CENTRAL VALLEY SALINITY ALTERNATIVES FOR LONG-TERM SUSTAINABILITY
ICM TECHNICAL SERVICES

MODELING MEETING
MONDAY, OCTOBER 29, 2012

Summary of Key Discussion Items and Decisions

A meeting was held on October 29th, 2012 to discuss the modeling approach for the ICM Technical Services. The purpose of the meeting was to review the ICM modeling approach and identify and discuss any technical issues/concerns and identify potential solutions. The meeting attendees included the following:

- Vicki Kretsinger, Luhdorff & Scalmanini
- Barbara Dalgish, Luhdorff & Scalmanini
- John Dickey, PlanTierra
- Joel Herr, Systech Water Resources
- Karen Ashby, Larry Walker Associates
- Tom Grovhoug, Larry Walker Associates
- Jeannette Sager, Larry Walker Associates
- Danielle Moss, Larry Walker Associates
- Richard Meyerhoff, CDM
- Thomas Harter, UC Davis
- Giorgos Kourakos, UC Davis
- Kristin Dzurella, UC Davis
- Nigel Quinn, Berkeley National Laboratory
- Randy Hanson, USGS

During the meeting the LWA Team presented a brief summary of the approach described in the ICM Workplans and requested feedback. The key discussion items from the meeting are summarized below.

- General Correspondence Between WARMF and CVHM
  - *There is a general concern that prior modeling efforts (e.g., Westside region modeling) have attempted to use WARMF and other groundwater models and that there have been discrepancies between the two models. Is there a way to improve the resolution of either CVHM or WARMF in order to make the correspondence between them better for the CV-SALTS efforts?*
  - For the purposes of the ICM, existing model runs are being used. However, WARMF will be re-run to include updated fertilizer application rates and crop uptake rates that will be provided by John Dickey (using data from the UC Davis SBX2_ 1 Nitrate Study).
  - One fundamental difference between the ICM and the other modeling efforts is that the ICM work will use the mass loads calculated from WARMF combined with the hydrology (i.e., flow, recharge volumes) from CVHM to calculate the salt and nitrate concentrations.
  - Therefore, it is not necessary for the recharge volumes to match exactly in WARMF and CVHM. It is important, though, to consider how sensitive the resultant mass load is relative to the recharge volume in WARMF.
  - Conclusions from the meeting
    - The use of WARMF and CVHM is fundamentally different than how they have been used in previous modeling efforts. The differences should be captured within the narrative within the ICM Report.
    - CVHM will be used for the model hydrology. The mass from WARMF (which will be aggregated within each of the IAZs) will be combined with the hydrology of CVHM to calculate salt and nitrate concentrations.
  - Both models reflect varied land uses and calculate net recharge rates. Both models also use land-use data from the Department of Water Resources (DWR), but the land use categories and aggregations within each catchment/IAZ are handled differently.

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- Rate of recharge is calculated by CVHM. WARMF uses recharge rates as inputs provided by various groundwater models.
- Conclusions from the meeting
  - An assessment of the land use acreage differences between the two models should be conducted either qualitatively or quantitatively to determine if this contributes to differences in the volumetric net recharge between the two models and how that relates to the mass component of recharge coming from WARMF [1][This will be completed as a part of Task 8]
  - Some comparisons will be evaluated for WARMF and CVHM, and may include volumetric components of:
    - stream leakage (WARMF interaction between the water table and surface water compared to volumes of stream leakage from CVHM for gaining and losing stream conditions),
    - land use (acreages of each land use category in WARMF and CVHM will be compared on an IAZ scale),
    - and net recharge (total net IAZ recharge to groundwater will be compared from WARMF output and CVHM output).
  - If there are differences in volumes from WARMF and CVHM outputs, it was agreed to assume the CVHM is correct and findings will be noted in the ICM report. The purpose of these comparisons is to identify significant differences which may affect the results.

