Frequently Asked Questions on DWR's Integrated Hydrologic Models and Water Budget Pilot Projects

These frequently asked questions (FAQ) have been addressed by DWR's staff working on the enhancement of publically available tools, such as the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) and the Integrated Water Flow Model (IWFM). These tools are being enhanced by the California Department of Water Resources (DWR) to foster and improve understanding of groundwater conditions (including the preparation of water budgets) at the State and regional levels.

Specifically these technical FAQs have been prepared to answer questions regarding:

- Availability and use of DWR's Integrated Hydrologic Modeling Tools, and
- DWR's Water Budget Dashboard
  https://public.tableau.com/profile/salma7330#!/vizhome/RegionalWaterBudget_Basins_Published_4/BaseMaps

A separate group of FAQs focusing on the relationship between the responsibility of Groundwater Sustainability Agencies (GSAs) to prepare basinwide water budgets and the potential obligation to model groundwater conditions for their groundwater sustainability plans (GSPs) under the Sustainable Groudnwter Management Act (SGMA) is addressed separately at the following location: http://water.ca.gov/groundwater/sgm/pdfs/SGMA_WaterBudgets_FAQ_20170921_Final.pdf.

Availability and Use of DWR's Integrated Hydrologic Modeling Tools FAQs

1. What is the Integrated Water Flow Model (IWFM)?

    IWFM is a water resources management and planning modeling platform that simulates groundwater, surface water, stream-groundwater interaction, and other components of the hydrologic system.

    Relative to older versions of the code, the newest version, IWFM-2015, allows for the assignment of more granular input data and generation of more detailed water budgets for user-defined subareas of model domain.

    For more information, visit Bay-Delta Office's IWFM webpage (http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/index.cfm).

2. What is the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim)?

    C2VSim is an integrated numerical model that simulates water movement through the linked land surface, groundwater, and surface water flow systems in California's Central Valley using the IWFM modeling platform. It covers an area of about 20,000 square miles that extends from Redding in the North to Bakersfield in the South. For more information, visit the Bay-Delta Office's C2VSim webpage (http://baydeltaoffice.water.ca.gov/modeling/hydrology/C2VSim/index_C2VSIM.cfm).

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3. What is the status of C2VSim?

    There are two versions of C2VSim, a coarse grid model (C2VSim-CG) for high level screening and a fine grid model (C2VSim-FG) for more detailed analyses. C2VSim-CG was released in 2013 and is currently being migrated to the IWFM-2015 platform and is being updated to include data through water year 2015. A beta version of C2VSim-FG was developed in 2014 and is currently being migrated to the IWFM-2015 platform and finalized with more recent data. Both C2VSim-CG and C2VSim-FG cover the same surface area and subsurface extent in the Central Valley. DWR expects to make calibrated versions of both models with user manual and documentation available to the public in early 2018.

4. What is the Sacramento Valley Groundwater-Surface Water Simulation Model (SVSim)?

    SVSim is a model of the Sacramento Valley developed on the IWFM-2015 modeling platform and based on C2VSim-FG datasets. SVSim was developed to support detailed analysis of stream depletion due to groundwater substitution transfers in the Sacramento Valley. Relative to C2VSim-FG, SVSim is more refined near major rivers (i.e., the horizontal grid spacing is smaller) and is more finely discretized vertically (i.e., there are more layers). SVSim also has an updated representation of aquifer properties based on an extensive lithologic texture analysis. It is scheduled for release in early 2018.

5. Does DWR have a San Joaquin Valley-specific model similar to SVSim?

    DWR does not have a San Joaquin Valley-specific model similar to SVSim, and DWR currently has no plan to develop such a model.

6. What is the element size of DWR's IWFM applications?

    IWFM models are discretized into triangular and/or quadrilateral elements over the area to be simulated (e.g., a groundwater basin or subbasin). Element sizes vary based on many factors, including the physical properties of the area simulated and the intended use of the model. Element sizes for the three DWR's IWFM applications are as follows:

    - C2VSim-CG has an average element size of 14.0 sq mi (range 2.1 to 33.0 sq mi)
    - C2VSim-FG has an average element size of 0.6 sq mi (range 0.006 to 2.8 sq mi)
    - SVSim has an average element size of 0.3 sq mi (range 0.001 to 3.7 sq mi)

7. Why is there such a large range of element sizes in C2VSim and SVSim?

    The model grids in C2VSim and SVSim are more refined along streams to more accurately simulate stream-aquifer interaction. Elements become gradually larger away from the streams.

