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COUNTY OF INYO
WATER DEPARTMENT

July 14, 2020

Saeed Jorat, Ph.D.
Eastern Sierra Environmental and Water Rights Group Manager
Los Angeles Department of Water and Power
111 N. Hope St., Room 1468
Los Angeles, Ca 90012

Subject: Review of Six-Month Pumping Test of Testing Well East (TW-E) at Owens Lake - Revised Testing Plan, May 2020

Dear Dr. Jorat,

The Inyo County Water Department (ICWD) appreciates this opportunity to comment on LADWP's May 2020 revised TW-E Test plan. The ICWD has participated on the Groundwater and Habitat Work Groups since their creation and realizes the importance of this test to the overall groundwater development project. The Water Department recognizes the additions and improvements made in the revised plan including: specifying a pumping rate, the inclusion of down-well velocity meters to monitor relative flow contribution of the multiple aquifers, the inclusion of ground surface monitoring, water quality sampling, the addition of monitoring wells in the vegetated dune areas (VDA), and the addition of groundwater triggers in specific monitoring wells.

The 6-month test, as currently designed, would pump more than 1000 AF of groundwater from a previously unstressed area. Due to the significant increase in pumping, combined with a lack of historic data it is critical to include measures in the test to safeguard environmental resources and private wells. While the revised plan includes environmental protections, ICWD has significant concerns related to water level triggers and environmental protections included in the plan.

Comments on the test plan are listed below and discussed more thoroughly in the following paragraphs:

1. Many of the triggers levels listed in Tables 8 and 9 are an order of magnitude or greater than the modeled drawdown and do not provide adequate protection for nearby groundwater-dependent resources.
2. The trigger levels that are based on changes in gradient (Table 9) must also include a trigger for absolute change in groundwater level or piezometric head. Triggers based solely on changes to the vertical or horizontal gradient will not protect against simultaneous declines in both upgradient and down gradient wells.
3. Arbitrarily setting vertical gradient triggers at seeps and springs at a potential 50% reduction in head without understanding the relationship between head and discharge is not conservative and is not acceptable.
4. ICWD recommends a modeling analysis be performed to investigate the efficacy of using model predictions of head in the intermediate aquifers which could provide advance warning and act as triggers to prevent potential drawdown from the deeper aquifer zones migrating to the shallow aquifer and/or spring and seeps. This information would also be valuable to assess whether the existing well network is adequate to accomplish the main goals of the test to examine the effect of faults.
5. ICWD recommends that precipitation monitoring during the test from existing monitoring stations be added to the plan. Also, the plan should include pre-test and late-test groundwater sampling and analysis for major cations and anions and stable hydrogen and oxygen isotopes in selected production and monitoring wells to potentially aid in determining relative contribution of groundwater from various aquifer zones.
6. ICWD would also like a pre- and post-test comparison of vegetative vigor, possibly by relying on remote sensing methods similar to previous work conducted LADWP consultants on the groundwater development project.
7. The post-pumping water level recovery monitoring and reporting period should be extended from 10-days to a more appropriate length of time (e.g. two months) or until full or substantial recovery of water levels in a majority of monitoring wells.
8. Monitoring frequency later in the test needs to be either increased or a mechanism created to automatically increase monitoring if groundwater levels are trending towards a trigger.
9. The process for finalizing triggers for the test in Section 6.5 is too vague; a more specific protocol should be developed that specifies the agencies that will participate in setting the final triggers just before the pumping commences.

Issue: Trigger Levels

The proposed 6-month test of TW-E appears to be designed to accomplish two goals. First, to stress the deeper aquifers in the central, fault-bounded section of Owens Lake to determine the hydrologic role of the faults and aquifers/aquitards. Second, the test is an operational test of TW-E's ability to supply groundwater for seasonal dust suppression. The proposed test could improve and validate the existing groundwater model's design and predictions which is being heavily relied upon to prevent impacts from the proposed test. In circumstances where reliance on largely untested model predictions is necessary, it is prudent to include conservative resource protections to protect against potential unforeseen pumping impacts.

