State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

October 10, 2024
Sent via email

Marshall Styers
Los Angeles Department of Water and Power
111 N Hope Street, RM 1044
Los Angeles, CA 90012

Dear Mr. Styers:

Comments on the Notice of Determination for an Addendum to the 1991 Environmental Impact Report: Water from the Owens Valley to Supply the Second Los Angeles Aqueduct 1970 to 1990, 1990 Onward, Pursuant to a Long-Term Groundwater Management Plan for Replacement of Wells W247 and W379 (Project), SCH# 1989080705, and Notice of Exemption

The California Department of Fish and Wildlife (CDFW) reviewed a Notice of Determination for an Addendum to the 1991 Environmental Impact Report: Water from the Owens Valley to Supply the Second Los Angeles Aqueduct 1970 to 1990, 1990 Onward, Pursuant to a Long-Term Groundwater Management Plan for Replacement of Wells W247 and W379 (Addendum), SCH# 1989080705, and Notice of Exemption pursuant to California Code of Regulations, title 14, section 15302, prepared by the Los Angeles Department of Water and Power (LADWP) for the Project pursuant the California Environmental Quality Act (CEQA) and CEQA Guidelines.[1]

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW ROLE

CDFW is California's **Trustee Agency** for fish and wildlife resources and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (*Id.*, § 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also submitting comments as a **Responsible Agency** under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed alteration regulatory authority. (Fish & G. Code, § 1600 et seq.) Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), the project proponent may seek related take authorization as provided by the Fish and Game Code.

PROJECT DESCRIPTION SUMMARY

Proponent: Los Angeles Department of Water and Power

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[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

Objective: The objective of the Project is to amend the 1991 EIR to include the replacement of two existing wells, well W247 with W247R with wells W379 with W379R, respectively. Both existing wells were described and analyzed in the 1991 EIR. The replacement wells are located in the immediate vicinity of and will have the same purpose and capacity of the wells they are replacing.

Location: Well 379 and its replacement W379R are located in the Big Pine Wellfield, approximately 0.5 miles north of the town of Big Pine, CA. Well 247 and W247R are located in the Laws Wellfield approximately 5 miles north of the town of Bishop, CA.

COMMENTS AND RECOMMENDATIONS

CDFW offers the comments and recommendations below to assist LADWP in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources. Based on the potential for the Project to have a significant impact on biological resources, CDFW concludes that a Supplemental Environmental Impact Report is appropriate for the Project.

Through the preparation of a Notice of Exemption and Addendum (LADWP, 2024a; LADWP, 2024b) to the 1991 Environmental Impact Report for the Long-Term Groundwater Management Plan (SCH #1989080705) (1991 EIR) (Inyo County Water Department (ICWD) and LADWP, 1991a), LADWP asserts that the original 1991 document has already analyzed the impacts from operating these two new wells, W247R and W379R, casting them as replacement of wells that existed at the time of the 1991 EIR. Therefore, implementing the mitigation measures in the 1991 EIR (ICWD and LADWP, 1991a), along with the terms of the *1991 Agreement between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long Term Groundwater Management Plan for Owens Valley and Inyo County* (Agreement) (ICWD and LADWP, 1991b), and the procedures of the *Green Book for the Long-Term Groundwater Management Plan* (Green Book) (ICWD and LADWP, 1990) is sufficient. However, LADWP also asserts that Section VI of the Agreement, addressing *new* wells and production capacity, covers the Project (see LADWP, 2024b, page 11). Section VI provides that the construction and operation of new wells not addressed in the 1991 EIR will be the subject of "subsequent" California Environmental Quality Act (CEQA) review (ICWD and LADWP, 1991b, page 27). Nonetheless, LADWP concludes that the new well impact analyses for operating these two wells presented in the Addendum and the *Replacement Well Pre-Construction Evaluations and the First Season of Operation Monitoring Plans* (LADWP, 2024c; LADWP, 2024d) provide all the updated information needed to comply with the requirements of CEQA Guidelines section 15164, subdivision (a).

LADWP proposes to construct two new wells adjacent and deeper than the existing ones, with W247R up to 230 feet and W379R up to 290 feet deeper. The new wells will be screened between 350 to 700 feet below ground surface (bgs) to draw water "primarily" from a deeper aquifer system. LADWP assumes that the deeper aquifer is a semi-confined aquifer at both new well sites because interbedded finer-grained layers, such as clays, overlie it. At the Big Pine well W379R, LADWP states that "[t]he effect of the interbedded clay layers on the aquifer is semi-confinement (leaky aquifer) from approximately 100 to 200 feet-bgs." (LADWP, 2024d, page 4.) LADWP does not specifically identify an overlying "leaky aquifer" semi-confining layer at well W247R. Instead, LADWP's report states that the existing W247 may be converted to a monitoring well for measuring groundwater levels in the deep aquifer "[t]o improve understanding of this semi-confinement aquifer." (LADWP, 2024c, page 5).

Based on its review of LADWP's documentation and other available information, CDFW concludes that neither the original 1991 EIR nor the Addendum and its accompanying pre-construction evaluation plans fully assess the currently existing environmental conditions around these new wells and, therefore, these documents have not adequately evaluated the potential environmental impacts from operating these new wells. The hydrogeology of the Laws Wellfield and Five Bridges area, in particular, is complex. The lack of site-specific data requires that any analysis of the potential impacts from pumping these two new wells, W247R and W379R, make numerous assumptions about the underlying geology, the sources of recharge, the interactions between groundwater aquifers, and the interactions between the aquifers and the overlying vegetation and habitat. As discussed in these comments, the deeper reach of W247R and W379R introduces changes to the project as evaluated in 1991 that may present new significant impacts, or a substantial increase in the severity of previously identified significant effects. Moreover, since preparation of the 1991 EIR, new information regarding the hydrology in these areas has become available. Additional hydrogeologic, vegetation, and habitat impact analyses are needed at each new well site to ensure there aren't impacts to vegetation and in turn wildlife resources that depend upon that vegetation and that a comprehensive supplemental EIR that presents this additional analysis is warranted.

The following comments focus on five main themes:

1. Lack of Knowledge on the Extent and Effectiveness of Semi-Confining Layers,
2. Need to Incorporate Newly Available Hydrogeologic Data,
3. Simulation of the Worst-Case Scenarios,
4. Revisions Needed to the Monitoring Plans, and Triggers,
5. Analysis of Pumping Test with Corrections for Drawdown Interferences.

Comment 1: Lack of Knowledge on the Extent and Effectiveness of Semi-Confining Layers

The Addendum assumes that the construction of these two new wells to extract groundwater below a depth of 350 feet will reduce the pumping drawdown in the overlying shallow aquifer system but increase the drawdown in the intermediate (at W379R only) and deeper aquifer systems. The pre-construction evaluations simulated drawdowns from pumping the existing and new wells in the shallow, intermediate, and deep aquifers. The drawdown modeling for new wells W247R and W379R assumes a continuous semi-confining layer between the shallow aquifer, and intermediate and deep aquifers. The reduction in shallow drawdown when pumping these new wells occurs because the semi-confining layer has a lower vertical hydraulic conductivity, which reduces the rate that the shallow aquifer recharges the water pumped out of the deeper aquifer.

Although the semi-confining layer reduces the downward flow rate to the deep aquifer from pumping the new wells, the layer is still "leaky;" therefore, groundwater storage is lost in the shallow aquifer system. The pre-construction evaluations do not address the issue of the source(s) of the recharge to the pumped deep aquifer system. For W247R, it is unknown if the shallow groundwater system provides deep aquifer recharge only from the areas shown on page D-1 of the 1991 EIR, (Exhibit 1 attached), or if the deep aquifer system interconnects with surrounding areas such as Chalfant Valley to the north, the White Mountains to the east, the Bishop Cone to the southwest, and/or Fish Slough to the northwest. A nearby example of this happening occurred in the 2019-2020 pumping test of well W385R in the western portion of the Laws Wellfield, when the pumping drawdowns were affected by the drawdown from well W410, located approximately 1.8 miles south in the Bishop Cone. CDFW recommends that the pre-construction evaluations and pumping drawdown impact modeling be revised using all the existing hydrogeologic data. LADWP should acquire additional data to fill in the knowledge gaps and identify all areas and pathways of deep aquifer recharge. Due to the hydrogeologic data gaps, the Addendum is not supported in reaching its conclusion that the only regions of deep recharge directly overlie and surround these two new wells.

Additionally, the groundwater pumping models for areas surrounding these two new wells do not appear to account for the known extent of the low permeability layers in Owens Valley, as reported by MWH in 2003 (MWH, 2003). Exhibit 2 is Map No. 7 from the 2003 MWH report showing maximum low permeability layer thickness contours for the Northern Owens Valley. While these contours are based on drilling logs, there is uncertainty where logs are absent. The map indicates that the assumption of a continuous semi-confining layer across the Laws and Big Pine Wellfields may not be warranted. Attached are Exhibits 3A, 3B and 3C which are maps of the Laws Wellfield taken from the well W247R Pre-Construction Evaluation Report with the approximate outer boundary of the maximum low permeability layer overlain. Exhibits 4A, 4B, and 4C are similar maps of the Big Pine

Wellfield. These exhibits show that around the proposed new wells, the known extent of the low permeability layer is not continuous across the model domain.
The pre-construction evaluation pumping drawdown modeling appears to have assumed a homogeneous, continuous, semi-confining layer across the model domain because the simulated drawdowns for shallow and deep aquifers are concentric. The shapes of the deeper aquifer drawdowns are like the shallow aquifer drawdowns, only the values are greater. If the low permeability layer was modeled as shown in Exhibits 2 through 4 with a variable thickness and discontinuity across the well fields, the shape of the deep drawdown contours should differ from the shallow contours. In addition to having a different shape, there is an important difference in the potential shallow aquifer impacts from pumping the deeper aquifer when the semi-confining layer is discontinuous.

In the U.S. Geological Survey Circular 1376 (Barlow and Leake, 2012), Barlow and Leake modeled the relative impacts of pumping beneath a continuous and non-continuous confining layer versus no confining layer. Exhibits 5A through 5D, taken from Circular 1376, present the findings from the model simulations. The study found that pumping beneath the non-continuous confining layer can produce increased depletion of surface waters not underlain by the confining layer compared to pumping with a continuous confining layer or without any confining layer, i.e., an unconfined aquifer. This increase occurs because the vertical hydraulic conductivity of the confining layer is much lower than the horizontal hydraulic conductivity of the pumped aquifer. As a result, drawdown from pumping below the non-continuous confining layer can propagate more easily laterally towards the river than to the overlying shallow aquifer. The model simulation Case 3 shows the rate of depletion of surface waters increases when the confining clay layers only partially cover the area; see Case 3 versus Cases 1 and 2 in Figure 37B of Exhibit 5D.

These simulations of the effects of a semi-confining layer on an overlying river are relevant to the hydrogeologic setting of these two new wells because rivers and unlined canals cross the Laws and Big Pine Wellfields. In addition, the simulated increase in seepage loss requires an increase in the rate at which groundwater flows away from surface water bodies. If there is no surface water to deliver recharge, then the groundwater aquifer overlying the pumping well has an increase in the rate of storage loss and decline in groundwater level.

The 1991 EIR states that "[f]ollowing the construction of each new well, an aquifer test of up to 72 hours duration will be conducted in conjunction with monitoring of one or more existing or new monitoring wells as determined necessary by the Technical Group." (LADWP, 1991a, page 16-33.) The Agreement includes this requirement in Section VI. (ICWD and LADWP, 1991b.) Although the Addendum and the Pre-Construction Evaluation Reports do acknowledge that pumping tests up to 72 hours will be conducted for each new well to obtain site-specific aquifer parameters to model better estimates of shallow and deep aquifer drawdowns, the known variability in the thickness and location of the low permeability layers suggests that the distribution of the existing monitoring wells may not be adequate to measure the heterogeneity of the surrounding drawdown. The only new monitoring wells discussed in the Pre-Construction Evaluations are the conversion of W247 and/or W379 to monitoring wells. Although the Addendum states that LADWP is installing two additional multi-completion monitoring wells east and west of the planned W379R (LADWP, 2024b page 10), it is unclear if the identities and locations of those new sets of monitoring wells are shown in Figure 1 or the two Figure 2s in the W379R Pre-Construction Evaluation and Monitoring Report.

Recommendation 1: To Address the Lack of Knowledge on the Semi-Confining Layer

CDFW recommends that additional hydrogeologic analysis be done at each of the new well sites and the results of that analysis be provided in a technical report that shows the subsurface characteristics of the aquifer and semi-confining layering Laws and Big Pine Wellfields, including the thickness and lateral extent of the layers, the hydraulic conductivity, and storativity of the layers. It would be important to provide copies of the hydrogeologic data used to identify the sources and areas of recharge to the shallow, intermediate, and deep aquifer systems, as well as identify the existing and/or additional monitoring wells that will be used to document the impacts on the recharge areas from these two new wells pumping the deep aquifer system. CDFW recommends making the technical report and documentation available to the public for review and comment at least 30 days before any well-pumping evaluation tests start.

Comment 2: Need to Incorporate Newly Available Hydrogeologic Data

Recent airborne electromagnetics (AEM) surveys by LADWP and Department of Water Resources (DWR), as shown in the attached Exhibit 6A (LADWP, 2024e), and Exhibits 6B through 6F (California Department of Water Resources, 2024) over the Laws Wellfield and Exhibits 6G and 6H for the Big Pine Wellfield. AEM is a geophysical technology that measures the electromagnetic response of the subsurface. AEM data are collected using geophysical instruments on a hoop towed beneath a helicopter. A current is generated in the hoop, which sends an electromagnetic signal into the subsurface to measure natural variations in the electrical properties of soil, rocks, and water. The AEM survey results can be used in conjunction with wellbore data to map hydrogeologic subsurface conditions. The DWR has made the AEM data publicly available on the web (DWR, AEM 3D Viewer (Beta) and AEM Profile Viewer), Exhibits 6B through 6H. LADWP has not publicly released its data set as of the date of this letter.

Recommendation 2: Incorporate Newly Available Hydrogeologic Data

CDFW recommends that the AEM data and any new borehole data be used to delineate the depth, thickness, and lateral extent of the semi-confining layer(s) and aquifers in the Laws and Big Pine Wellfields. Using this additional data, monitoring well locations and depths can be selected to assess the impacts of pumping these two proposed new wells and the cumulative impacts of pumping the existing production wells in the surrounding areas.

CDFW recommends that additional subsurface data, such as AEM or seismic reflection surveys, be acquired when necessary to better define the subsurface conditions, such as the stratigraphic offsets caused by faulting or filling in the AEM dropout areas where they occur, and the additional data be used in the modeling of drawdowns and the selecting groundwater monitoring sites with the possibility of new sites.

CDFW may also have additional comments on the data gaps and need for additional subsurface hydrogeology data once the 2005 and 2023 model document reports cited in the Pre-Construction Evaluation Reports are available for public review.

Comment 3: Simulation of the Worst-Case Scenario

Section VI of the Agreement provides that LADWP may "…replace existing wells and construct new wells in areas where hydrogeologic conditions are favorable, and where the operations of that well will not cause a change in vegetation that would be inconsistent with these goals and principles." (ICWD and LADWP, 1991b, pages 24-25.) Section IV of the Green Book provides guidelines that will be followed when constructing and putting new wells into operation. (ICWD and LADWP, 1990, pages 97-100.) One of these guidelines requires that if a groundwater flow model is used to evaluate the potential impacts of a new well, it will be run to:

> … model with all existing wells and the new well(s) pumping during a simulated worst-case, three-year drought (hydrologic conditions of runoff year 1977-78, which is the driest on record, repeated three times) to identify the areas with the greatest potential for surface effects due to pumping (area of 10 feet or greater drawdown). (ICWD and LADWP, 1990, Section IV.B.1.a.ii, page 97.)

The groundwater model simulations done for the Pre-Construction Evaluation Reports to compare existing to future drawdowns from pumping the new wells W247R and W379R but did not simulate a three-year drought worst case. Instead, the simulations modeled one year without consideration of any drought conditions at the proposed maximum pumping rate to compare the current and future drawdowns in the shallow, intermediate (W379R only), and deep aquifers. The modeling demonstrated that when the new wells are no longer screened across the shallow aquifer, there will be less drawdown in the shallow aquifer but greater drawdown in the intermediate (W379R only) and deep aquifers. The results of these simulations did not consider the actual starting depth of groundwater below the ground surface or the availability of recharge, i.e., the water year type.

