will a formal comparison of seasonal plots and trend lines for C2VSim seepage be presented in addition to the annual analysis already provided?
  - b) SacWAM groundwater accretion and depletion characterization is dependent on C2VSim and therefore dependent upon its calibration. Is there a plan to update SacWAM with the newest version of C2VSim when it is released? How will any changes to C2VSim affect SacWAM calibration?
  - c) The minimum amount of water extracted from groundwater as “Water Demand Units” appears to be estimated as a function of the irrigated area unmet by surface water deliveries (i.e., acreage percentage for surface water delivery and groundwater delivery as a proportional function of surface water coverage). How does SacWAM account for non-uniformity in coverage of high water demand crops? In other words, some small units may have very high demands and some large units may have very small demands but groundwater usage will vary; does the current methodology differentiate between these cases?