The trigger levels as presented in the proposed test are not conservative/protective enough. For example, in Table 8 the model predicts drawdown caused by the test of 0.24 ft at T931, however the trigger is 5-ft (20-times the predicted drawdown). If drawdown at this monitoring well approached the trigger value, it would represent a major failure of the model and misrepresentation of the hydrologic properties or system. Similarly in Table 9, the model predicts little to no change in both vertical and horizontal gradients, but the associated triggers would allow many feet (tens of feet in some circumstances) of drawdown. Trigger values should be revised to more closely reflect the model predictions while recognizing that drawdown larger than diurnal or seasonal variations would be necessary to distinguish effects of the test from background fluctuations. Triggers at various monitoring points should be developed collaboratively and be based on the specific hydrologic and ecologic conditions at each point.

The proposed triggers levels use both absolute changes in groundwater level/head in many wells and a change in gradient in other wells. The gradient triggers in Table 9 need to be supplemented with absolute trigger in the shallow/downgradient well in addition to gradient change triggers in order to protect against a situation where head drops caused by pumping results in head declines in both deep and shallow wells to occur in tandem. A head decline in the upgradient well could result in less discharge causing the shallow/down gradient monitoring wells to decline in similar proportion. For example, if the groundwater elevation in $P1_{deep}$ were to decline by 3-ft due to pumping, it could reduce spring discharge which could lower the groundwater elevation in $P1_{shallow}$. The gradient as defined in the proposed test between these two wells may remain relatively unchanged, but spring flow would be reduced.

Spring discharge is proportional to the hydraulic conductivity of the subsurface materials and the upward piezometric head gradient. As noted in the proposed test plan, the actual relationship between head and discharge has not been established. In light of that uncertainty, based on the basic flow equation, a 50% drop in upward gradient could lead to a 50% drop in spring/seep discharge. Over a six month period, a large decrease in discharge has the potential to significantly impact groundwater dependent vegetation. A smaller reduction in gradient customized to each spring/seep zone should be established until future testing, modeling, and analysis more firmly establishes the head/discharge relationships at each to the primary springs/seeps.

The purpose for including groundwater triggers is to prevent an impact to sensitive resources. Water levels will need to be established at trigger wells in terms of change in depth to water at values that are protective of vegetation. Given the hydrographs presented in Appendix A, these trigger levels will require some customization depending on location to anticipate both natural seasonal variability and resource-specific needs. Due to the lack of historic data and lack of historic pumping stress at the various VDAs, additional rationale is required to justify whether a 1-foot pumping induced drawdown will cause a significant impact to the associated dune vegetation. Please conduct and present additional justification (supporting literature or expert review) to justify the 1-foot trigger. Alternatively, triggers could be set at an intermediate distance from the pumping well and/or in a deeper aquifer to act as advance warning of drawdown extending to the shallow aquifer in the VDA locations. We realize that suggestion may require the installation of additional monitoring wells or adding additional triggers to the existing monitoring network.

Issue: Modeling

LADWP and its contractors have produced several technical reports concerning the groundwater model and its numerous revisions, and LADWP previously has expressed a willingness to consider additional potential modelling scenarios. There are numerous cluster or multiple completion monitoring wells included in the six month test proposal. Several of these monitoring wells have an "intermediate" screened zone that is between the shallow aquifer and the deeper, confined aquifer zones that TW-E would withdraw water from. ICWD would like to see model results which examine whether the model can use head changes in these intermediate zones to forewarn of changes in the shallow aquifer zones and thus prevent potential impacts to associated groundwater-dependent vegetation. For example, if the model predicts that a certain amount of drawdown in intermediate wells MW-5i, MW-6i or T906i will eventually communicate into the shallow aquifer at a trigger-level amount of drawdown at their respective counterparts (MW-5s, Mw-6s, or T907) then pumping will stop when that intermediate well hits its defined trigger level. ICWD has successfully used the predictive capabilities of groundwater modeling to estimate the drawdown magnitude and time lag between pumping at the Hay Ranch in Rose Valley and future declines in head to avoid future impacts at Little Lake.