The Addendum's one-year pumping comparison of the hypothetical existing versus new well shallow aquifer drawdowns does not provide the three-year worst-case simulations required by the Agreement because the duration of the simulation is not long enough, the simulated drawdowns are not compared to the existing groundwater levels, and the modeling does not simulate cumulative drawdowns and impacts from pumping the new and surrounding existing wells at the same time, with or without multiple years of pumping.

Without including the existing groundwater level conditions and the effects of pumping multiple wells for multiple years, the results of the new well groundwater model simulations cannot accurately estimate the duration, volume, or source areas needed to backfill the aquifer storage lost in the deep aquifers from pumping the new wells, nor estimate the rate of leakage through the overlying semi-confining layer, where it exists, and the loss in storage and groundwater decline in the shallow aquifer systems. The lack of realistic simulations of pumping the new wells can cause multi-year cumulative declines in groundwater levels in the overlying shallow, intermediate, and deep aquifers.

Well W247R Worst Case Three Year Hydrological Water Year Issues

Hydrographs of historical shallow groundwater levels in the wells surrounding the proposed well W247R show levels vary significantly; see Exhibit 3A for locations. Exhibits 7A through 7F are hydrographs of the wells surrounding existing well W247. These hydrographs show that the depth of groundwater has fluctuated significantly in the Laws Wellfield area around well W247. At monitoring well T606, a shallow well 50 feet northeast of proposed well W247R (Exhibit 7C and 9A), the depth to groundwater changes from 10 feet to 37 feet in a recent 10-year period from 2006 through 2016 (Exhibit 7A). A similar decline occurred in a well T577, 1,800 feet to the southeast, from near zero to 28 feet deep (Exhibit 7C). A third shallow well, T605, varies from a depth of 5 to greater than 20 feet, which is the maximum depth of the well.

The decline in groundwater levels during the years 2010 through 2016 occurred when there was no pumping in well W247 or the adjacent production wells W246, W248, W259, W385, W386, and W398. Exhibit 10A is a map of the Laws Wellfield production wells. The annual pumping volumes are given in Exhibits 11A and 11B. The highlighted section of Exhibit 11B shows that production was zero in W247 and the six adjacent wells except for one acre-foot of production in the year 2015 at well W385. Most of the production from 2010 through 2016 was east of W247 in wells W236, W239, W244, W245, and W365, which are at the base of the White Mountains, Exhibits 10 and 11B.

The hydrograph for well V290 shows annual drawdown cycles of approximately 5 feet from 2010 through 2016. In contrast, the simulation results in Figure 7 in the W247R Pre-Construction Evaluation Report show approximately 3 feet of decline with pumping well W247R for a full year at 5.3 cfs, 3,837 AF (LADWP, 2024c).

These hydrographs raise a series of questions that could affect analyses of potential impacts of W247R. What caused the historical 2010-2016 increase in annual decline, and how does that affect the new well drawdown simulation? Was the historical decline due to drought even though there was zero production in the nearby wells during this 7-year period? Why did the groundwater level rise 20+ feet in the year 2017? The rise started in August 2016 and ended in July 2017, with the rainfall at the Bishop Airport reaching 8.98 inches by December 2017, Exhibits 12A through 12C. However, in 2010, the Bishop Airport rainfall was slightly higher at 9.14 inches, but there was no 20-foot rise in groundwater level. Did the 2017 rise occur because of artificial recharge and/or reduced pumping to the east? The worst-case modeling of well W247R pumping impacts should account for this historical change in groundwater levels to provide a complete analysis of the potential for cumulative impacts.

Well V290 has been monitored since 1971, which provides the longest record of shallow groundwater levels in the vicinity of W247R (Exhibits 7D and 7E). The V290 hydrograph shows multiple periods of groundwater decline, including the decline experienced in the dry year 1977-78. The recent 2010-2016 maximum depth of groundwater at well V290 was like the dry year 1977-78 maximum. This suggests that the conditions during the 2010 through 2016 period at well W247 could be used instead of the 1977-78 period in the worst-case groundwater modeling simulation with the drawdown from pumping new well W247R being added to the regional decline in groundwater elevations when no pumping was occurring in the adjacent wells.

Exhibit 7F is a hydrograph of the recorded groundwater elevations at well W247 during the no-pumping period of 2014 through 2016, along with the elevations of the nearest monitoring wells, T577 and T606, Figure 7A-7B. This hydrograph shows that during this period of no pumping, the groundwater elevation in well W247, which is screened from 28 to 470 feet below the ground surface (bgs), is higher than the groundwater levels in the surrounding shallower wells, which are screened from 31 to 140 feet bgs. This suggests that the deeper groundwater naturally flows upward during periods of no pumping, i.e., a natural upward vertical gradient. This upward vertical gradient was also found between the shallow and deep aquifer systems to the west in the area of Fish Slough. For example, the recently constructed sets of monitoring wells, T978S and T978D, and FS#3S and FS#3D, in the southern portion of Fish Slough, have a natural upward vertical gradient, Exhibits 13A and 13B. The worst-case modeling of the pumping impacts at the new well W247R should analyze the changes in upward vertical during pumping because this upward flow is a source of recharge to the shallow aquifer system. Reducing or reversing the rate of vertical groundwater flow can have a widespread impact on shallow groundwater levels and overlying vegetation and may impact groundwater quality.

The historical declines in groundwater level in the V290 hydrograph are likely within the Agreement’s Groundwater Mining standard of 20 years of pumping matching 20 years of recharge in Section III.B. The levels declined for 19 years with groundwater levels rising back to the start in the latest year. While, due to this one-year bounce back, this may satisfy a long-term water balance, it has the potential to be detrimental to long-term vegetation and habitat survival. For example, at V290, starting around 2006 through 2016, groundwater levels are far below the maximum 10 feet required by the Agreement and, therefore, should be considered harmful to overlying vegetation. A 20+ foot rise in one year, 2017, does not make the years of decline acceptable.

Well W379R Pumping Worst Case Three Hydrological Water Year Issues

The hydrographs for the wells adjacent to well W379 in the Big Pine Wellfield show a more subdued fluctuation than wells at W247 (Exhibits 8A through 8F). Exhibits 8A and 8B show that around well W379, the depth, and elevation to the shallowest groundwater in well T690 at 55 bgs is significantly higher than at the intermediate and deeper groundwater, wells T627 at 200+ feet bgs and W379 screened from 200 to 400 feet bgs. Note that W379 is now apparently filled in with sand below 200 feet, according to the Pre-Construction Evaluation Report (LADWP, 2024d, page 1). The depths to shallow and deep groundwater to the north of well W379 are different because the depths are closer together. Exhibit 8C is a hydrograph of shallow well T689, which shows fluctuations in groundwater that are generally between 2 and 16 feet bgs, like well T690, Exhibit 8A. The difference comes with the deep well T736. The annual pumping volumes are given in Exhibits 11C and 11D.

Exhibit 8D is a hydrograph of well T736, at 350 feet bgs, and located approximately 1,300 feet northwest of W379. It shows a large rise in groundwater level from the late 1980s to around the year 2000 when it stabilizes at approximately 10 feet bgs. After 2000, the deep groundwater level in T736 ranges in elevation between approximately 3,943 to 3,953 feet, (Exhibit 8E). This is approximately 40 feet higher than the deep groundwater level at wells W379 and T627, where elevations were at approximately 3,900 feet in 2014-2016 (Exhibit 8B). Exhibit 8E shows the groundwater elevation hydrographs for deep well T736 with the adjacent shallow well T689. The groundwater levels in these adjacent wells appear to fluctuate together after the year 2000, with the deeper elevations in T736 sometimes being higher than the shallow groundwater. This suggests an upward vertical gradient between the deep and shallow aquifer systems may exist, at least briefly. This upward vertical groundwater gradient contrasts with the apparent downward gradient to the southeast at wells W379 and T690 (Exhibits 8A and 8B). Exhibit 8F shows a plot of groundwater measurements taken in well W378, screened from 200 to 400 feet bgs, with the nearby deep well T736, during the brief period of 2014-2016. The groundwater elevations in well W378 are approximately the same as well W379 at around 3,900 feet elevation. Do these brief W378 elevations represent a period of pumping, as reflected in a similar brief decline in levels in T736 at the same time? Would the groundwater levels in W378 rise to match those in T736 without pumping?

The Pre-Construction Evaluation for well W379R describes the lithology of the Big Pine Wellfield *as* "…relatively consistent coarse strata interbedded with fines, mostly in the central and eastern parts of the wellfield. The effect of the interbedded clay layers on the aquifer is semi-confinement (leaky aquifer) from approximately 100 to 200 feet-bgs." (LADWP, 2024d, page 4.) The evaluation asserts that the 40-foot difference in groundwater elevation between wells T690 and T627 is evidence of a possible leaky aquifer, presumably between 55 and 200 feet bgs. However, a review of the well logs from W379, W378, and T690 finds that the lithology encountered is all sands, gravels, and rock (Exhibits 10C through 10E). This contrasts with the lithology encountered at well W247 in the Laws Wellfield, which had a mixture of sand, gravel, and clay (Exhibit 10B 1-3).

Recommendation 3: Worst Case Three Hydrological Water Year Scenarios

CDFW recommends that LADWP conduct the groundwater model simulations for new wells W247R and W379R to estimate changes in shallow and deep groundwater levels using the worst-case three hydrological water years as the Agreement requires. CDFW also recommends resolving data gaps in the hydrogeologic setting at the Laws and Big Pines Wellfields before the worst-case modeling is done. Reporting of the modeling analyses of potential impacts from pumping these deep wells should include documenting when and where the new well drawdowns will change the actual seasonal groundwater elevations and depths below the ground surface, not just the difference in relative drawdowns. Furthermore, to support a conclusion that the new wells will not result in any new significant impacts, the analysis of impacts would need to demonstrate that: 1) pumping these new deeper wells will not result in groundwater levels below 10 feet bgs any longer than the current non-drought condition; 2) the increased drawdown in the deep aquifer systems will not interfere with pumping in adjacent wells; 3) any changes in the magnitude and/or direction of the vertical gradient between the shallow and deep aquifers will not result in additional shallow groundwater storage losses, declines in groundwater levels that harm overlying vegetation and habitats, or changes in groundwater quality in either the shallow or deep aquifers; and 4) the increased deep aquifer pumping will not result in increased loss of groundwater storage or surface water flow in the recharge source areas. Finally, CDFW recommends conducting this analysis of impacts for well W247R to inform whether the increase in deep aquifer pumping results in an impact on groundwater levels to the north in the Chalfant Valley, to the west at Five Bridges near wells W385R and W386R, or northwest at Fish Slough.

Comment 4: Revisions Needed to the Monitoring Plans and Triggers

The 1991 Agreement assumed that the construction of new wells may impact the surrounding vegetation and environment and requires a joint evaluation by the Technical Group that develops information on the hydrogeologic conditions at the well site along with "…an inventory and classification of vegetation that could be affected by the operation of the well, and the assessment of any other potential significant effects on the environment." (ICWD and LADWP, 1991b, page 25). The Agreement also recognizes that a new well "…may result in a change in the areas that would be affected by pumping from existing wells. Therefore, additional monitoring of groundwater tables and vegetation shall be implemented as necessary outside of existing management areas and monitoring requirements shall be altered or created as necessary." (ICWD and LADWP, 1991b, pages 25-26.) The comments above point out significant data gaps in the information provided in the Addendum and the Pre-Construction Evaluations and First Season Monitoring Plans about the hydrogeologic setting surrounding proposed new wells W247R and W379R, and the potential environmental impacts from pumping these wells on surrounding vegetation and habitats and revegetation areas, Exhibits 3B and 4C.

The Addendum and First Season Monitoring Plans propose that an initial pumping test with a duration of up to 72 hours will be conducted for these two new wells. Following the 72-hour test, the May 2024 First Season Monitoring Plans will be revised and updated based on aquifer test data analysis, including pumping tests, and results of model simulations after recalibrating the wellfield models. (LADWP, 2024b.) The first season of operations will then be conducted. After the first operating season, a long-term operations plan will be developed to protect nearby non-LADWP wells.

During the first season of operation, vegetation monitoring will include using the Normalized Difference Vegetation Index (NDVI) derived from remote sensing data from Sentinel and Landsat satellites for comparing the health of vegetation before and after the completion of the first season of operation. LADWP and ICWD staff will continue the annual monitoring of the associated vegetation parcel utilizing line point transects.

Comment 5: The timing and duration of the first season of operations have not been clearly described in the Addendum or Monitoring Plans. The start and duration of any pumping test should be timed to minimize the potential impacts. For example, the 60-day pumping test of new well W385R in the western portion of the Laws Wellfield started and ended the pumping phase during the winter months of 2019-2020, a normal hydrologic water year.

Recommendation: CDFW recommends that the start and stop dates of the pumping phase and recovery phase for the proposed first season of operations be clearly stated in the monitoring plans. In addition, the operations tests should not be conducted when the hydrological conditions are less than normal, i.e., not during a drought year.

Recommendation: CDFW recommends that the monitoring plans be revised for operating each new wells during the first season or after by providing specific groundwater depth and elevation triggers for the shallow and deep aquifers that, when exceeded, require the pumping to be stopped. These groundwater level triggers should prevent: 1) impacts to overlying vegetation and habitats; 2) changes in the flow direction of groundwater that deprives the surrounding areas of the normal volume and timing of recharge; 3) changes in groundwater quality; and 4) cumulative long-term reduction in groundwater storage that would be detrimental to vegetation, habitats, or the operations of any non-LADWP wells. These groundwater level triggers should be set at values that prevent impacts during pumping and pumping recovery periods.

Comment 6: The monitoring plan for vegetation during the first season of operations proposes to use satellite NDVI measurements, to prevent harm, presumably. The plan calls for a before and after comparison, but apparently does not intend to use the data during the pumping operations. The monitoring plans do not indicate that baseline NDVI studies have been conducted.

Recommendation: CDFW recommends that the baseline “before” NDVI studies and NDVI correlations to vegetation transects studies should be performed and reported before starting any new well pumping test. Based on the baseline studies, trigger values for the maximum allowable NDVI change should be established. The areas of NDVI surveys should be expanded outside the currently monitored areas based on the potential impacts from the worst-case modeling scenarios. The NDVI surveys should continue to be used long-term during periods of pumping and non-pumping at these new wells because the historical groundwater depths at these new well have declined below the 10-foot threshold even when there was no pumping.

Comment 7: As discussed in Comments 1 through 3 of this letter, additional hydrogeologic data needs to be acquired, analyzed, and incorporated into the environmental impacts assessment and the monitoring plans for new wells W247R and W379R. CDFW expects that filling the data gaps will require installing additional monitoring locations, including the construction of additional monitoring wells, additional vegetation inventories and transects, and possibly surface water monitoring.

Recommendation: CDFW recommends that these additional monitoring stations be established before starting any operational pumping test for these new wells, and the public be allowed to review and comment on any revised monitoring plan.

Recommendation: CDFW recommends that multiple sets of groundwater monitoring wells be included in the well W247R and W379R monitoring plans, placed as necessary between these wells and the sources of recharge to the pumped groundwater, such as the Chalfant Valley, Five Bridges, and Fish Slough, to document the baseline conditions, groundwater elevations, and flow directions, and to allow for measuring the impacts from pumping on adjacent aquifer systems and overlying vegetation and habitats. If needed, additional monitoring wells should be installed and monitored to develop baseline data before implementing a pumping test for new wells W247R or W379R.

Recommendation: CDFW recommends expanding the monitoring network to include existing wells that may experience drawdowns from the pumping. For example, the well W247R monitoring plan should include production wells W386R and W386R, and monitoring wells T978S and T978D, and FS#3S and FS#3D, along with wells in the northern portion of the Laws Wellfield and the southern portion of Chalfant Valley.

Comment 8: Analysis of Pumping Test with Corrections for Drawdown Interferences
The proposed Monitoring Plans for the First Season of Operations pump tests for new wells W247R and W379R do not appear to address the monitoring and data analysis problems that natural and artificial events might cause at the time of the test. For example, in the well W385R pumping test conducted in 2019-2020, the rise in shallow groundwater levels during the winter months due to natural reductions in evapotranspiration (ET) needed to be documented. Measurements of changes in shallow groundwater levels during the pumping test needed to be adjusted to account for the natural ET rise. Similarly, flows in the McNalley Canals had to be stopped several months before the test so that the seepage mound around the canals was dissipated and removed as a source of groundwater level interference. The pumping of surrounding production wells needed to be stopped before the start of the W385R test so that the drawdown from these wells could be fully recovered at the test monitoring sites. The pumping test had to occur during the winter months of a normal hydrological water year and not during a drought so that the test did not add to the impacts of a drought. Failure to remove these external stresses on the groundwater and vegetation systems during the pumping test causes an inaccurate interpretation of the new well’s impacts.

