



Memorandum

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TO:

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Napa Valley Subbasin Groundwater Sustainability Plan Advisory
Committee

FROM:

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SUBJECT:

**GUIDANCE ON USE OF THE NAPA VALLEY INTEGRATED HYDROLOGIC
MODEL AS A DECISION-SUPPORT TOOL**

“While models are, by definition, a simplification of a more complex reality, they have proven to be useful tools over several decades for addressing a range of groundwater problems and supporting the decision-making process.” – California Department of Water Resources¹

Recognizing the Groundwater Sustainability Plan Advisory Committee’s (GSPAC’s) historical knowledge and expertise in various fields, we offer this guide for interpreting the role of the Napa Valley Integrated Hydrologic Model (NVIHM) as one of many tools for understanding groundwater conditions and assessing the effectiveness of proposed Management Actions. State Groundwater Sustainability Plan (GSP) Regulations and guidance documents favor the use of models to support sustainable groundwater management, while acknowledging the limitation of models. For the development of water budgets (including 50-year projected hydrology to evaluate future scenarios of hydrologic uncertainty associated with climate change), the GSP Regulations require:

“If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.” – GSP Regulations §354.18

¹ DWR. 2016. Best Management Practices for the Sustainable Management of Groundwater: Modeling. December 2016. https://water.ca.gov/-/media/DWR-Website/WebPages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/BestManagement-Practices-and-Guidance-Documents/Files/BMP-5-Modeling_ay_19.pdf

As a result, Management Actions proposed in the Napa Valley Subbasin GSP should be supported by multiple lines of evidence and analysis, such as vetted publications, expert advice, historical photos, or local direct experience. Below, we outline points to guide the use of the NVIHM.

Department of Water Resources SGMA Guidance – Modeling Fundamentals:²

- “Models provide insight into ... complex system behavior and (when appropriately designed) can assist in developing conceptual understanding.”
- “Models provide an important framework that brings together conceptual understanding, data, and science in a hydrologically and geologically consistent manner.”
- “In addition, models can estimate and reasonably bound future groundwater conditions, support decision-making about monitoring networks and management actions, and allow the exploration of alternative management approaches.”
- “However, there should be no expectation that a single ‘true’ model exists. All models and model results will have some level of uncertainty.”
- “Models can provide decision makers an estimate of the predictive uncertainty that exists in model forecasts. By gaining a sense of the magnitude of the uncertainty in model predictions, decision makers can better accommodate the reality that all model results are imperfect forecasts and actual basin responses to management actions will vary from those predicted by modeling.”

Evaluating Potential Projects and Management Actions

Initial approaches for evaluating potential Projects and Management Actions can include a range of complementary screening tools prior to evaluating selected Projects and Management Actions for further evaluation with a modeling tool.

- A Management Action should be supported by several considerations including a determination of feasibility, not based solely on model results.
- Management approaches should be adaptive, just like the natural environment. As Management Actions are implemented, monitoring should be undertaken to assess their effectiveness. Management Actions should be modified in response to monitoring results, both to reduce uncertainty and ensure that undesirable results are avoided.
- A Management Action should be implemented with a comprehensive understanding of possible outcomes. A Management Action supported by model results should include an assessment of the likelihood of effectiveness, quantified by a confidence interval of the actual or predicted Subbasin condition that the Action is intended to address.

As the GSPAC engages in technical discussions of modeling, it is important to appreciate the framework, content, and uncertainties inherently present with all models, including the NVIHM. The software being used to develop the model for the Napa Valley Subbasin GSP is an open source (public domain) platform, which is widely used and among the software and modeling platforms referenced in DWR’s

² DWR. 2016. Best Management Practices for the Sustainable Management of Groundwater: Modeling (link in footnote above)

2016 Groundwater Modeling Best Management Practices document.³ The One-Water software, developed by the U.S. Geological Survey, has been peer-reviewed and vetted by the scientific community and is being used to support GSPs in other basins including in Sonoma Valley, Petaluma Valley, and Salinas Valley.⁴

The Committee is encouraged to ask questions regarding the uncertainty associated with model inputs and outputs. The GSPAC's collective knowledge is valuable in informing assumptions made to approximate the physical groundwater system and the associated water budget components. Modeling tools like the NVIHM are not intended to yield precise forecasts on the timing of events or the exact location of certain conditions, but they can help inform where stresses (human or natural) may lead to changed conditions, including undesirable results.

As the Napa County Groundwater Sustainability Agency and GSPAC forward with an integrated hydrologic model in the toolkit, it will also be important to consider other valuable screening tools that could be used to hone the focus of various Projects and/or Management Actions that the Committee prioritizes for further evaluation with the model. New data will also help to revise and refine the model regularly during GSP implementation, further reducing model uncertainties and improving assessments of the effectiveness of Projects and Management Actions to maintain or achieve sustainability objectives.

³ DWR. 2016. Best Management Practices for the Sustainable Management of Groundwater: Modeling (link in footnote above)

⁴ <https://www.usgs.gov/software/modflow-one-water-hydrologic-flow-model-conjunctive-use-simulation-software-mf-owhm>