Issue: Monitoring

ICWD proposes three additional monitoring components to the six month test plan. To discriminate potential drawdown related to pumping versus other environmental factors, precipitation on the Owens Lake should be monitored and reported. There are several existing stations at the lake that could be used for this purpose. In Section 4.4 Water Quality Sampling, major cations and anions should be added to the analytes listed in Table 6. This additional information will allow for standard tri-linear comparison of constituents. Deuterium and O^{18} should be added as analytes. Both the cation/anion and stable isotope data can be used to potentially assess the composition and relative contributions from differing aquifers during the test. Also, it is unclear at which locations groundwater quality samples will be collected. Please identify these locations.

LADWP and its consultants have developed remote sensing methods to monitor and assess vegetation conditions on the dry lake. ICWD requests that a similar, targeted analysis be used to compare vegetation vigor and extent in the year preceding and the year following the six month test and included in the post-test report.

The test plan calls for a 10-day period of recovery monitoring. This is likely too short a period to capture recovery from pumping, especially if there is a lag in hydraulic communication between the deeper aquifers and fault-bounded areas to the shallow aquifers and seeps and springs. The recovery monitoring and analysis should proceed for a minimum of 2 months or until almost full recovery in wells clearly affected by pumping stress. This period could be shortened for those wells that experience little or no drawdown.

In Section 4.3 Reporting Interval, there are significant gaps in data collection and analysis later in the test period. Since impacts to groundwater resources in the shallow aquifer are more likely to occur later

in the test as pumping stress possibly communicates across aquitards and faults, the data collection interval needs to include additional site visits. ICWD suggests a schedule with data collection at weeks 1, 3, 5, 7, 11, 14, 17, 20, 23, and 26. This suggestion adds four additional monitoring events. Furthermore, if data analysis suggests that drawdown in any trigger well is trending downward towards its trigger level before the next scheduled monitoring event, the frequency at that location should be increased to prevent significant time from passing once a well falls below its trigger level and pumping ceases.

Issue 4: Oversight and Stakeholder Process

Section 6.5 discusses the finalization of the triggers levels for various wells shortly before the test. ICWD agrees that this fine tuning is necessary to reflect changing conditions between adoption of the plan and commencing pumping. Section 6.5 should indicate the parties that will be involved in the final trigger level discussions. In order to make project review and analysis more efficient, ICWD requests digital copies of the monitoring well locations and spreadsheet data along with well construction characteristics (e.g. Table 2).

Miscellaneous comments

Hydraulic gradient has a well-defined meaning which for the purposes of this test plan was simplified to a length scale. To prevent confusion, the length should not continue to be referred to as a hydraulic gradient and a more suitable term substituted.

On December 21, 2011, LADWP submitted a request to the Technical Group to resolve the issue of whether groundwater pumping to supply water to a dust control project at Owens Lake implemented by LADWP pursuant to an order by the GBUAPCD under the authority of Health and Safety Code section 42316 is governed by the Water Agreement.

LADWP believes that such groundwater pumping is not governed by the Water Agreement because section XVIII of the Water Agreement provides that "*Any project implemented pursuant to Health and Safety Code section 42316 is not a part of this Stipulation and Order*." The County believes that the exclusion from the Water Agreement of Health and Safety Code section 42316 projects does not include groundwater pumping to supply such projects because section 42416 provides that any air quality mitigation measures that the GBUAPCD orders LADWP to implement "…*shall not affect the right of the city to produce, divert, store or convey water*…"; therefore, the GBUAPCD is without authority to order LADWP to pump groundwater to supply mitigation measures order by the GBUAPCD.

The issue submitted by LADWP has not been resolved. The Technical Group tabled the issue because LADWP and other agencies and organizations were in the process of developing a Master Plan for Owens Lake which could include a plan for supplying groundwater to dust control projects on Owens Lake that might be acceptable to LADWP and to the County. By submitting these comments on the "Six-Month Pumping Test of Testing Well East (TW-E) at Owens Lake - Revised Testing Plan, May 2020," the County is not admitting that groundwater pumping under the test is not governed by the Water Agreement.