Recommendation: CDFW recommends revising the monitoring plans for the pumping test and the long-term operations of new wells W247R and W379R to include the measuring and development of natural and man-made conditions that might alter the interpretation of the pumping impacts. Studies are needed to develop baseline information for adjusting or removing natural or man-made interferences. These baseline studies should be done before the new well testing starts. Reports on these interference adjustments should be made available to the public for review and comment before the new well testing starts.

CONCLUSION

CDFW appreciates the opportunity to comment on the Addendum and Notice of Exemption to assist LADWP in identifying and mitigating Project impacts on biological resources.

Questions regarding this letter or further coordination should be directed to Graham Meese, Senior Environmental Scientist at (760) 996-7387 or Graham.Meese@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Alisa Ellsworth
84FBB8273E4C480...

Alisa Ellsworth
Environmental Program Manager

ec: Office of Planning and Research, State Clearinghouse, Sacramento
State.Clearinghouse@opr.ca.gov

ATTACHMENTS

Attachment A: Well247R and W379R Exhibits

REFRENCES

Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p. (Also available at https://pubs.usgs.gov/circ/1376/)

California Department of Water Resources. (2024). *DWR Airborn Electromagnetic (AEM Surveys Data*. Retrieved from California Natural Resources Agency: https://data.cnra.ca.gov/dataset/aem

DWR: AEM 3D Viewer (Beta) (computer only): https://dwr.maps.arcgis.com/apps/instant/3dviewer/index.html?appid=f781b14f42ab45e5b72f32cf07af899c

DWR: AEM Profile Viewer website: https://dwr.maps.arcgis.com/apps/instant/attachmentviewer/index.html?appid=65f0aa6db8124aeda54e1f33c5dfe66c

Inyo County Water Department (ICWD) and LADWP, 1990, Green Book for the Long-Term Groundwater Management Plan for the Owens Valley and Inyo Conty. https://www.inyowater.org/documents/governing-documents/green-book/

ICWD and LADWP, 1991a, Final Environmental Impact Report: Water from the Owens Valley to Supply the Second Los Angeles Aqueduct. https://www.inyowater.org/documents/governing-documents/1991-eir/

ICWD and LADWP,1991b, Agreement between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long-Term Ground Water Management Plan for Owens Valley and Inyo County. https://www.inyowater.org/documents/governing-documents/water-agreement/

Los Angeles Department of Water and Power (LADWP), 2024a, Notice of Exemption: Addendum to the 1991 Environmental Impact Report: Water from the Owens Valley to Supply the Second Los Angeles Aqueduct 1970 to 1990, 1990 Onward. https://ceqanet.opr.ca.gov/Project/1989080705

LADWP, 2024b, Addendum to the 1991 Environmental Impact Report: Water for the Owens Valley to Supply the Second Los Angeles Aqueduct 1970 to 1990, 1991 Onward, Pursuant to a Long-Term Groundwater Management Plan for Replacement of Wells W247 and W379.

LADWP, 2024c, Well W247 Replacement (W247R) Laws Wellfield, Owens Valley: Pre-Construction Evaluaiton Report. https://www.inyowater.org/wells-new-replacement/

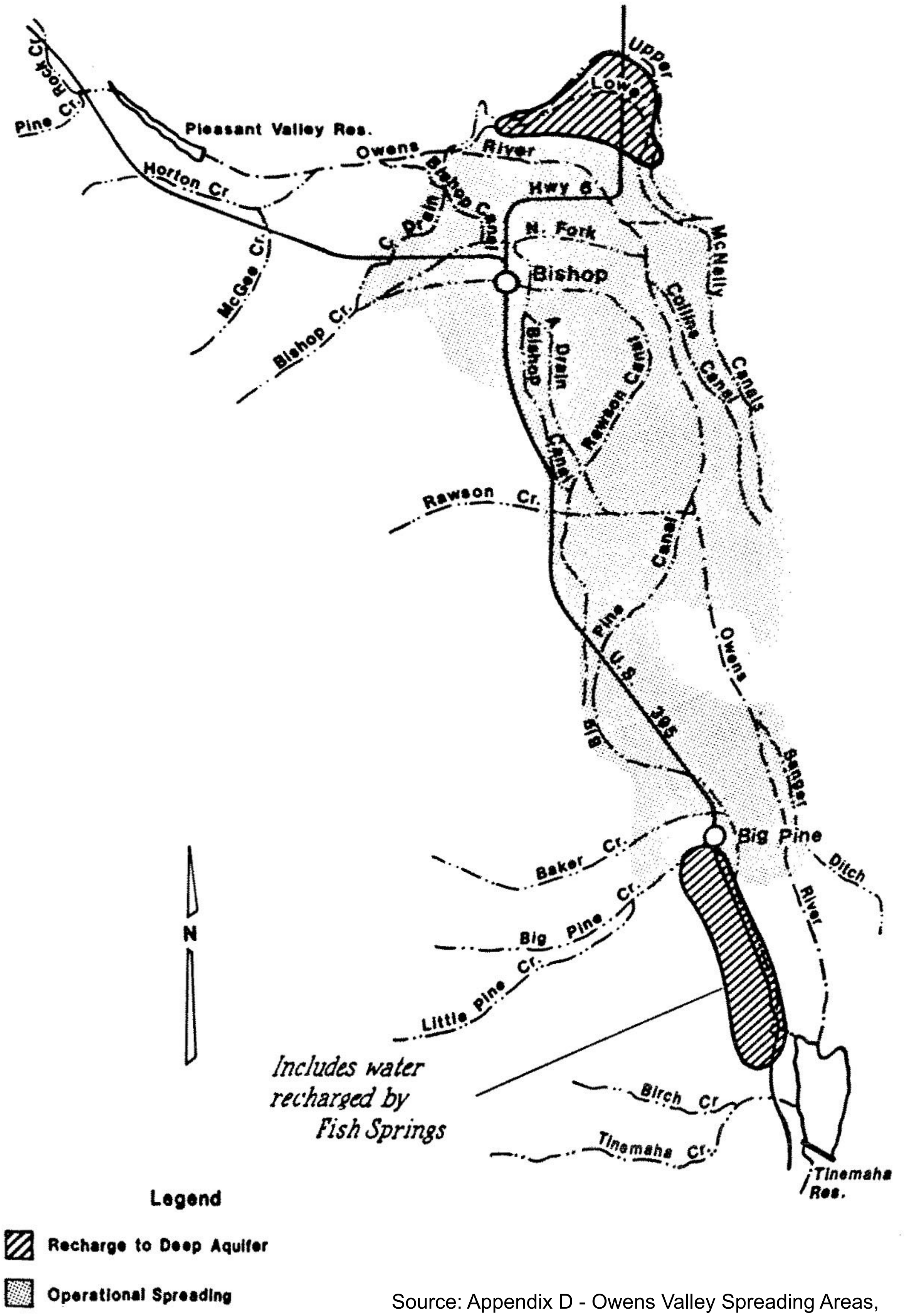
LADWP, 2024d, Well W379 Replacement (W379) Big Pine Well Field: Pre-Construction Evaluation Report. https://www.inyowater.org/wells-new-replacement/

LADWP, 2024e, LADWP Planned Flights for Groundwater Resource Surveying Scheduled to Start Monday, April 15. *LADWP News*. https://www.ladwpnews.com/eastern-sierra-airborne-electromagnetic-survey-helicopter-to-make-low-level-flights-over-three-areas-of-mono-county-inyo-county-and-mineral-county/

MWH, 2003, Confining Layer Characteristics Cooperative Study, Final Report. https://www.inyowater.org/documents/reports/inyola-cooperative-studies/confining-layer-study/

ATTACHMENT A

Exhibit 1



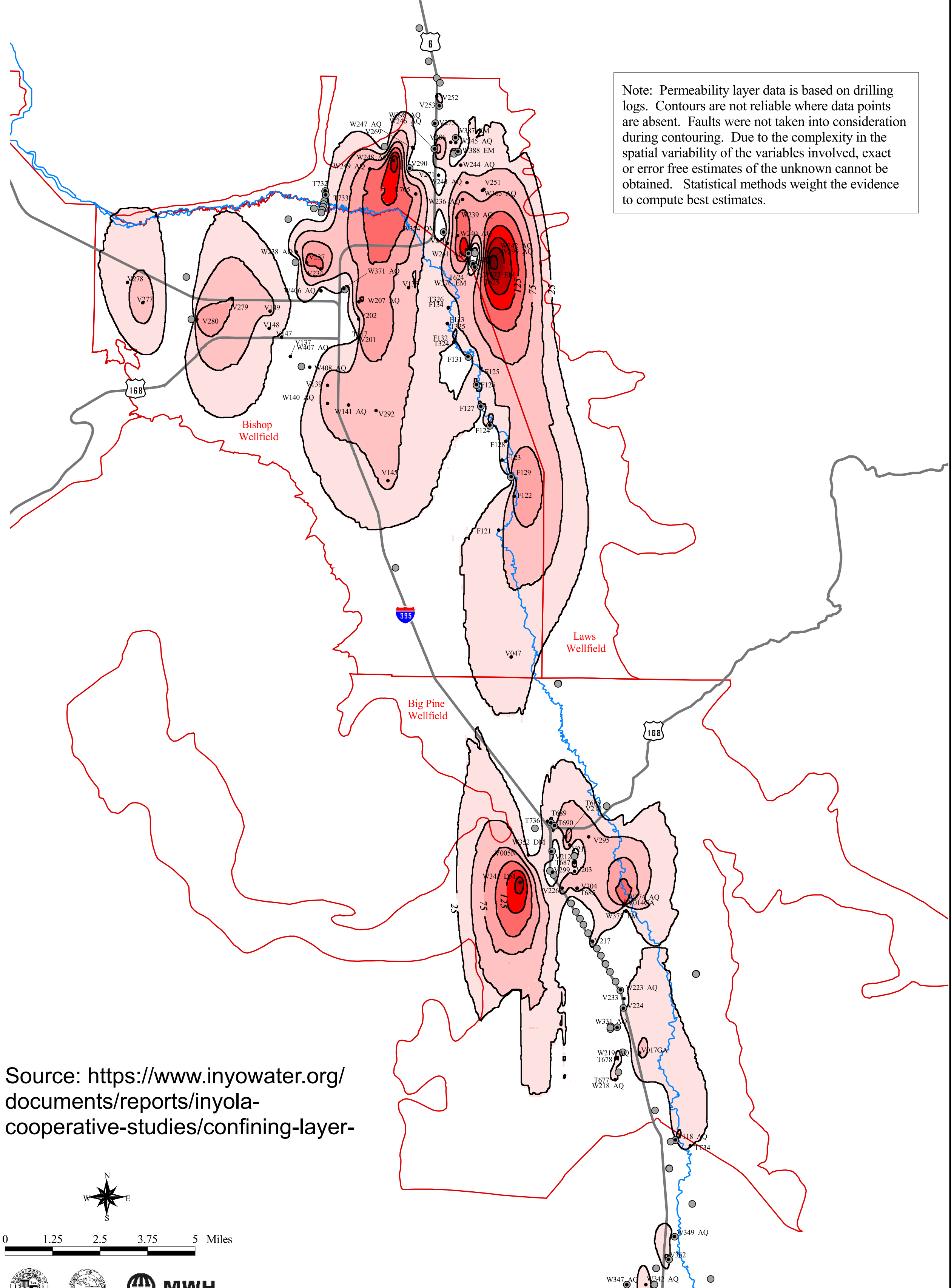
Source: Appendix D - Owens Valley Spreading Areas,

BISHOP-BIG PINE AREAS SPREADING LOCATIONS

MAXIMUM LOW PERMEABILITY LAYER THICKNESS MAP (CONTOUR)
NORTH OWENS VALLEY
MAP No. 7

Exhibit 2

Note: Permeability layer data is based on drilling logs. Contours are not reliable where data points are absent. Faults were not taken into consideration during contouring. Due to the complexity in the spatial variability of the variables involved, exact or error free estimates of the unknown cannot be obtained. Statistical methods weight the evidence to compute best estimates.



Source: https://www.inyowater.org/documents/reports/inyola-cooperative-studies/confining-layer-

Maximum Interpreted Permeability Layer Thickness

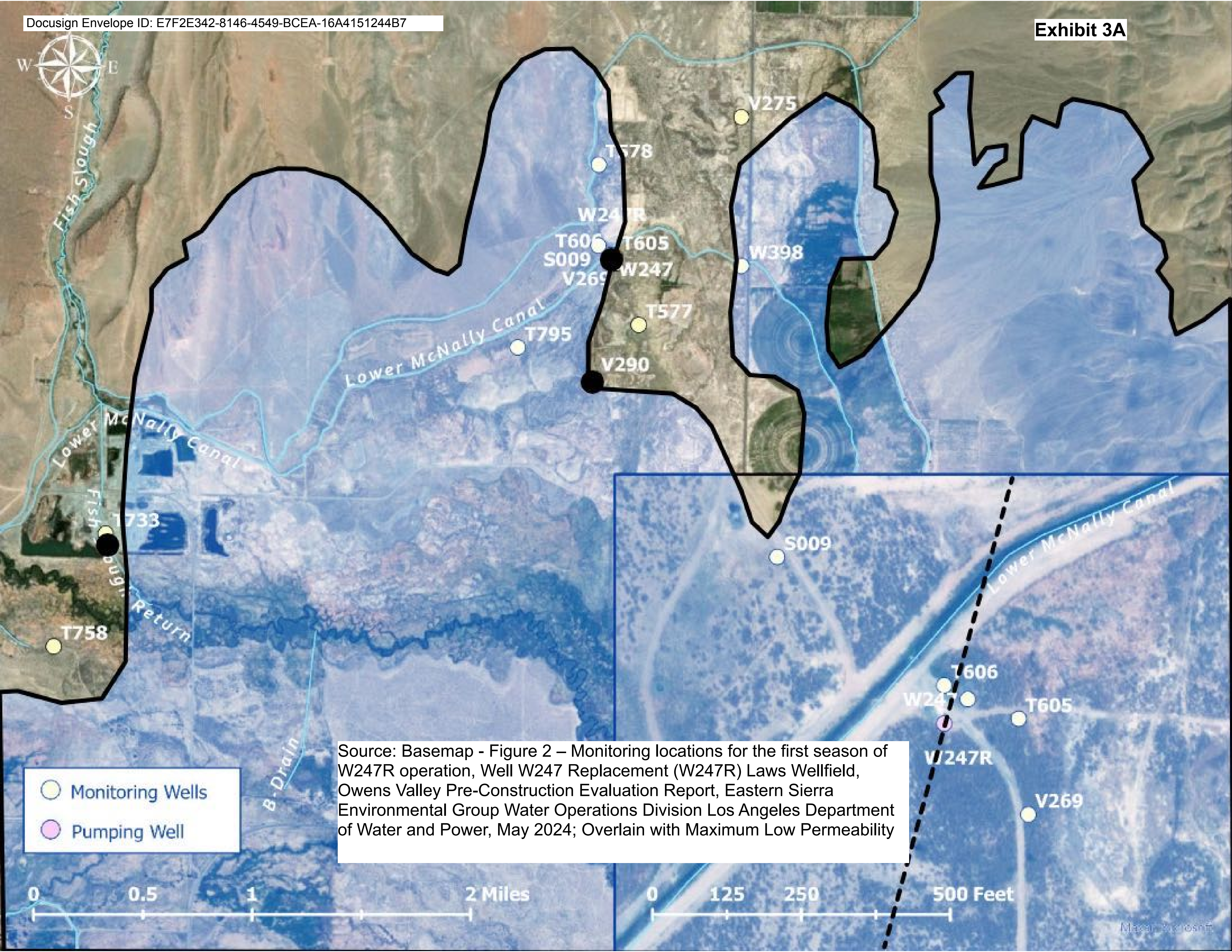
- 25 - 50
- 51 - 75
- 76 - 100
- 101 - 125
- 126 - 150
- 151 - 175
- 176 - 200
- 201 - 225
- 226 - 250

- Low Permeability
- No Low Permeability
- Contour (Interval = 25 ft)
- Owens River
- Highways
- Management Area Boundaries

A low permeability layer is defined as a layer with an ending depth greater than 50 feet below the ground surface and:
A permeability code of 1, that is at least 5 feet thick or;
A permeability code of 2, that is at least 10 feet thick or;
A permeability code of 3, that is at least 30 feet thick.