8. How many layers are in DWR's IWFM applications?

    - Both versions of C2VSim currently have three layers; the updated versions will have four layers
    - SVSim has nine layers

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9. Is DWR planning to develop IWFM-based models for any other parts of California (e.g., the Central Coast Hydrologic Region)?

   Currently, DWR has no plans to develop IWFM-based models for any other parts of California, such as the Central Coast Hydrologic Region, or any other hydrologic region.

10. Is there a way to track water quality in IWFM-based models (e.g., C2VSim and SVSim)?

    No. Tracking salts (e.g., total dissolved solids or nitrate concentration) and/or migration of groundwater contaminants are not currently incorporated in IWFM. However, IWFM-based models, such as C2VSim and SVSim, provide groundwater flow field data as output that can be used as input data to a water quality model to assess the movement of salts or contaminants.

11. Are impacts from subsidence including resulting loss of groundwater storage incorporated into C2VSim? How accurate is the C2VSim subsidence information?

    Impacts from subsidence, including resulting loss of groundwater storage, are incorporated into C2VSim. The current version of C2VSim has limited data on land subsidence, which are not adequate to determine the accuracy of the subsidence simulation in C2VSim.

12. Does DWR provide training on IWFM and C2VSim?

    Yes. DWR provides a four-day training on IWFM and a two-day training on C2VSim once per year, unless there is a request to hold additional workshops.

    Hosted by both DWR and U.S. Bureau of Reclamation (USBR), IWFM users group provides a venue to encourage development and understanding of IWFM modeling platform and IWFM based-models such as C2VSim. Information pertaining to upcoming quarterly meetings, as well as information regarding previous meetings can be accessed online at (http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/UsersGroup/index_UsersGroup.cfm).

    If you are interested in receiving IWFM or C2VSim training, or would like to join the IWFM users group, contact IWFMtechsupport@water.ca.gov.

DWR's Water Budget Dashboard FAQs

DWR is developing historical water budgets for all groundwater basins and overlying watersheds in California based on existing models and available data, reports and studies. The water budget estimates will be refined as more data and models become available to DWR through coordination with GSAs and local agencies, and with data and information submitted as part of the GSPs.

The Water Budget Dashboard (Dashboard) (https://public.tableau.com/profile/salma7330#!/vizhome/RegionalWaterBudget_Basins_Published_4/BaseMaps) is being developed to share and communicate currently available water budget information to ensure common understanding among interested parties. The Dashboard provides a visual display of available data from existing models and from the California Water Plan. The Dashboard contains a number of data analysis tabs showing water budget information for the period of analysis. The water

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budget information currently included in the Dashboard is for the Tulare Lake Hydrologic Region for the 10-year period of water years 2000-2009 with results generated using C2VSim.

1. What is imported water in the Dashboard?

   Imported water is the volume of surface water or groundwater brought from outside into a water budget zone where the water is being used. For example, State Water Project and Central Valley Project water originating outside a water budget zone of use will be considered imported surface water.

2. What data are used to determine the irrigated lands estimates?

   Prior to 2014, irrigated land use estimates were based on a combination of best available data sources including county Agricultural Commissioner's annual crop reports, available water district crop reports, and DWR land use surveys conducted every seven to eight years.

   In addition to the above sources, DWR is beginning to incorporate remote sensing information into irrigated lands estimates. Data are available from various sources starting from 2007.

3. How is fallowed land captured within C2VSim and reported in the Dashboard?

   The IWFM modeling platform can incorporate fallowed lands, but current versions of C2VSim aggregate fallowed land in native vegetation land use category. DWR is currently exploring ways to incorporate data on fallowed land into C2VSim input data and report it as a separate data element in the Dashboard.

4. What is defined as "other inflows" in the Dashboard?

   "Other inflows" include seepage from canals and lakes as well as groundwater that is released as a result of permanent land subsidence.

5. Can DWR refine the land use crop data, like breaking out the mature vs. new trees?

   DWR has no immediate plan to refine the land use crop data to include mature vs. new trees. DWR will explore this kind of crop data refinement to improve agricultural water demand estimates in future.

6. Is there a way to visualize groundwater elevation contours in the Dashboard?

   Currently, no such feature is included in the Dashboard. DWR will consider including this feature in future updates of the Dashboard.