LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

GROUNDWATER RESOURCES
HYDROLOGY . DEVELOPMENT . MANAGEMAGEMENT

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Ms. Paula Landis
Chief, Division of Integrated Regional Water Management
California Department of Water Resources
P.O. Box 942836
Sacramento, CA
94236-0001

SUBJECT: COMMENTS ON DRAFT CASGEM GUIDELINES

Dear Ms. Landis:

In response to the California Department of Water Resources (DWR) distribution of draft *Procedures for Monitoring Entity Reporting* for the new California Statewide Groundwater Elevation Monitoring (CASGEM) authorized by SB X7 6, enacted in November 2009, and DWR's request for comments, Luhdorff & Scalmanini, Consulting Engineers (LSCE) is providing the enclosed comments. Additionally, as DWR has also distributed the draft Groundwater Elevation Monitoring Guidelines and requested comments, LSCE also offers some comments on this document as well.

We appreciate the goal of the CASGEM to set up a collaboration between DWR and local entities (Counties, Watermasters, irrigation districts, etc.) in which the local entities setup DWR-approved groundwater level monitoring networks in DWR-recognized groundwater basins in California, collect seasonal groundwater level data, compile the data, and transmit the data to DWR. We also appreciate DWR's presentation of statewide workshops to facilitate education of local entities and others who will be involved in the implementation of the CASGEM program on the program framework, program deadlines, DWR's expectations, and the opportunity to ask questions and provide comments about the CASGEM program.

LSCE had representatives at two of the workshops and found that they provided important information on the CASGEM program and what DWR expects from local entities as part of being in compliance with the new regulation. We understood from the presentations offered by DWR staff that although the CASGEM program has a goal of being able to adequately monitor groundwater levels in the basins throughout the state using aquifer-specific monitoring wells, it was conveyed in the workshops that, in the short-term, groundwater monitoring networks developed by local entities may not meet this standard. If monitoring networks are not ideal, DWR encourages the local reporting entity to describe what needs to be accomplished in the future to eventually develop a monitoring network that will provide aquifer-specific groundwater level data that is representative of basin-wide conditions. In essence, DWR wants the local

500 FIRST STREET · WOODLAND, CA · 95695-4026 · 530.661.0109 · FAX 530-661.6806

monitoring entity to show a good-faith effort in meeting the overall, long-term objectives of the CASGEM program.

Our comments are provided below in two sections. The first group of comments pertains to the draft Procedures for Monitoring Entity Reporting, and the second group pertains to the draft Groundwater Elevation Monitoring Guidelines. Our comments are global in nature with emphasis on clear communication of the legislative requirements and procedures to ensure successful implementation of the new program.

Comments on CASGEM Procedures for Monitoring Entity Reporting (PMER, October 2010 Draft)

PMER Comment 1:

The language in the document pertaining to eligibility for water grants or loans administered by the state is vague. It should reflect the same clarity as SBx7-6. SBx7-6 states:

> 10933.7. (a) If the department is required to perform groundwater monitoring functions pursuant to Section 10933.5, the county and the entities described in subdivisions (a) to (d), inclusive, of Section 10927 shall not be eligible for a water grant or loan awarded or administered by the state.
>
> (b) Notwithstanding subdivision (a), the department shall determine that an entity described in subdivision (a) is eligible for a water grant or loan under the circumstances described in subdivision (a) if the entity has submitted to the department for approval documentation demonstrating that its entire service area qualifies as a disadvantaged community.

In other words, if the California Department of Water Resources (DWR) is required to perform groundwater monitoring functions, all of the existing entities in that area that may assume responsibility for monitoring functions will not be eligible for a water grant or loan awarded or administered by the state unless such entities can demonstrate that their entire service area qualifies as a disadvantaged community.

In contrast, PMER states in its introduction:

> If no local entities volunteer to monitor groundwater elevations in a basin or part of a basin, DWR may be required to develop a monitoring program for that part. If DWR takes over monitoring of a basin, certain entities in the basin may not be eligible for water grants or loans administered by the state.