- *How does WARMF handle the applied nitrogen mass?*
- WARMF involves mass balances and historical N application rates; N uptake rates are inputs to the model
- The sum of N mass lost to recharge and to lateral outflow in WARMF will be maintained in the linkage with CVHM. The WARMF simulation within the soil is largely insensitive to whether water leaving the soil goes down to groundwater or out to surface water.
- WARMF calculates nitrification/denitrification rates
- Conclusion from the meeting
  - Denitrification is one case where the hydrology differences between the models could affect nitrogen mass. If the total net flow through the soil is markedly different between the models, the difference in retention time could affect the mass of nitrogen nitrified and denitrified.

[1] The ICM approach is on the 30,000 foot level, and the distribution of mass loading associated with certain land use types is therefore aggregated across an entire IAZ

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- Modeling the Vertical Dimensions/Transfer
    - *Concern was expressed about the approach that was proposed for the modeling of the vertical dimension/transfer*
    - The LWA Team has been discussing this topic since it was raised at the Project Kickoff meeting on October 8th. The approach recommended and agreed upon at that meeting is being incorporated into the ICM approach.
    - As a part of Tasks 4 and 5, the LWA Team will describe the method that will be used to delineate the upper aquifer thickness for each IAZ as an estimated 20-year travel time and the corresponding layers of CVHM (e.g., layers 1 – 3).
    - The method for establishing the vertical dimension and saturated volume of the upper aquifer will be incorporated in the Task 4 and Task 5 reports.
    - Conclusion from the Meeting
        - Since the CVHM has been selected for use for the ICM, the subsurface properties can be extracted from it to determine how far water will travel vertically over a 20-year period. This information will be used to capture the effects of water traveling downward over 20 years and will represent the "mixing zone". [This is incorporated in the ICM approach]
        - The lateral flux of solutes (salt and nitrate) is trivial compared to the vertical flux. However, these findings will be presented in the ICM report.
    - In the ICM Task 4 report regarding the IAZs that was submitted to the Project Committee on October 29, 2012, this approach is presented for the vertical dimension
    - ICM Task 5 will include the methodology for calculating the vertical dimensions or depth of each IAZ.

    - *Concern was expressed about the approach for the salt balance and drainage for the Westside region. This is a difficult area to characterize. The model hydrology for the shallow aquifer zone should be consistent with understood conditions for this area (recognizing that there have been updates to CVHM-1 in the revised model, CVHM-2, which is anticipated to be available in spring 2013).*
    - The Westside is vertically dominated, but compared to other Central Valley subregions, has the most lateral flow from the shallow aquifer zone to tile drains
    - For most IAZs, the ICM will reflect the conditions represented by CVHM-1, which does not include tile drainage; another step will be added for the Westside region and corresponding IAZs in that area (see below)
    - The partitioning will need to be consistent between WARMF and CVHM.
    - Conclusion from the meeting:
        - WARMF addresses tile drains by adding a high-permeability layer under the soil layers. Since there is no root zone, the water that comes into this layer is transferred out laterally. WARMF simulates the drainage of precipitation and irrigation percolating down from the surface but does not simulate groundwater entering the tile drains from below.

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- CVHM-1 does not simulate tile-drains, only runoff of applied water. CVHM-2, which is not finalized or published, and therefore not available for the ICM, is going to include the drain package.
- This should be described within the ICM report.
- The introduction of a proportioning mechanism will be described in Task 5 to help adjust the movement of mass vertically and horizontally between groundwater recharge and lateral flow to surface water components to match the conceptualization of reality where tile drains exist (the focus of this effort will be for the Westside region).

- Central Valley Floor Boundary and Region 5 Jurisdictional Boundary
  - *There is a general concern that the Region 5 jurisdictional boundary will need to be considered and accounted for within the C V-SNMP Master Plan.*
  - The CVHM boundary coincides with the Central Valley floor and with the boundaries of the Sacramento and San Joaquin Valley Groundwater Basins. Data collection (as feasible as a part of ICM Task 3) in other areas of Region 5 will be included to help address this concern. CVHM-1 has hydrology input from the foothills. CVHM-2 will have the same coverage.
  - The Central Valley floor coverage and Region 5 boundary considerations are discussed in the Task 4 Report and will also be included in the Task 8 Report.
  - Since the CV-SNMP must address the Region 5 jurisdictional boundary, Phases 2 and 3 should include salt and nitrate management considerations for the entire jurisdictional boundary.