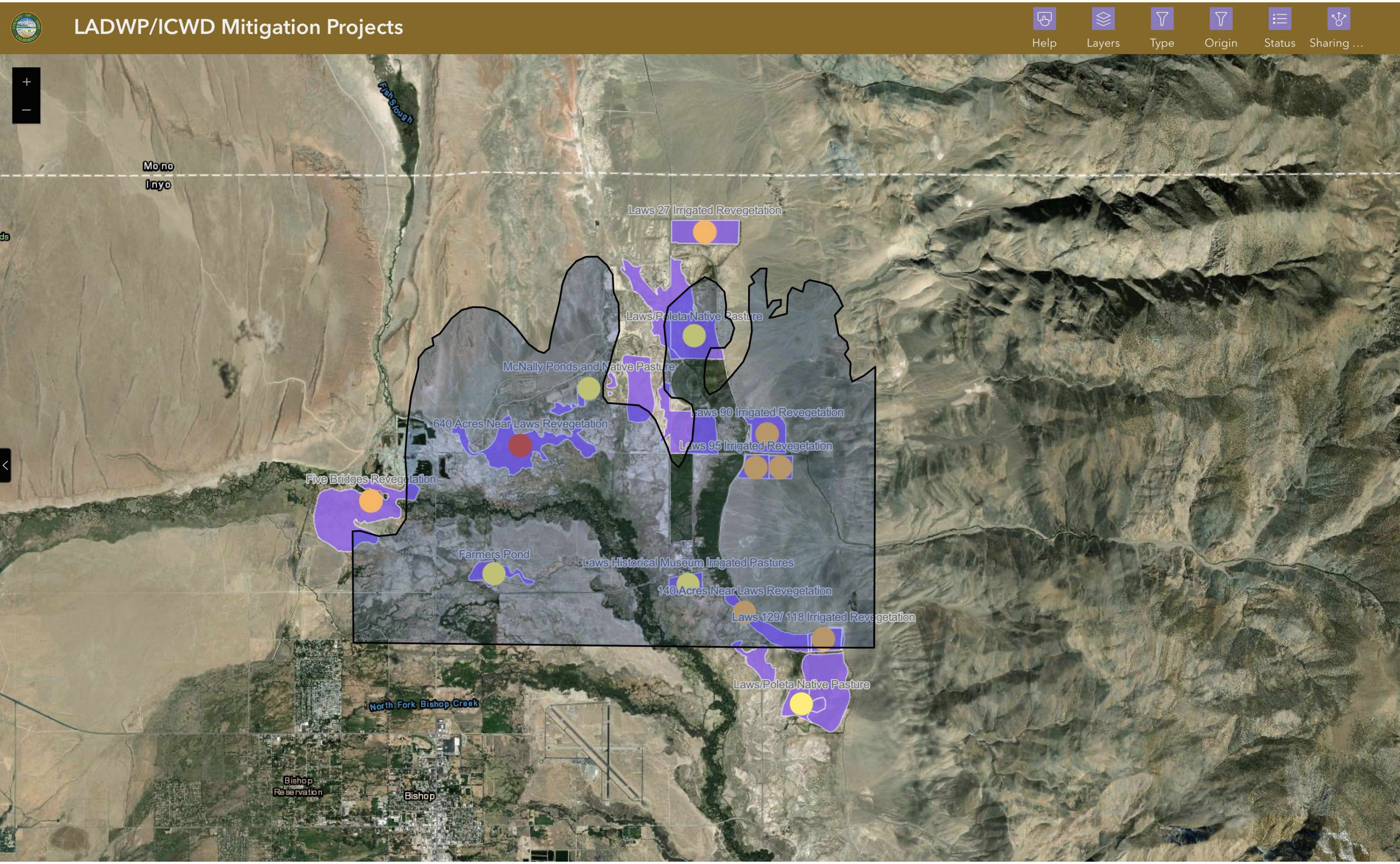
Code	Description	Layer
1	Relatively Impermeable	Clay, "Gumbo", mostly clay with some sand, clay and silt
2	Low Permeability	Silt, Clayey -cemented (includes tufa), clay/gravel mixtures
3	Moderate Permeability	Silty Sand, sandy silt, clay/sand/gravel mixtures

Exhibit 3A



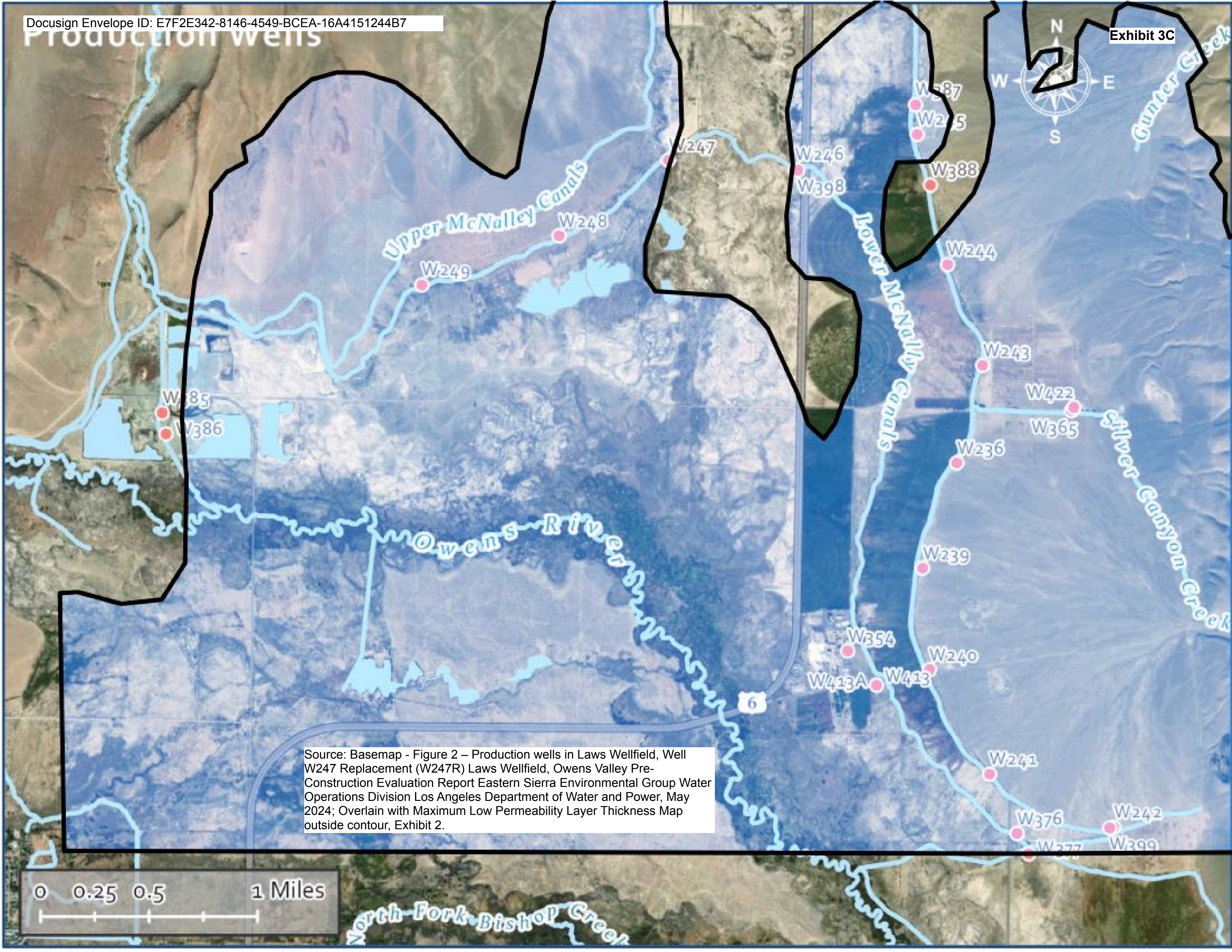
Source: Basemap - Figure 2 – Monitoring locations for the first season of W247R operation, Well W247 Replacement (W247R) Laws Wellfield, Owens Valley Pre-Construction Evaluation Report, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024; Overlain with Maximum Low Permeability

Exhibit 3B



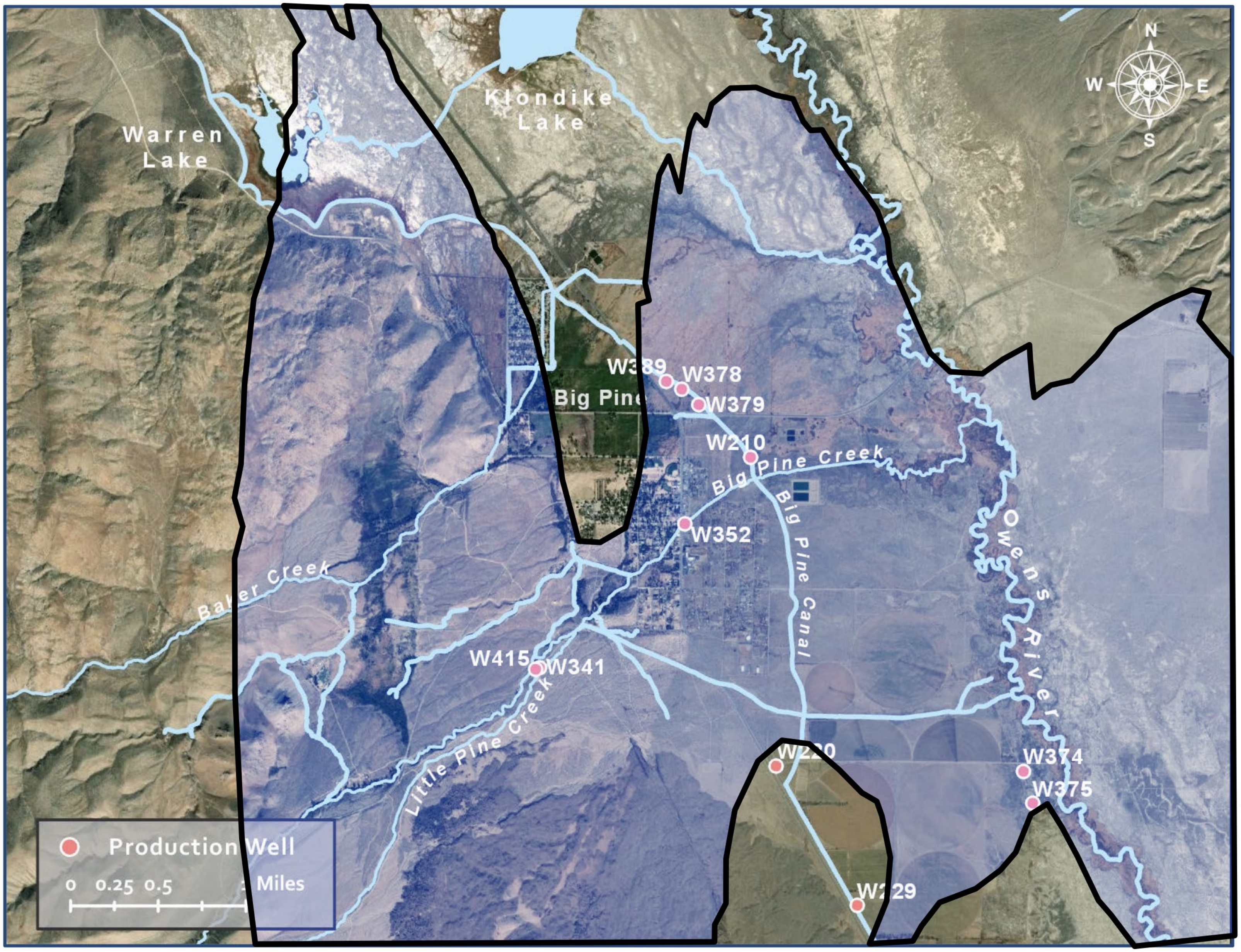
Source:Basemap - LADWP/ICWD Mitigation Projects website - https://experience.arcgis.com/experience/44b652a16c4b443b9b4a2e7dc3fcbb91/page/Page-1/?draft=true&org=inyocounty ; Overlain with Maximum

Exhibit 3C



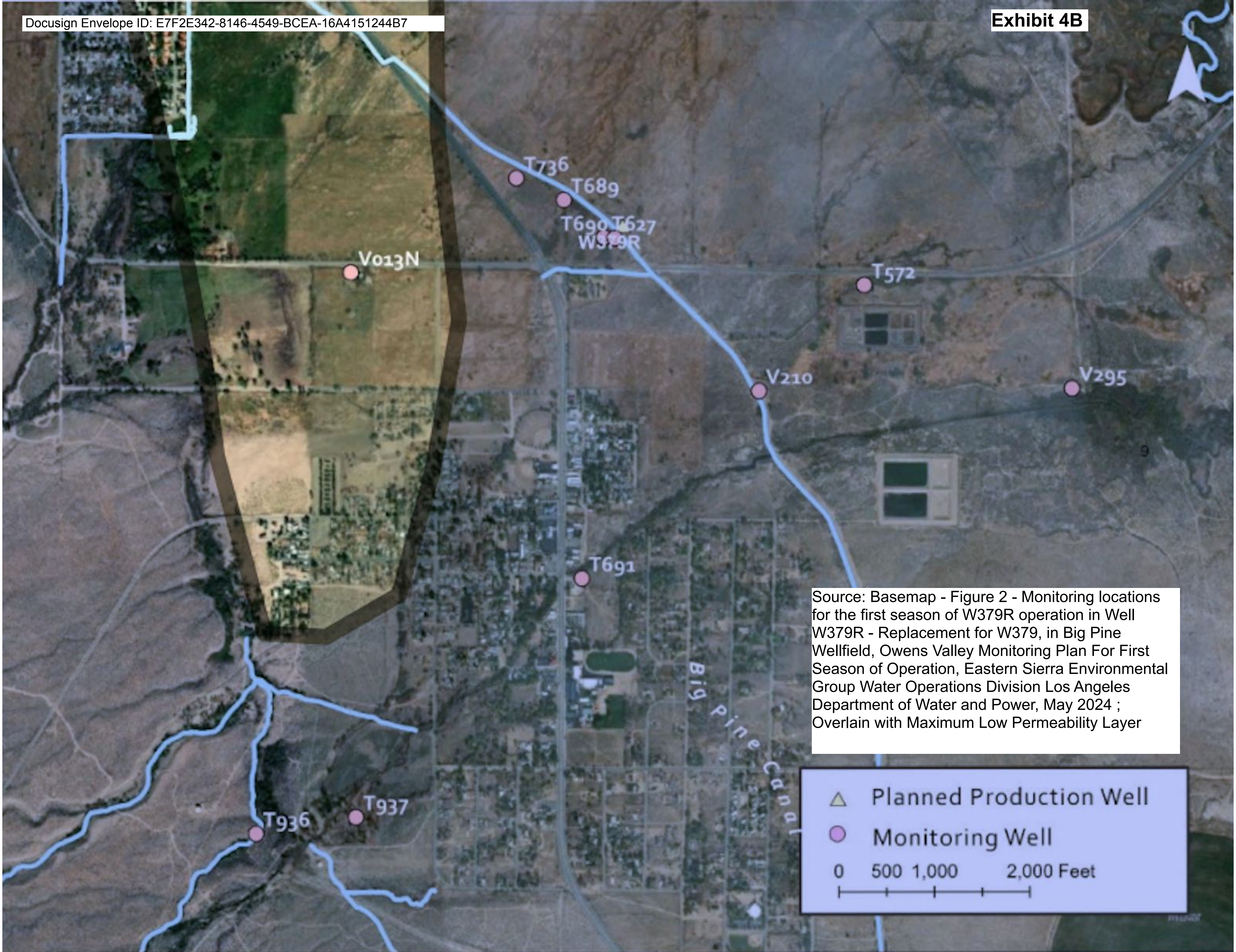
Source: Basemap - Figure 2 – Production wells in Laws Wellfield, Well W247 Replacement (W247R) Laws Wellfield, Owens Valley Pre-Construction Evaluation Report Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024; Overlain with Maximum Low Permeability Layer Thickness Map outside contour, Exhibit 2.