While this statement is technically correct, it is unnecessarily vague, which may lead to a lot of "What if?" inquiries from local entities. A similarly vague statement is made on page 14 "Data Gaps".

It should be made clear to any affected monitoring entity that, in the above case, only through its successful documentation demonstrating that its entire service area qualifies as a disadvantaged community will it retain eligibility for a water grant or loan awarded or administered by the state.

At the same time, DWR should be providing unequivocal clarity on who will retain eligibility for a water grant or loan awarded or administered by the state in any possible scenario. For example:

- Will an agency supplying measurement data to a monitoring entity retain eligibility for a water grant or loan awarded or administered by the state (Page 9, Figure 1, Scenario C)?
- In a case where several potential monitoring entities exist and one assumes responsibility to perform monitoring functions, will the other entities retain eligibility for a water grant or loan awarded or administered by the state?
- If a monitoring entity assumes responsibility for a portion of a basin that is within its area of authority (i.e., the remainder of the basin lies outside of its area of authority), will DWR expressly affirm that this satisfies the intended requirement to be eligible for a water grant or loan?

PMER Comment 2:

On page 9, last sentence of Section "Roles and Responsibilities of Monitoring Entities":

The last sentence states that a monitoring entity needs to demonstrate that they have the "capability to take over the DWR monitoring network" in the monitoring entity's area. This requirement was never presented in the workshops as having to be met by a monitoring entity. What was conveyed in the workshops is that a monitoring entity (or the measurement collection agencies) must demonstrate the capability to take over monitoring wells in DWR's network if those wells are a part of the monitoring entity's monitoring network, should DWR discontinue monitoring those wells.

PMER Comment 3:

On page 15, "Monitoring Sites and Timing", first paragraph, it is stated:

> When proposing monitoring locations and frequencies, Monitoring Entities should justify why they are sufficient to represent static groundwater level conditions across the basin (e.g., enough points to draw accurate contour maps and enough frequency to develop accurate hydrographs for seasonal and long-term variability).

The above example misuses terminology. *Accuracy* provides an indication of the proximity of a measurement to the true value of the measured variable. More data points (in space and in time) will result in more detail presented in contour maps and hydrographs, respectively, but this has no inherent bearing on the accuracy of collected data or the validity of results.

In most instances, the conceptualization of the aquifer system(s) and choice of measurement points (i.e., groundwater monitoring facilities representative of the monitored aquifer system) will have a dominant influence on the quality and usefulness of compiled data. The above language from page 15 could be interpreted to suggest that DWR may expect contour maps to be submitted by the monitoring entity. SBx7-6 does not indicate the preparation of groundwater elevation contour maps as a responsibility of monitoring entities. The monitoring entity may certainly choose to prepare contour maps and hydrographs for its own purposes. However, it would be more appropriate for DWR staff to assume the responsibility to generate maps of groundwater level elevations to provide a consistent approach to data processing and data manipulation, including the selection of appropriate wells to differentiate groundwater levels in different aquifers. The intended responsibility can be made clear with a small modification of the quoted paragraph above:

"When proposing monitoring locations and frequencies, Monitoring Entities should justify why generated data will be sufficient to represent static groundwater level conditions across the basin or part thereof (e.g., enough locations for DWR staff to prepare groundwater level contour maps that show adequate detail, and enough frequency for DWR staff to develop hydrographs that show seasonal and long-term variability)."

PMER Comment 4:

On page 15, first paragraph, it is stated:

> Note that public water supply wells as defined by the California Department of Public Health (DPH) should not be used for monitoring in this program because of the confidentiality requirement of DPH to not disclose the location of these wells. Thus, unless there is an agreement between DWR and DPH to the contrary, public supply wells should not be used in the CASGEM program.