Thank you for considering these comments, and we look forward to continuing the discussion of the Revised Testing Plan at an upcoming meeting of the Groundwater Working Group. If you have any questions, do not hesitate to contact me at the Water Department.

Sincerely,

Aaron Steinwand, Ph.D.
Director
Inyo County Water Department

CC: Anselmo Collins
Nelson Mejia
Adam Perez

Los Angeles Department of Water & Power

CUSTOMERS FIRST

Eric Garcetti, Mayor

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Nicole Neeman Brady
Susan A. Rodriguez, Secretary

Martin L. Adams, General Manager and Chief Engineer

November 2, 2020

Aaron Steinwand, Ph.D.
Director
Inyo County Water Department
P.O. Box 337
Independence, CA 93526

Dear Dr. Steinwand:

Subject: Six-Month Operational Test of Testing Well East at Owens Lake – Updated Testing Plan

Thank you for the review and providing comments on the testing plan for the proposed six-month operational test of Testing Well East (TW-E) at Owens Lake. The Inyo County Water Department's (ICWD) comments were focused on several important issues including the trigger mechanisms to ensure the protection of the groundwater-dependent resources during the test, the role of the groundwater model in setting the trigger levels, monitoring program, and the oversight and stakeholder process. The Los Angeles Department of Water and Power (LADWP) and ICWD staff had a productive conference call on July 17, 2020, to discuss and address these comments.

As stated in the updated testing plan, the proposed operational test of TW-E is part of the Owens Lake Groundwater Development Program (OLGDP), a component of the planned Owens Lake Master Project (OLMP). The objective of the OLGDP is to optimize groundwater management at Owens Lake by implementing groundwater banking in and around Owens Lake when excess Los Angeles Aqueduct supply is available and utilize water from beneath Owens Lake to supply a portion of water demand for dust mitigation in an environmentally sustainable manner. As we have conveyed in the past, LADWP is utilizing an adaptive management strategy by implementing the OLGDP in small increments along with extensive and comprehensive monitoring, and adjusting the OLGDP as data is collected and analyzed.

A list of the ICWD's main comments (shortened and summarized for brevity) and explanations of how they are addressed in the updated Testing Plan, is given below.

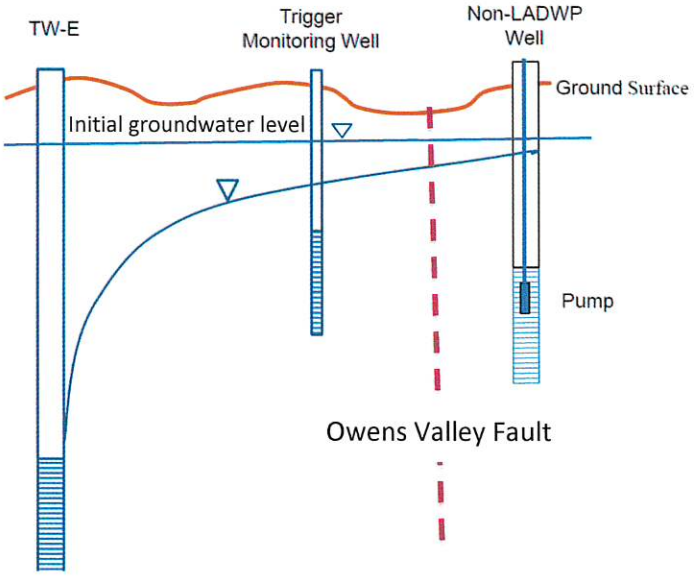
Trigger Levels – The trigger levels as presented in the proposed test are not conservative/protective enough.

The proposed operational test of TW-E is designed to ensure that there will not be significant impacts on groundwater-dependent resources in and around Owens Lake. A review of formation lithology of wells in the northern part of Owens Lake shows that an approximately 100-foot-thick layer of low transmissivity clay separates the surficial aquifer that support springs and Vegetated Dune Area (VDA) habitats from the deeper aquifers, where TW-E is screened and will draw water from. The existence of this thick clay layer minimizes any effect of the operational test on groundwater levels under these resources.