Exhibit 4A



Source: Basemap - FIGURE 3 – LADWP PRODUCTION WELLS IN THE VICINITY OF W379 IN BIG PINE WELLFIELD in WELL W379 REPLACEMENT (W379R) BIG PINE WELLFIELD PRE-CONSTRUCTION EVALUATION REPORT, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024 ;

Exhibit 4B



Source: Basemap - Figure 2 - Monitoring locations for the first season of W379R operation in Well W379R - Replacement for W379, in Big Pine Wellfield, Owens Valley Monitoring Plan For First Season of Operation, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024 ; Overlain with Maximum Low Permeability Layer

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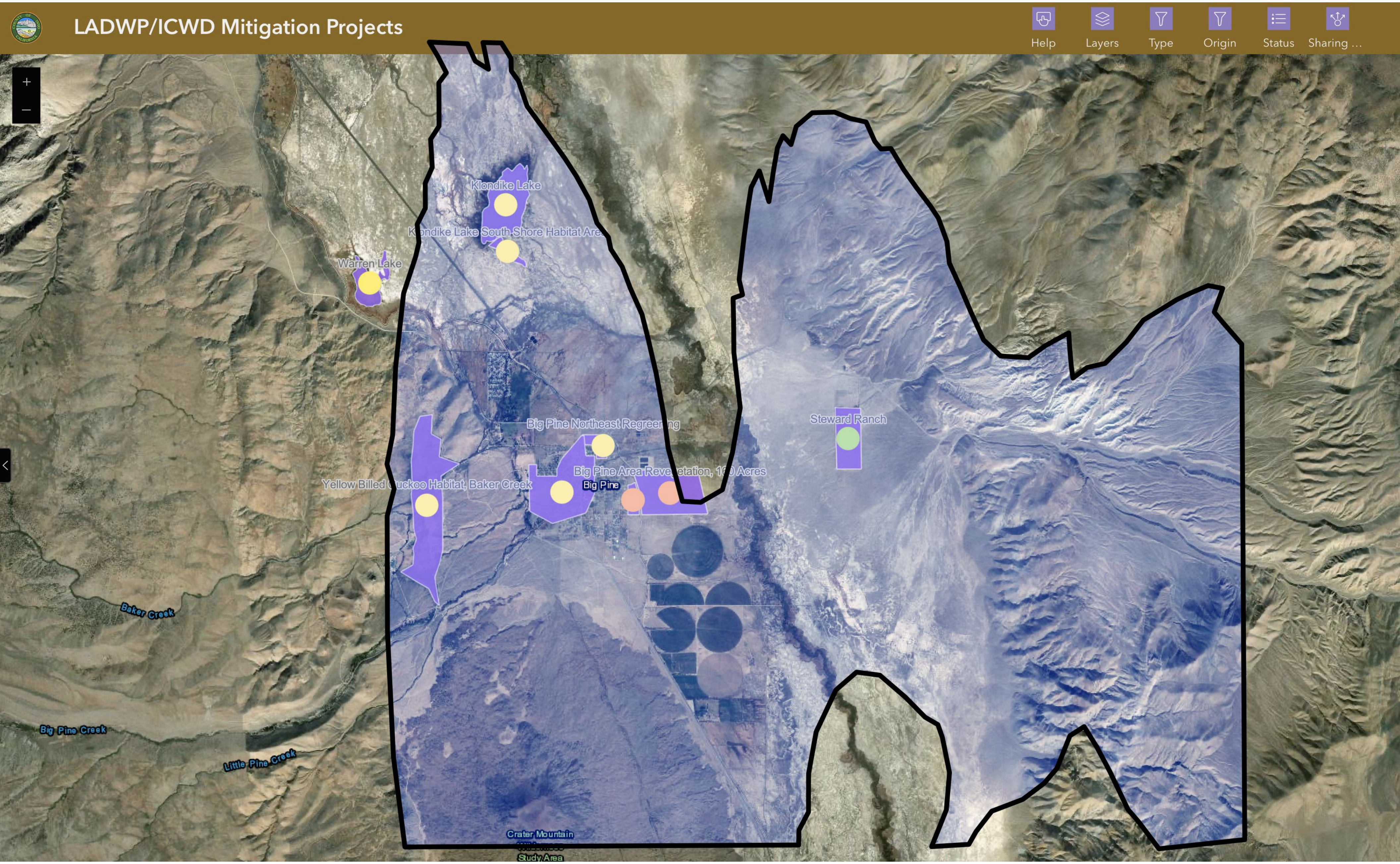
Exhibit 4C



Source:Basemap - LADWP/ICWD Mitigation Projects website - https://experience.arcgis.com/experience/44b652a16c4b443b9b4a2e7dc3fcbb91/page/Page-1/?draft=true&org=inyocounty ; Overlain with Maximum Low

Exhibit 5A

Effects of Confining Layers on Depletion

Various geologic features that act as conduits or barriers to groundwater flow can affect the timing of depletion from groundwater pumping and also can affect which streams are affected by the pumping. Confining layers within or adjacent to aquifers are the most common type of geologic feature that potentially affect timing and locations of depletion. Here the term "confining layers" is used to refer to horizontal or nearly horizontal beds of clay, silt, or other geologic strata that have substantially lower hydraulic conductivity than adjacent aquifer material. In unconsolidated sediments that typically are a part of stream-aquifer systems, aquifer material generally consists of sand and gravel, and confining material generally consists of silt and clay. Confining layers may be laterally discontinuous or they may form laterally extensive barriers that separate adjacent aquifers. Drawdown from a pumped well propagates more rapidly in coarse-grained aquifer material than in confining layers, and in most cases confining layers between pumping locations and streams slow down the progression of depletion in comparison to equivalent aquifer systems without confining layers. It is not reasonable, however, to expect that pumping beneath an extensive confining layer will eliminate depletion. Water does move vertically from one aquifer to another through confining layers, and drawdown from pumping can propagate through confining layers as well. Also, the effective storage coefficient in confined aquifers (beneath confining layers) commonly


Photograph by Stanley Leake, U.S. Geological Survey

Groundwater from aquifers beneath the Colorado Plateau is shown discharging at Fossil Springs in north-central Arizona.

Source: USGS Circular 1376, Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p. (Also available at https://pubs.usgs.gov/circ/1376/.)

Exhibit 5B

is 2–4 orders of magnitude less than in shallow unconfined aquifers with storage properties dominated by specific yield. Smaller storage coefficients result in faster lateral propagation of drawdown from pumping locations to distant edges of confining layers or locations where drawdown can more easily propagate upward. The argument that pumping beneath a confining layer eliminates the possibility of depletion implies that the pumped aquifer is without any vertical or lateral connection to aquifer material that is connected to surface water. The existence of gradients of water levels in confined aquifers, however, is evidence that the aquifers receive water from and discharge water to vertically adjacent aquifers. Drawdown from pumping also can propagate to these adjacent aquifers. The timing of depletion in systems with extensive confining layers is best understood using numerical models of groundwater flow.

Discontinuous confining layers between pumping locations and connected streams can either slow down or speed up the progression of depletion, depending on the configurations of the confining layers in relation to connected streams and pumping locations. These effects are illustrated using a finite-difference model of the hypothetical basin-fill aquifer shown in figure 36. The aquifer is 30 mi wide, 45 mi long, and 600 ft thick. A river connected to the upper part of the aquifer is present along the center of the basin. Horizontal and vertical hydraulic conductivity, specific yield, and specific storage for coarse sediments and confining clay layers (fig. 36*D*) are within ranges of values for these types of sediments in real aquifer systems. The larger storage property, specific yield, applies only at the upper boundary of the system where lowering of the water table causes pore spaces to drain. In the aquifer below the water table, a much smaller storage property consisting of the product of specific storage and aquifer thickness accounts for storage changes from compressibility of water and the matrix of solids that makes up the aquifer. Three cases with different configurations of clay layers in the aquifer are shown in figure 36*B*. In Cases 2 and 3, clay layers are 5 percent of the total aquifer thickness and are near the vertical center of the aquifer.

Horizontal dimensions of finite-difference cells were 1,575 ft in each direction, resulting in 101 columns and 151 rows to simulate the basin width and length, respectively. Twenty layers, each with a thickness of 30 ft, were used to simulate the entire aquifer thickness. Depletion fractions from pumping at four locations in section *A–A′* at a rate of 1,000 ft^3/d for 25 years were computed using the superposition modeling approach with MODFLOW–2005 (Harbaugh, 2005).

Comparison of depletion curves for the three cases and four pumping locations (fig. 37) yields some insights into the range of effects of clay layers on depletion. The first result to note is that even with no clay layer present, depletion from pumping at depth in some locations progresses faster than depletion from pumping near the top of the aquifer. For example, with no clay layer, depletion progresses slightly faster from pumping at depth (fig. 37*B*) than from pumping nearer to the water table (fig. 37*A*). This difference occurs because vertical hydraulic conductivity is much lower than the horizontal hydraulic conductivity. Drawdown from pumping at depth can propagate more easily laterally toward the river location than to the overlying water table where the specific yield value can result in large storage-change values that slow the propagation of the cone of depression.

The existence of a clay layer under the river (Case 2) greatly slows depletion for the deep pumping location nearer to the river (fig. 37*D*). The clay layer restricts direct propagation of drawdown upwards to the river. Drawdown must propagate laterally around the edge of the clay layer and then back to the river. This case is similar to the situation in the Upper San Pedro Basin in Arizona, where a silt and clay layer underlies the stream at most locations (fig. 13).

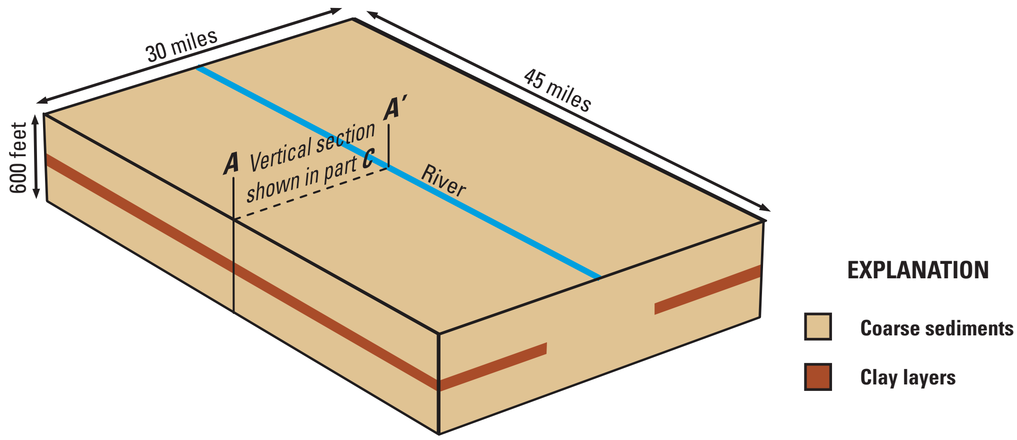
The existence of clay layers along the margins of the valley (Case 3) substantially speeds up the depletion for the pumping location beneath that layer (fig. 37*B*). The clay layer speeds up depletion from underlying pumping because it creates a confined aquifer zone that restricts propagation of drawdown to the water table and, with a small storage coefficient, allows relatively rapid propagation of drawdown to the edge of the clay layer.

In summary, confining layers and other geologic features are complexities that can affect the timing of depletion from groundwater pumping. If features have a lower hydraulic conductivity than that of aquifer material, the feature can slow down the progress of depletion through time. In some cases, such as is shown in figure 37*B*, the feature may speed up the progress of depletion. For systems with multiple aquifers separated by confining layers, or for aquifers with discontinuous confining layers and other heterogeneities, numerical flow modeling approaches are needed to better understand the timing of depletion.

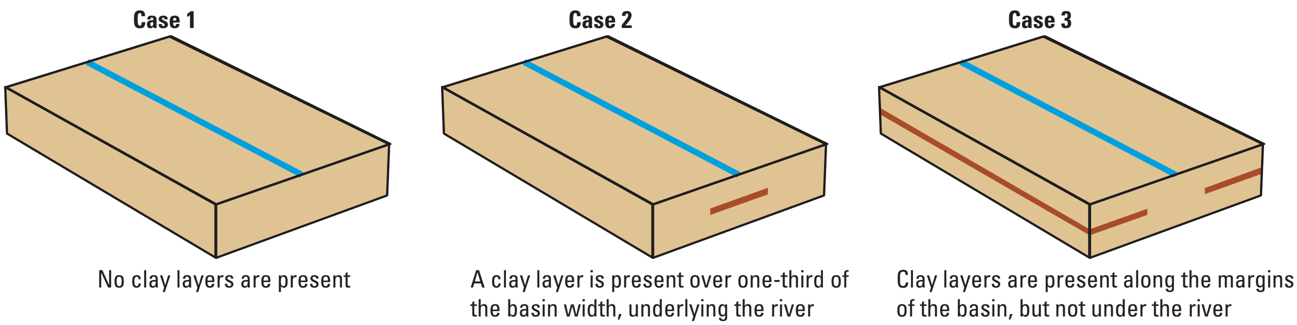
Source: USGS Circular 1376, Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p. (Also available at https://pubs.usgs.gov/circ/1376/.)

Exhibit 5C

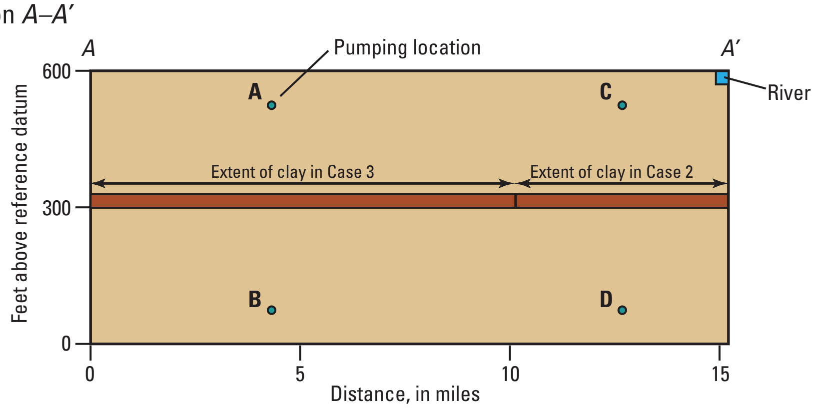
A. Model dimensions and location of section *A–A′*



B. Configurations of clay layers for Cases 1, 2, and 3



C. Geometry of section *A–A′*



D. Aquifer properties

	Horizontal hydraulic conductivity, in feet per day	Vertical hydraulic conductivity, in feet per day	Specific storage, in per foot	Specific yield, dimensionless
Coarse sediments	3×10^{1}	3×10^{-1}	6×10^{-7}	2×10^{-1}
Clay layers	3×10^{-3}	3×10^{-5}	6×10^{-7}	2×10^{-1}

Figure 36. *A*, Hypothetical basin-fill aquifer used to illustrate possible effects of discontinuous clay layers on timing of depletion in the river as a function of vertical and horizontal locations of pumping. *B*, Configurations of clay layers are shown for three cases. *C*, Depletion in vertical section *A–A′* is shown in figure 37 for pumping locations A, B, C, and D. *D*, Aquifer properties are within the range of values typical of basin-fill aquifers, with a horizontal-to-vertical hydraulic conductivity ratio of 100:1. Clay layers in Cases 2 and 3 increase restrictions to vertical flow in parts of the aquifer.

Source: USGS Circular 1376, Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p. (Also available at https://pubs.usgs.gov/circ/1376/.)