In November 2009, the SWRCB made possible access to public water supply well groundwater quality data through a new GeoTracker feature. This was done through the use of modified location coordinates to slightly decrease the precision of the well location. The feature resulted in being able to relate historical groundwater quality data to locations in a basin to evaluate groundwater quality conditions and trends. To the extent that groundwater levels from public supply wells have been collected and used by local entities, there use should not be discouraged for the reason as conveyed on page 15.

PMER Comment 5:

Page 19, "Groundwater Level Information", requires the submittal of an "accuracy" to accompany depth-to-water measurements.

To provide clear guidance to monitoring entities, DWR should provide definitions of concepts of accuracy, precision, and resolution; and then revisit reporting requirements. The whole document should be reviewed for the correct application of this terminology.

While many manufacturers provide technical specifications for their instruments, including calibrated accuracies derived from highly controlled laboratory experimentation, such accuracies often bear little relation to actual accuracies achieved by the end user. The calibrated accuracy of an instrument can be used in combination with individual measurements (performed by individual end users) to calculate an estimated uncertainty inherent in the measurements (i.e., measurement value ± uncertainty interval) to specify the range within which one thinks the true value of the measured variable falls with a specified degree of confidence for individual end users. This can be time consuming. Also, many monitoring entities will not have the expertise to do this.

It should be recognized that measurements will be affected by undetected systematic errors in many cases. For example, depth-to-water readings in wells that are out-of-plumb will yield measurements that systematically overstate the true depth to water, and in many cases, this error source will dwarf the measurement uncertainty introduced by the calibrated accuracy of an instrument or skill of the end user. However, although inaccuracies introduced by systematic errors can potentially be large, even such a "biased" data set can be of value as it will show seasonal and long-term water level variability.

Given the difficulty for monitoring entities to evaluate the uncertainty in individual measurements and their inability to state actual accuracies, it may suffice to establish minimum data quality objectives. Recognizing the objectives of the monitoring effort, monitoring entities could be asked to specify (from predefined choices) a best estimate for an interval around individual measurements within which the entity thinks the true value of the measured variable falls (e.g., ±0.1, 0.5, 1, or >1 ft). Their estimate should be based on calibrated instrumentation accuracy and experience regarding individual wells and field personnel.

Comments on CASGEM Groundwater Elevation Monitoring Guidelines (GEMG, October 2010 Draft)

GEMG Comment 1:

Page 1, Introduction, 3rd paragraph, states:

> DWR will report findings of the CASGEM program to the Governor and the Legislature by January 1, 2012 and thereafter in years ending in 5 and 0.

This is not consistent with SBx7-6, 12924. (b), which states:

> The department shall report its findings to the Governor and the Legislature not later than January 1, 2012, and thereafter in years ending in 5 **or** 0. (**bold underline** added for emphasis)

Is DWR intending to clarify the intent of the legislation by ensuring the department will report its findings in 5 year intervals?

GEMG Comment 2:

Page 1, Selection of Monitoring Wells for Monitoring Plans, 1st Paragraph

As mentioned in the CASGEM workshops, wells selected for the monitoring plans should not only have known well construction information but also be designated as monitoring a specific aquifer as well. Knowledge of the hydrogeology of the basin is important, coupled with well construction data, in order to select wells which will provide groundwater level data specific to a known aquifer. Selection of wells should be aquifer specific and wells with known well construction which are screened across more than one aquifer should not be candidates for selection. Therefore, monitoring wells which are screened in a single aquifer are recommended, if possible, over production wells, which in some cases may be screened across multiple aquifers.

GEMG Comment 3:

The section on "Selection of Monitoring Wells for Monitoring Plans" provides little useful guidance regarding the choice of an appropriate well network density. Referenced previous work is described without needed detail, large density ranges are quoted without qualitative evaluation, objectives of previous studies are not always disclosed, and frames of reference are lacking (e.g., knowledge of the amount of groundwater pumpage in a particular county is not helpful without the knowledge of the size of the county). Also, cited well network densities for the evaluation of water quality data do not provide guidance for the CASGEM Program.