Utilizing the current version of the Owens Lake Groundwater Model (OLGM), six months of pumping TW-E at a rate of 3.0 cfs was simulated. Based on the model predictions, effects, if any, will be reflected in the northern part of Owens Lake. Therefore, more attention will be given to the resources in the northern half of Owens Lake.

A trigger mechanism is utilized as an additional protection for the groundwater-dependent resources in and around Owens Lake as a part of managing the proposed operational test. Trigger wells and trigger levels are set specific to each type of resource that is being protected. If the water level in a trigger well falls below the pre-set trigger level for that well, pumping will stop and recovery phase of the operational test will start. Below, is a summary of triggers for non-LADWP wells, springs, and VDAs.

<u>Triggers for non-LADWP wells</u> – The goal of the trigger for non-LADWP wells is to ensure that the well owners' capability to pump water for their intended use is not affected by the proposed operational test. The non-LADWP wells around Owens Lake are located either west of the Owens Valley Fault or east of the Owens River Fault and are protected by the barrier effect of each fault. The water level in non-LADWP wells cannot be measured directly because of access limitations. Instead, trigger wells are selected at a location between the TW-E and each non-LADWP well or group of wells. The sketch below shows the general spatial relationship between the TW-E, trigger wells, and the non-LADWP wells. For non-LADWP wells, a drawdown of five feet from the pre-pumping groundwater level as the trigger level in the trigger well, corresponds to a much smaller drawdown at non-LADWP wells, and therefore, is considered very conservative.



<u>Triggers for springs</u> – Springs are located at the margins of the lakebed. Habitat at the springs utilize the groundwater that seeps to the ground surface at these locations. The reason for the groundwater seeping from lower zones to the surface is the higher head in the deeper zones compared to the shallower zone. We have been using the term "groundwater gradient" for this phenomenon. Data collected from the cluster of monitoring wells located at eight select springs, since 2015, show relatively constant groundwater gradient at the springs. For springs, horizontal and vertical gradient is utilized as the trigger mechanism. Any potential effect of pumping will first result in lowering of the groundwater level in the deeper monitoring wells at the springs, which in turn will result in lowering of gradient at the monitoring site. A reduction of gradient will subsequently result in the reduction of groundwater flow from the deep to shallow zone and lowering of the groundwater level in the upper monitoring well. Therefore, the use of gradient monitoring is a more conservative method as an early warning for the protection of habitat at the springs than the groundwater level in the shallow aquifer. However, as requested by our reviewers, LADWP will also use an absolute drawdown in the shallow monitoring wells at the springs as a trigger for the operational test.

Seeping groundwater to the surface will continue as long as there is a positive groundwater gradient at spring areas. The proposed trigger for springs is a 50-percent reduction in groundwater gradient, meaning that the spring will continue to receive flow from the lower aquifer zone during the test. Finally, even with a drop in the groundwater levels, vegetation roots will still have access to moisture due to capillary action of the soil during the operational test.

Regarding an absolute groundwater trigger in the shallow monitoring wells at springs, because LADWP has been collecting groundwater level data from these monitoring wells since 2015, which included dry and wet runoff years and multiple seasonal variations, the ranges for natural variability of groundwater levels in shallow monitoring wells will be used to set an absolute trigger in shallow monitoring wells at each spring utilized as trigger locations.

Triggers for Vegetated Dune Areas - A review of literature indicates the resilience of desert vegetation such that lowering of groundwater level by several meters for multiple years will not cause mortality of these type of plants. Therefore, a lowering of only one foot during the proposed six-month operational test is a very conservative trigger to protect habitat at VDAs. Additionally, it is important to note that the plan is to conduct the proposed operational test during the dust season, which generally coincides with the non-growing season, when plants are dormant and do not need much water. It has been documented (see updated operational plan), that plants on VDAs can depend on both precipitation and groundwater; the proposed operational test will occur during the rainy season and potential reduced groundwater supply would be compensated by precipitation. Finally, even with a drop in the groundwater levels, vegetation roots will still have access to moisture from the capillary action of the soil during the operational test.