Exhibit 5D

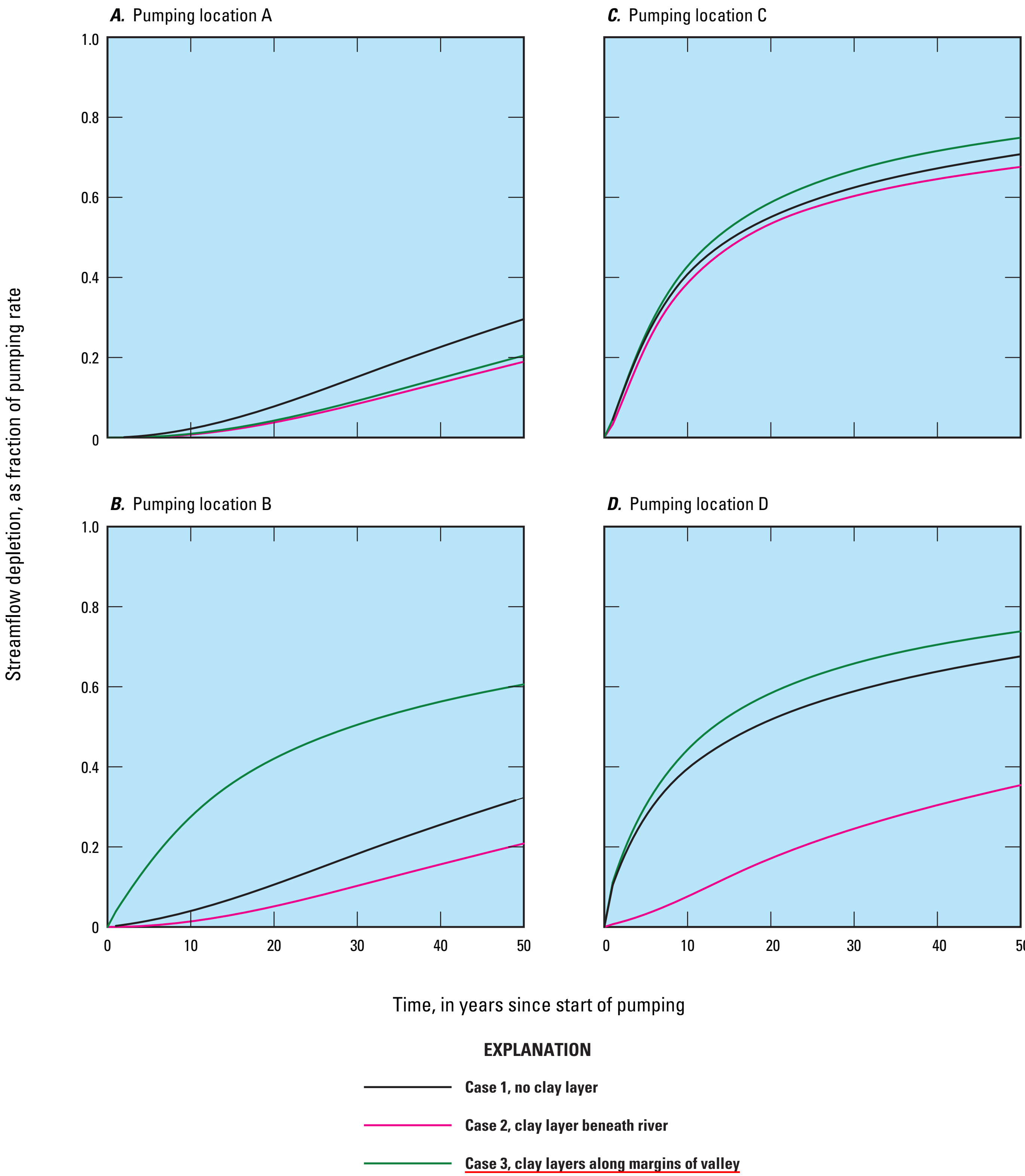


Figure 37. Computed depletion at pumping locations A, B, C, and D in vertical section *A–A′* shown in figure 36*C*. For *A*, shallow distant pumping location A, either configuration of clay layers slows depletion in comparison to case 1. For *B*, deep distant pumping location B, pumping below the clay layer at the valley margins (Case 3) produces substantially more rapid depletion than in the case with no clay layers. For *C*, shallow close pumping location C, configurations of clay layers change depletion from the case of no clay layer by a minor amount. For *D*, deep close pumping location D, the clay layer beneath the river (Case 2) substantially slows the process of depletion.

Source: USGS Circular 1376, Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells—Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p. (Also available at https://pubs.usgs.gov/circ/1376/.)

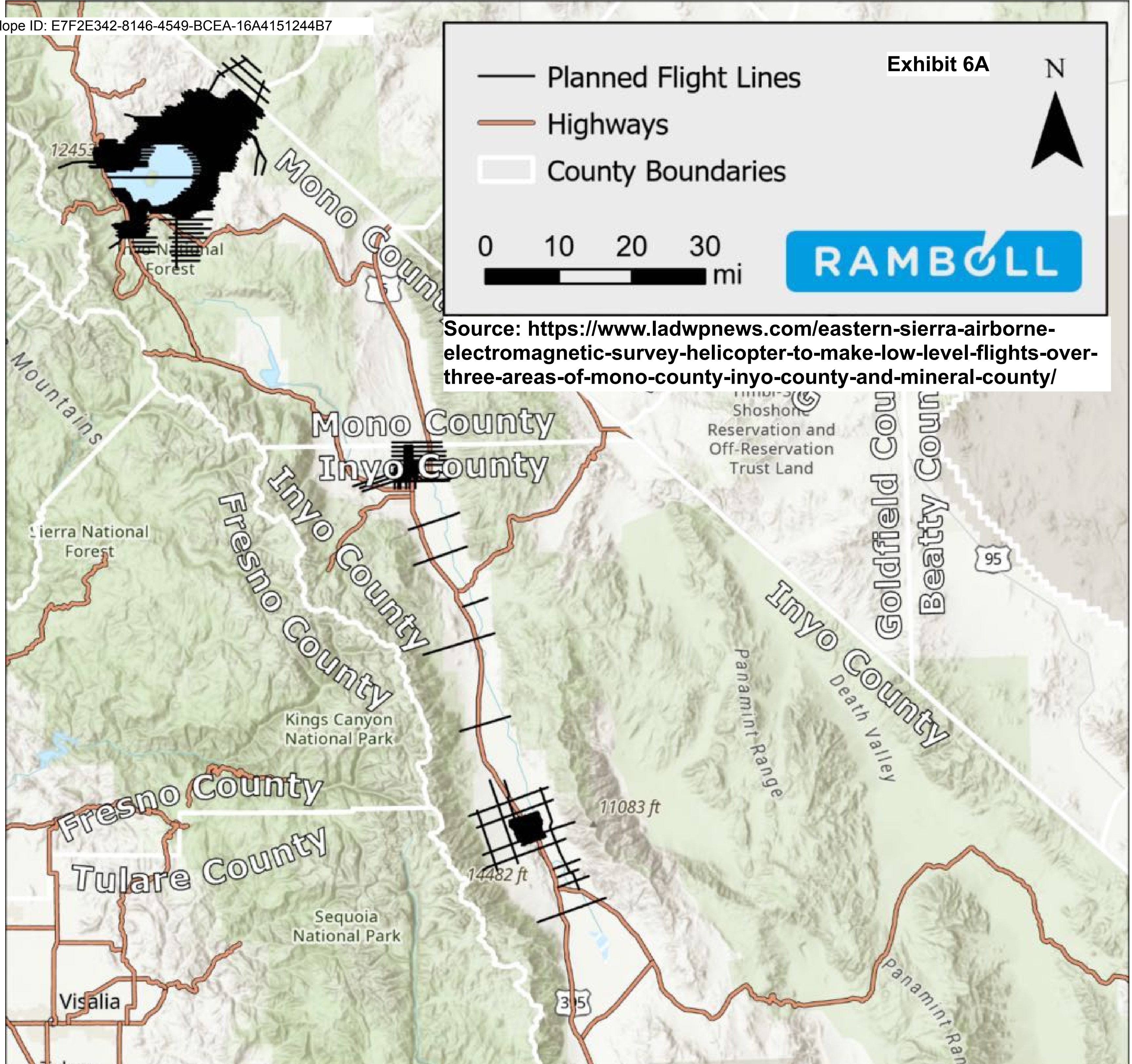
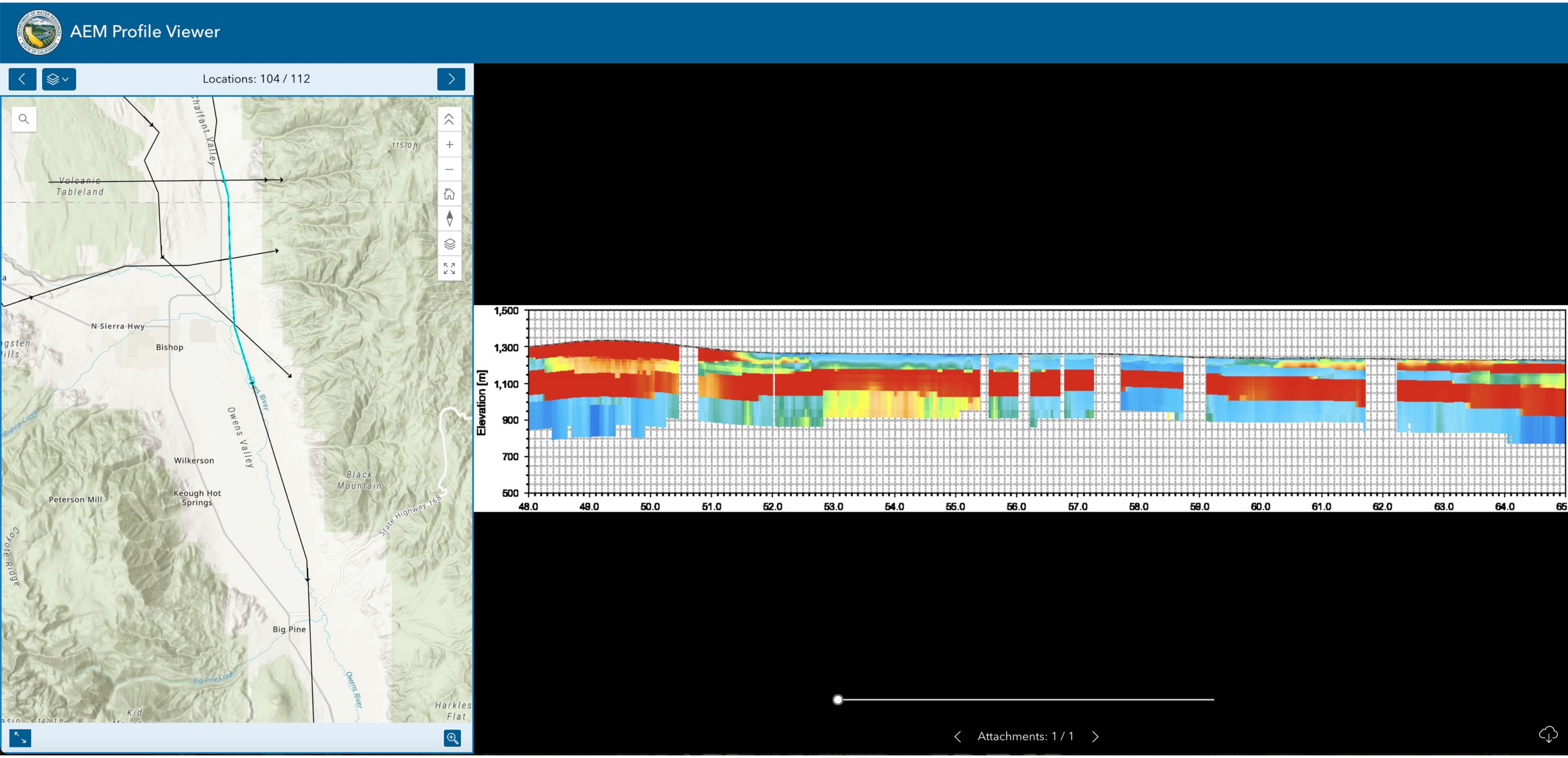


Exhibit 6A

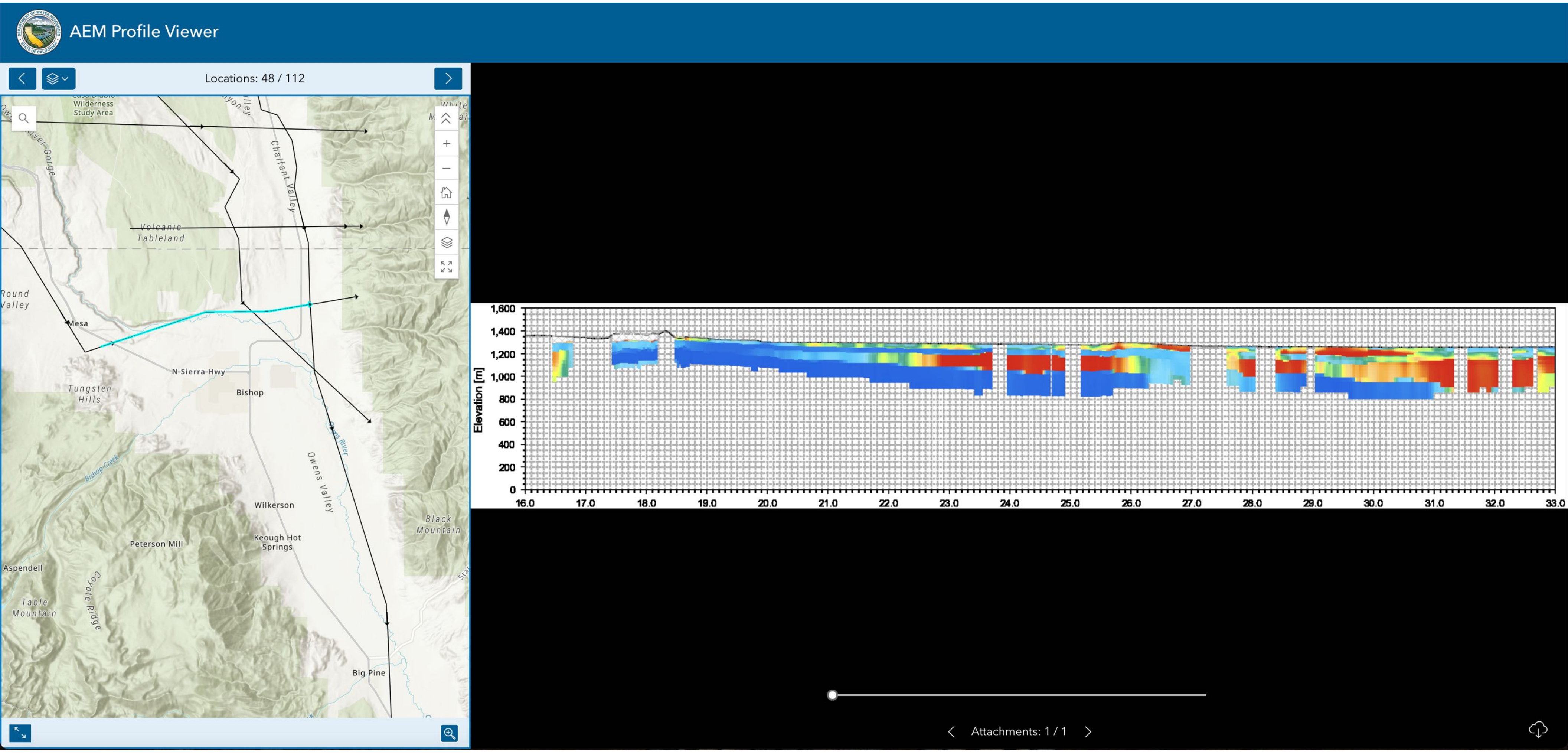
Source: https://www.ladwpnews.com/eastern-sierra-airborne-electromagnetic-survey-helicopter-to-make-low-level-flights-over-three-areas-of-mono-county-inyo-county-and-mineral-county/