This section could be improved if substantial additional detail were given on previous work efforts, their objectives, and findings. The discussion would need to be linked to CASGEM Program objectives and provide straight forward guidance to DWR staff. In addition, DWR staff will need to rely on the experience and good judgment of their staff members on a case-by-case basis.

GEMG Comment 4:

"Selection of Monitoring Wells for Monitoring Plans" (page 3, last paragraph) misuses the term "accuracy". An increased number of wells used to create a groundwater elevation contour map does not increase its accuracy, it increases the level of resolution.

To provide clear guidance to DWR staff (and also monitoring entities who are encouraged to use this document), DWR should provide definitions of concepts of accuracy, precision, and resolution. The whole document should be reviewed for the correct application of this terminology.

If Figures 1a and 1b are retained in the final document, they should be discussed in more detail. Presently, with the information given in the document, the lowest density well networks appear adequate to attain CASGEM Program objectives.

GEMG Comment 5:

Regarding "Frequency of Water-Level Measurements", page 4, paragraphs 1 and 2:

DWR should reconsider their recommended minimum water-level measurement frequencies with respect to the CASGEM Program objectives. Hourly or even daily measurements are not needed to describe seasonal and long-term groundwater level trends.

Table 3: Frequencies for both unconfined and confined aquifer types are identical and could, therefore, be combined.

GEMG Comment 6:

"Guidelines for Measuring Water Levels" states that the reporting accuracy was reduced for measurements in production wells. However, the following section, "(1) Steel Tape Method" states:

> However, with the obstructions found in production wells it is best to only report water levels to the nearest 0.1 foot.

This equates to a reduction in the resolution of the measurement, not to a reduction in its accuracy.

Also, it is unclear why measurements in production wells should categorically be reported using a reduced resolution. Rationale for this guidance should be given.

GEMG Comment 7:

"(4) Pressure Transducer Method" (page 26, first bullet point) states that no correction is needed for angled wells.

Although it is correct that the pressure reading of the sensor is not influenced by the angle of the well, the depth-to-water measurement needed to calculate the water surface elevation is influenced by the angle of the well.

GEMG Comment 8:

Figure 5: The physical location where the transducer cable is fastened to the well casing or anywhere else (e.g., a crane 50 feet above ground surface) is irrelevant to the determination of the water level elevation. Therefore, the concept of a hanging depth, as indicated in this figure, is irrelevant and should be removed. Relevant measurements are the depth to water (from the RP) and a simultaneous reading from the transducer, the sum of which determines the elevation of the transducer. Following transducer measurements (without manual depth-to-water readings) are then related to the transducer elevation to calculate water level elevations. Table 7 should also be appropriately modified.

GEMG Comment 9:

"(4) Pressure Transducer Method, Making a Measurement" (page 30, fourth numbered point): We recommend sending the instrumentation to the manufacturer for re-calibration if drift is suspected. Field calibration cannot substitute the controlled conditions in a laboratory.

GEMG Comment 10:

"Glossary of Terms": The given definition for Specific Conductance is incorrect. We suggest correction and adding a definition for Electrical Conductivity.

Electrical Conductivity of water:
Electrical conductivity is a measure of the ability of water to conduct electricity and, therefore, a measure of the water's ionic activity and content. The higher the concentration of ionic (dissolved) constituents, the higher the conductivity will be. Conductivity of the same water changes as its temperature changes. This can have a confounding effect on attempts to compare this feature across different waters, or seasonal changes in this parameter for a particular body of water. Normalization of the electrical conductivity eliminates this problem (see specific conductance).

Specific Conductance of water:
The specific conductance is the electrical conductivity normalized to a temperature of 25 °C.

We appreciated the opportunity to submit comments on the draft CASGEM program documents and look forward to the implementation of this new statewide program. Please contact us if you have any questions.

Sincerely,

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Till Angermann, PG, PHg
Project Hydrogeologist

Vicki Kretsinger Grabert
Principal Hydrologist

FOR WILL HALLIGAN

Will Halligan, PG
Senior Hydrogeologist