For the reasons stated above, we believe that the proposed trigger mechanism is conservative and protective of the groundwater-dependent resources. That being said, we are open to discussing even more conservative trigger levels and/or locations with your agency and other stakeholders that are based on a clear and reasonable rationale for each resource to be protected (non-LADWP wells, springs, and/or VDAs).

Issue: Modeling – Use of the model in setting trigger levels

Since the initial development of the OLGM, vetted by a Blue-Ribbon Panel of experts, a number of improvements have been made to it as new data became available. However, the role of faults on groundwater flow in the Owens Lake groundwater area is still considered a data gap that we hope to address with the data collected during the proposed operational test. Using the current version of the OLGM, a six-month pumping of TW-E was simulated to determine the aerial extent of the potential effects. The actual trigger levels for the resources within the area of influence for TW-E were proposed specific to the resource being protected, and not simply the modeling results. This ensures that the resources are protected, regardless of the results or accuracy of the groundwater model. Utilizing the data from the operational test, the OLGM will be updated and recalibrated, which is expected to result in a more robust tool for groundwater management at Owens Lake.

Issue: Monitoring – Three additional components

LADWP agrees that the addition of precipitation, water quality, and vegetation monitoring to the monitoring plan will result in an improved understanding of the hydrogeologic conceptual model of Owens Lake. More detail on the addition of these three components is provided in the updated testing plan. While measurements will be made continually at monitoring locations, we also agree to download data from monitoring locations at the end of weeks 1, 3, 5, 8, 11, 14, 17, 20, 23, and 26 after the start of the pumping phase of the test. Finally, as the measurement data will continue to be collected after completion of the test, the recovery data will effectively be collected until 100 percent of groundwater levels return to seasonally adjusted pre-pumping levels.

Issue 4: Oversight and Stakeholder Process

LADWP agrees that, similar to previous operational tests conducted in the Owens Valley, which included a trigger mechanism, we can agree on trigger locations and preliminary trigger levels during the planning phase and finalize the trigger levels immediately prior to the start of the test. In doing so, we will consider the actual near-term data and, when available, long-term groundwater level fluctuations in the trigger wells. Similar to the previous operational tests, this can be accomplished with the participation of technical members of the responsible agencies.

Miscellaneous comments

We agree that the regulatory framework for the groundwater management at Owens Lake is not set at this point. Most of the lands in the Owens Valley floor and even around Owens Lake, is governed under the Long-Term Inyo County/Los Angeles Water Agreement. However, groundwater management at the Owens Lakebed is under jurisdiction of the California State Lands Commission but in Inyo County. As you are aware, multiple regulatory framework options have been explored so far, but an agreement has not been developed yet. We expect the issues of governance of groundwater management under Owens Lake should, and hopefully will, be addressed during the preparation of a Hydrologic Monitoring, Management, and Mitigation Plan, which will be a part of the environmental documentation for the OLMP, a component of which is the OLGDP.

I would like to thank the ICWD and other reviewers for their active participation in the proposed operational test by reviewing and providing comments on the Testing Plan. Based on all the input received, the testing plan has been updated. We look forward to working with your agency to develop final trigger levels, performing a successful

operational test, and ensuring that groundwater production at Owens Lake does not impact groundwater-dependent resources.

The final Testing Plan is uploaded to the OLGDP web page (www.ladwp.com/olg) and will be used as the basis for the preparation of a Negative Declaration for the proposed operational test. The process of adopting a Negative Declaration will provide an additional opportunity for the stakeholders to provide comments and input on the Testing Plan for the six-month operational test of TW-E.

If you have any additional comments, questions, or concerns, please contact Dr. Saeed M. Jorat, Manager of Eastern Sierra Environmental Group, at (213) 367-1119 or via email at saeed.jorat@ladwp.com.

Sincerely,

Anselmo G. Collins
Director of Water Operations Division

SMJ:jm
c: Dr. Saeed M. Jorat
Mr. Nelson O. Mejia