Exhibit 6B



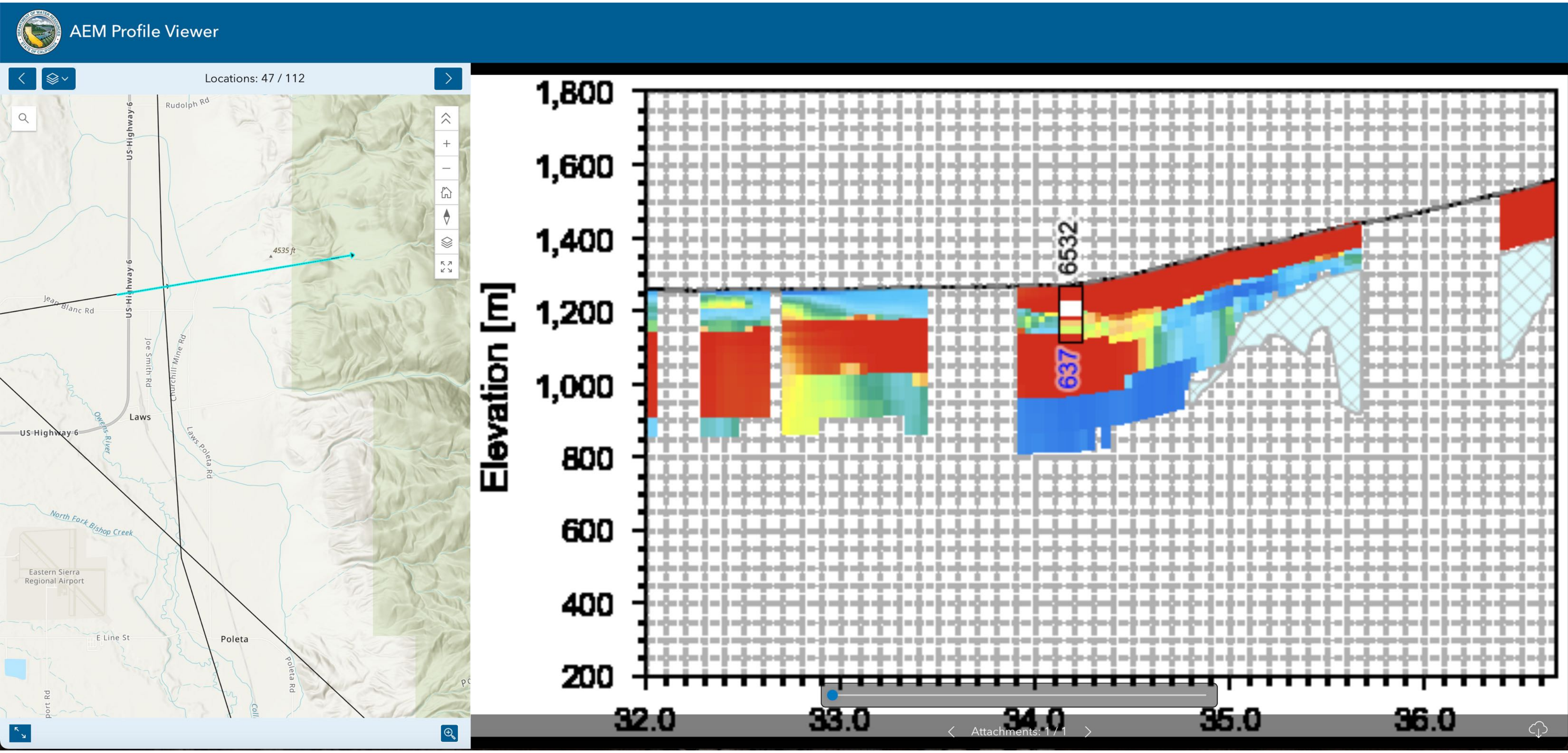
Source: DWR AEM Profile Viewer, https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

Exhibit 6C



Source: DWR AEM Profile Viewer, https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

Exhibit 6D



Source: DWR AEM Profile Viewer, https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

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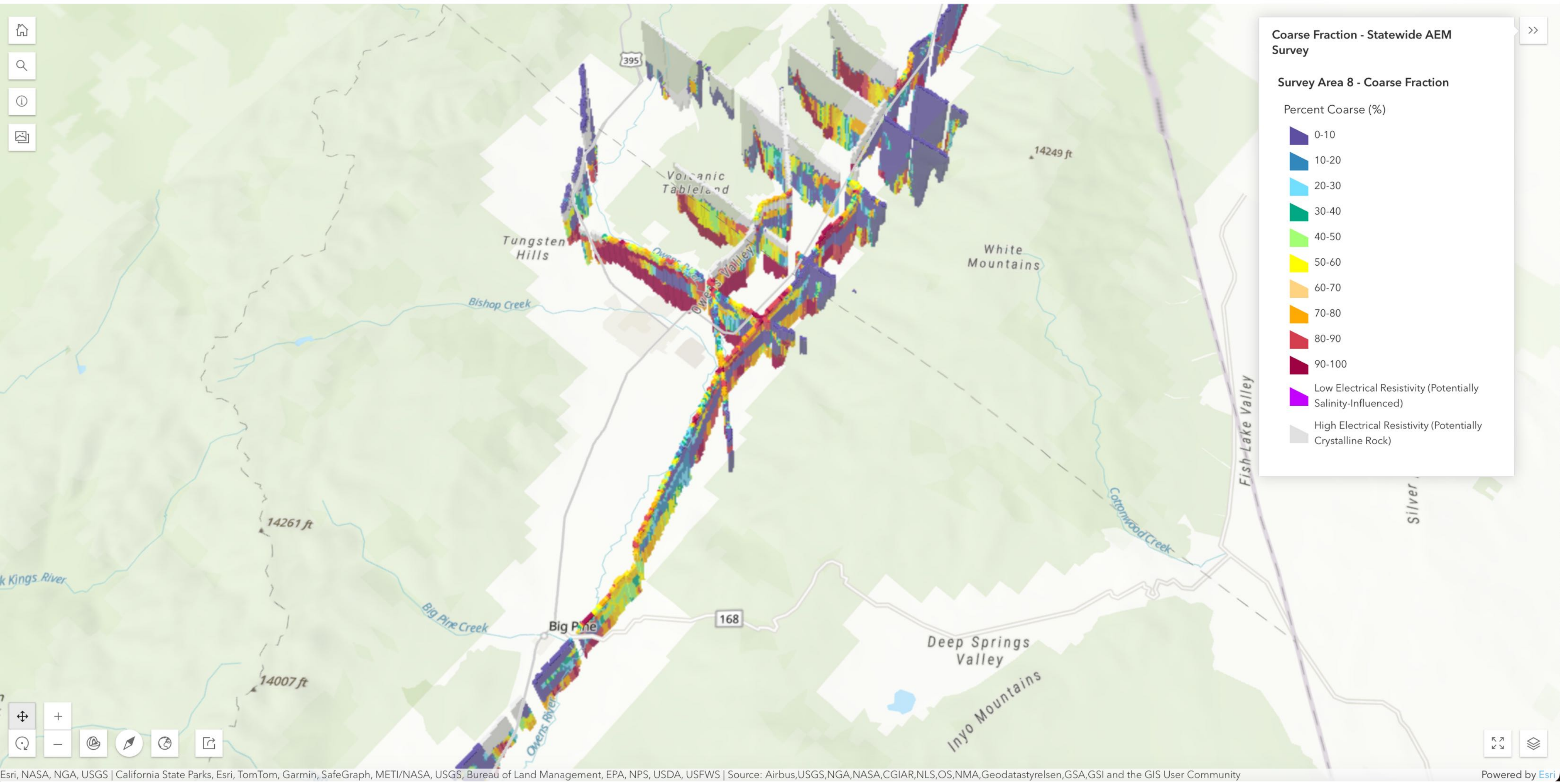
AEM 3D Viewer (Beta)

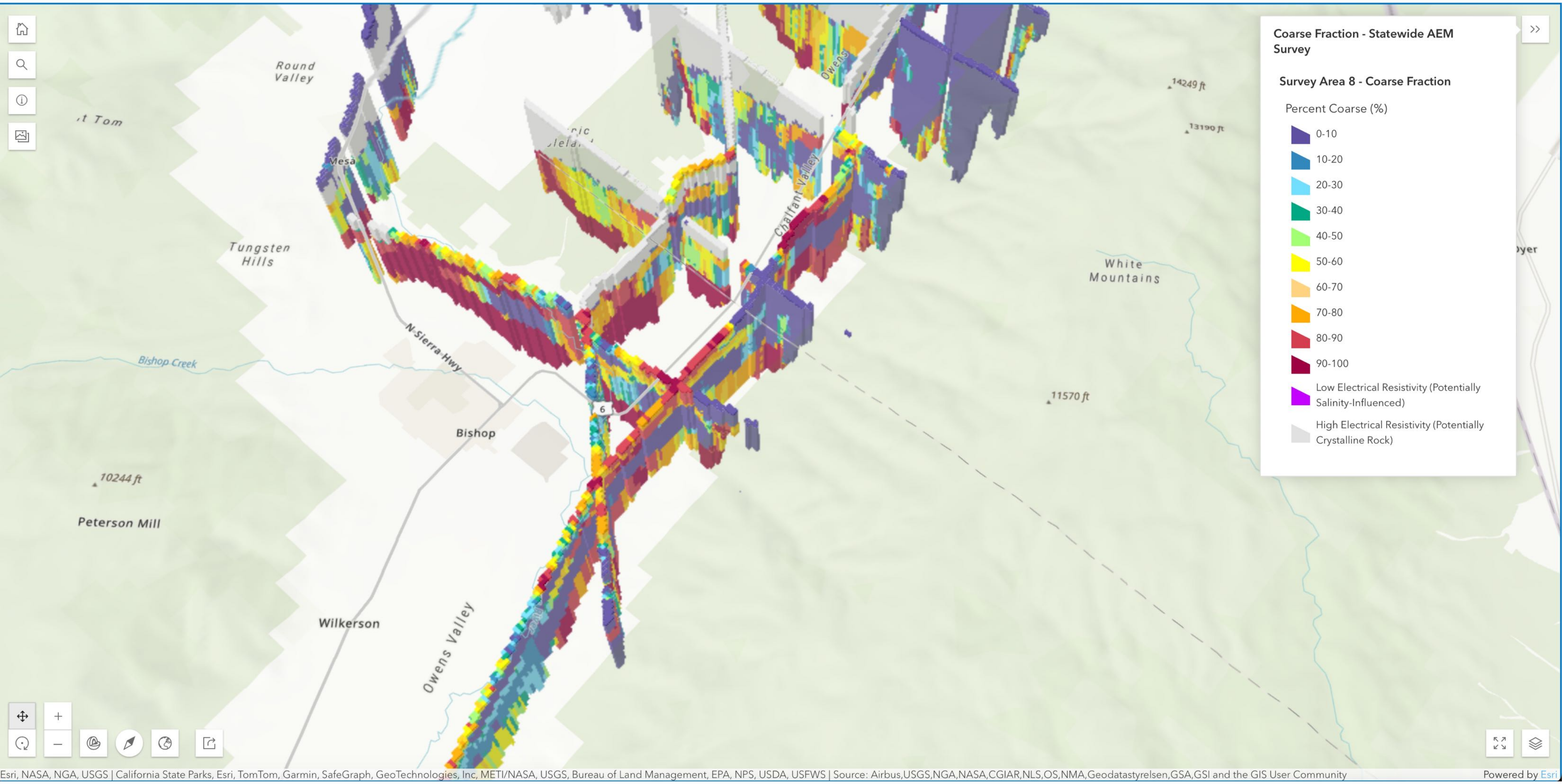
Exhibit 6E



Source: DWR AEM 3D Viewer (Beta), https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

AEM 3D Viewer (Beta)

Exhibit 6F



Source: DWR AEM 3D Viewer (Beta), https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

Exhibit 6G

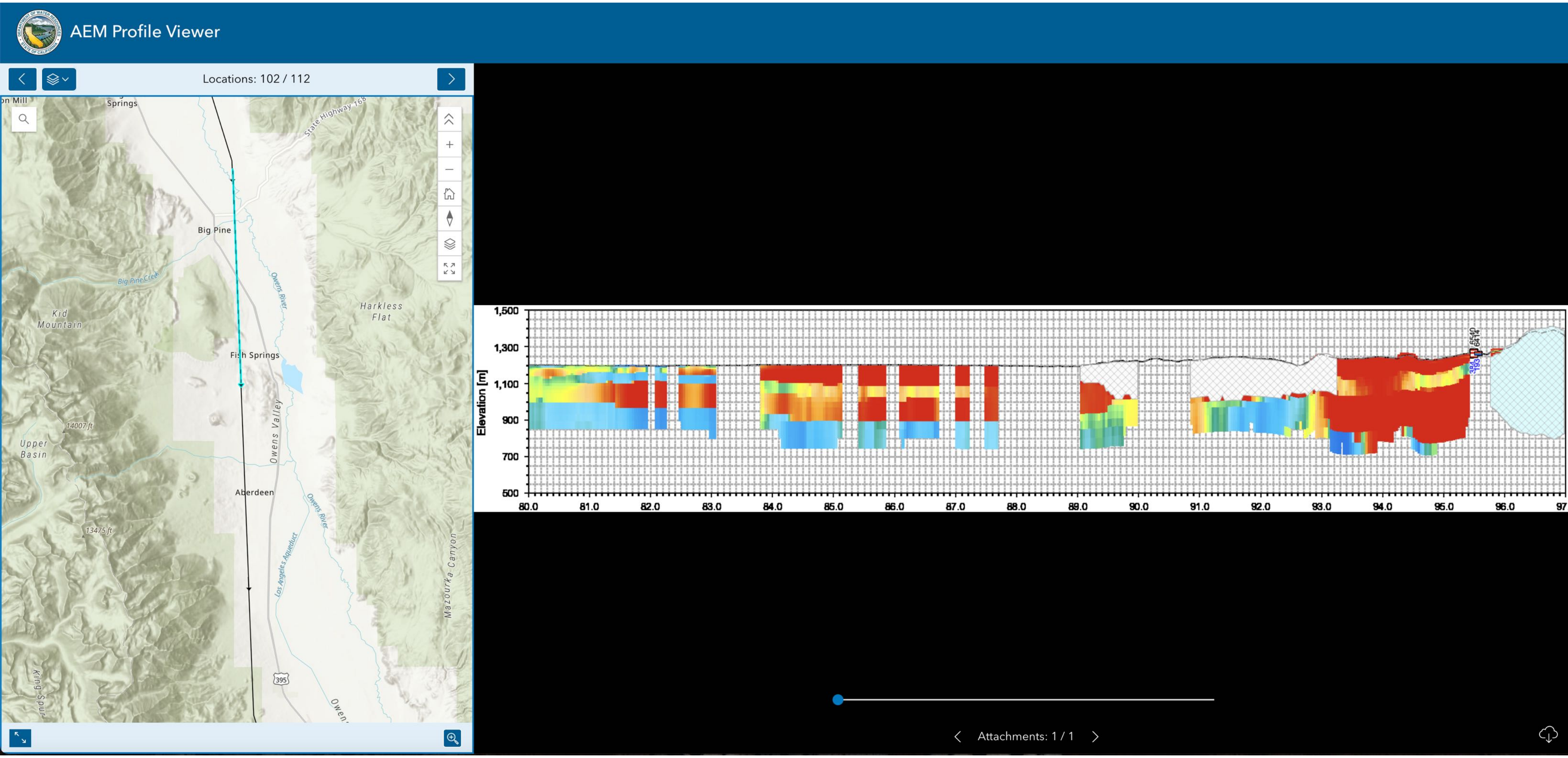


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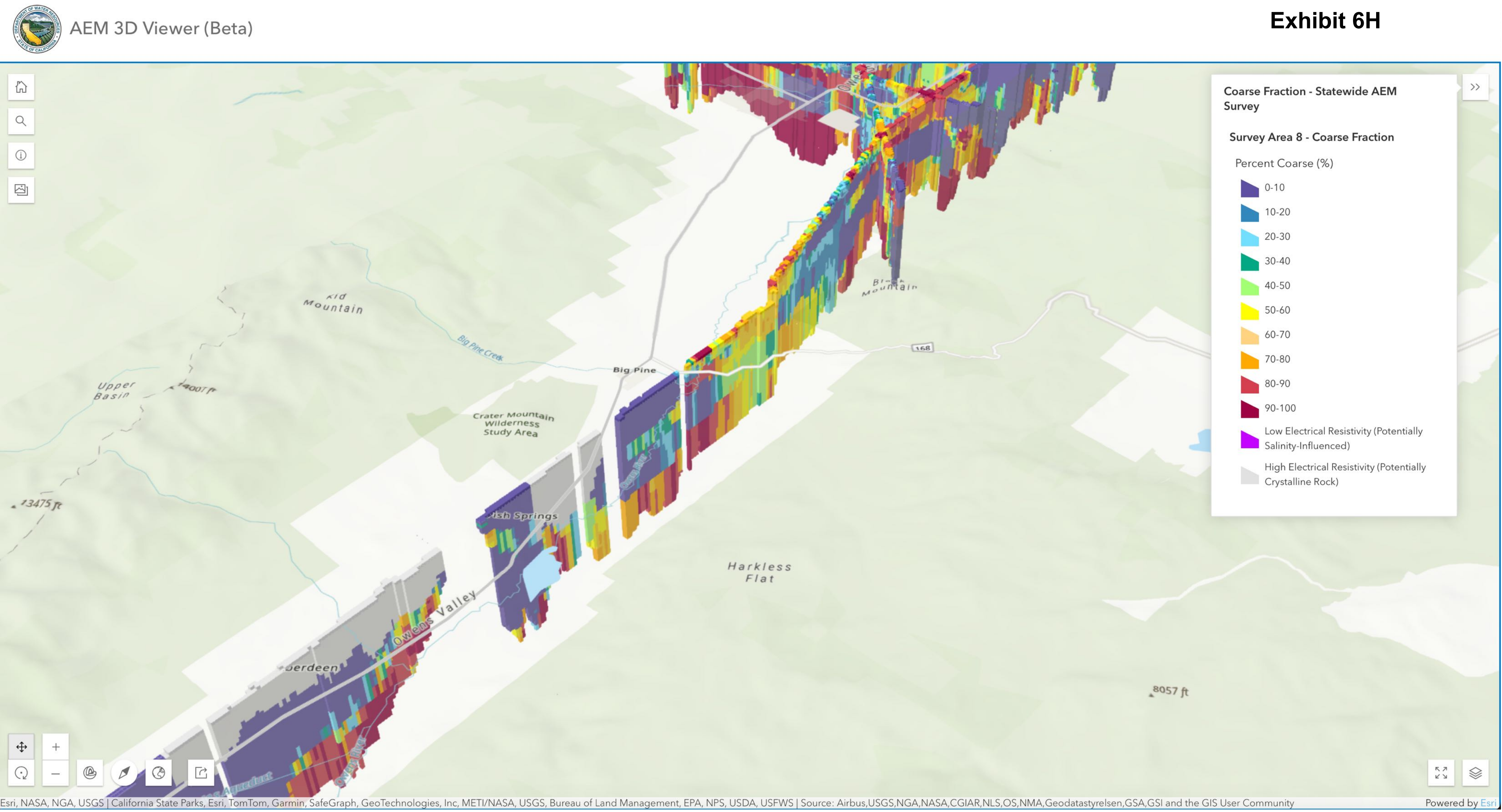
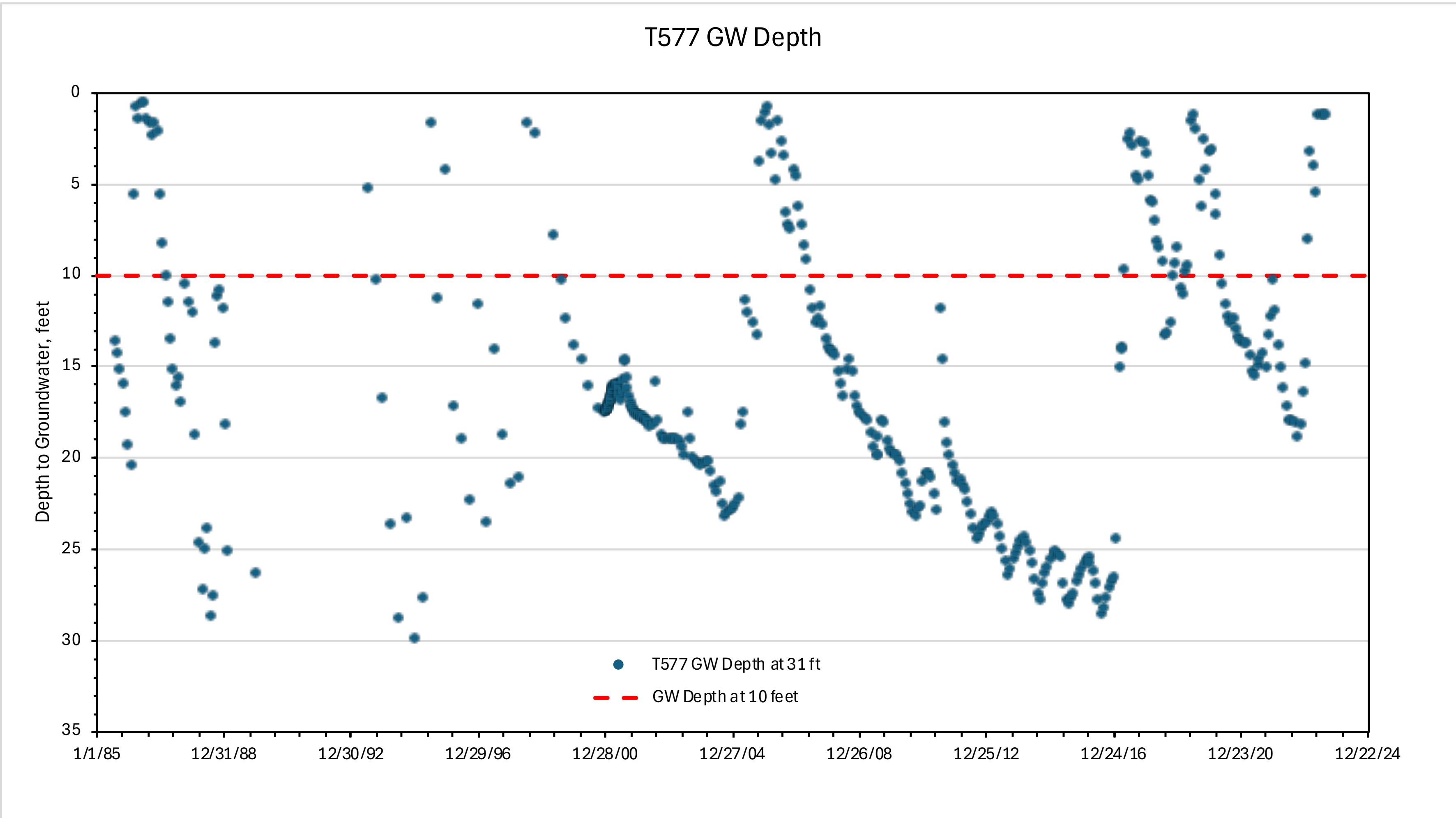
Exhibit 6H



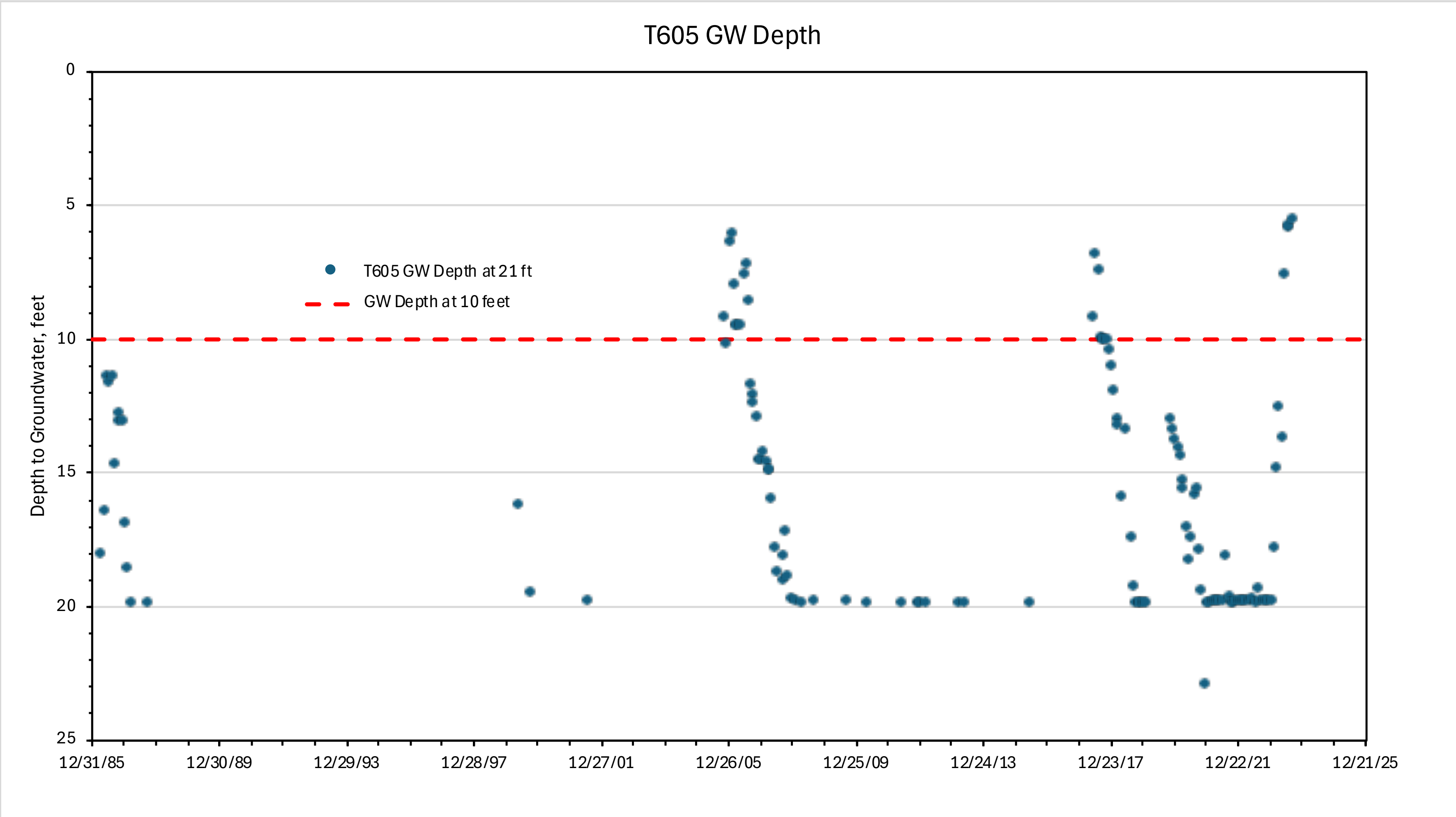
Source: DWR AEM 3D Viewer (Beta), https://data.cnra.ca.gov/dataset/aem/resource/29c4478d-fc34-44ab-a373-7d484afa38e8

Exhibit 7A



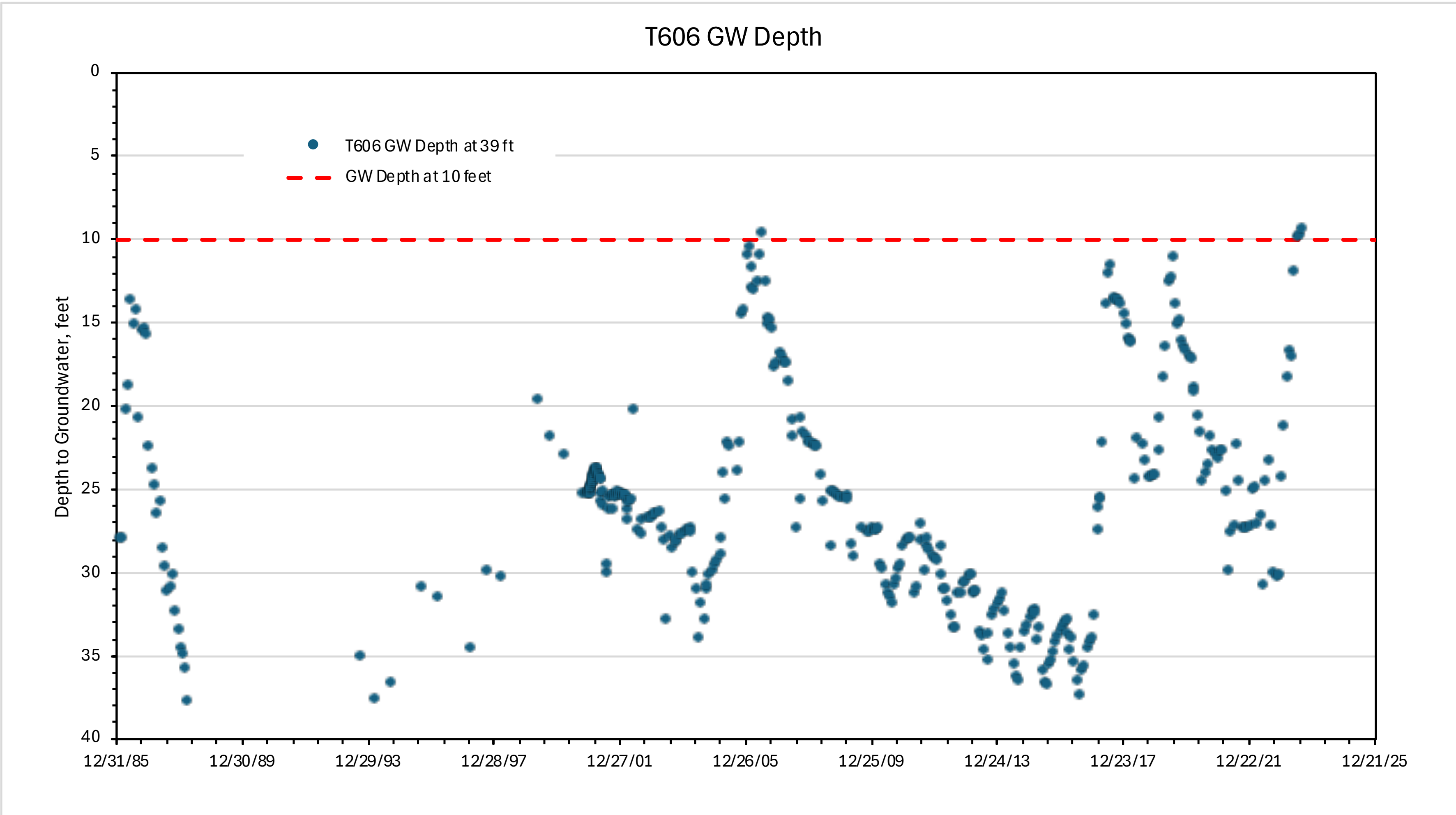
Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 7B



Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 7C



Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 7D

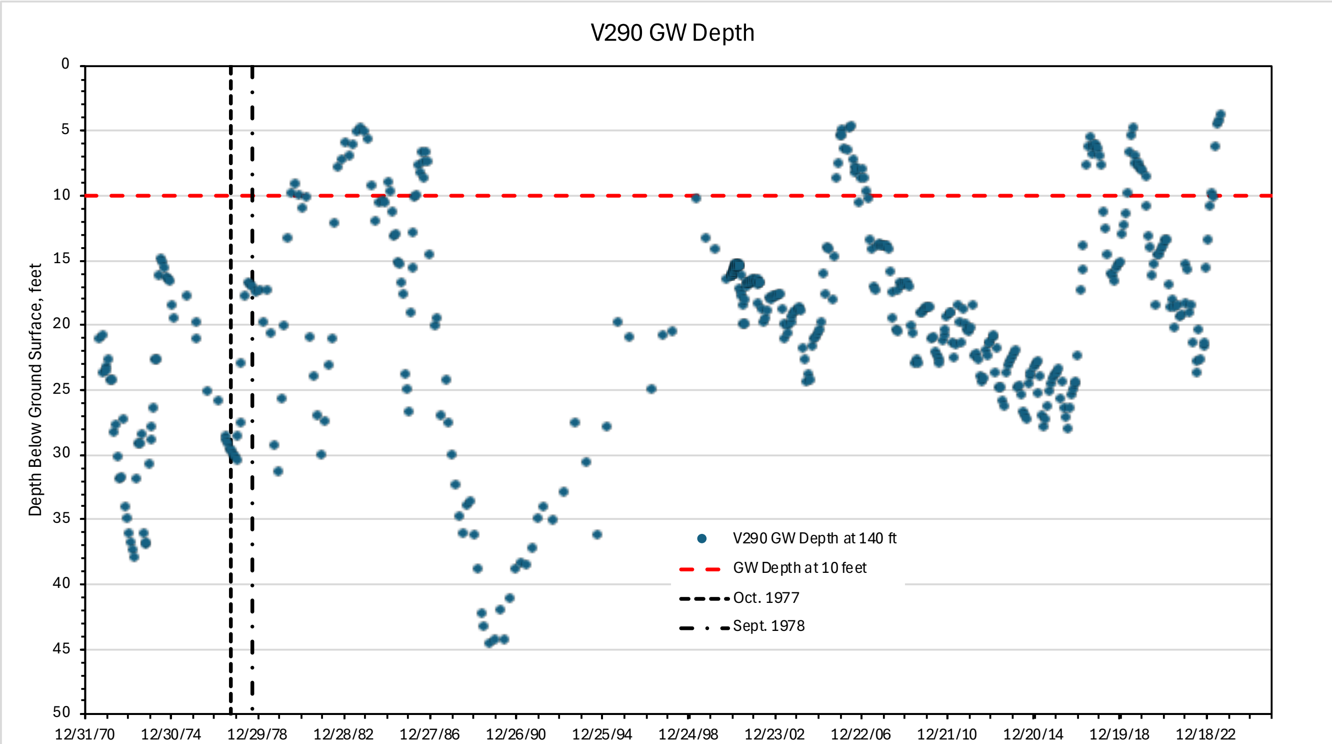
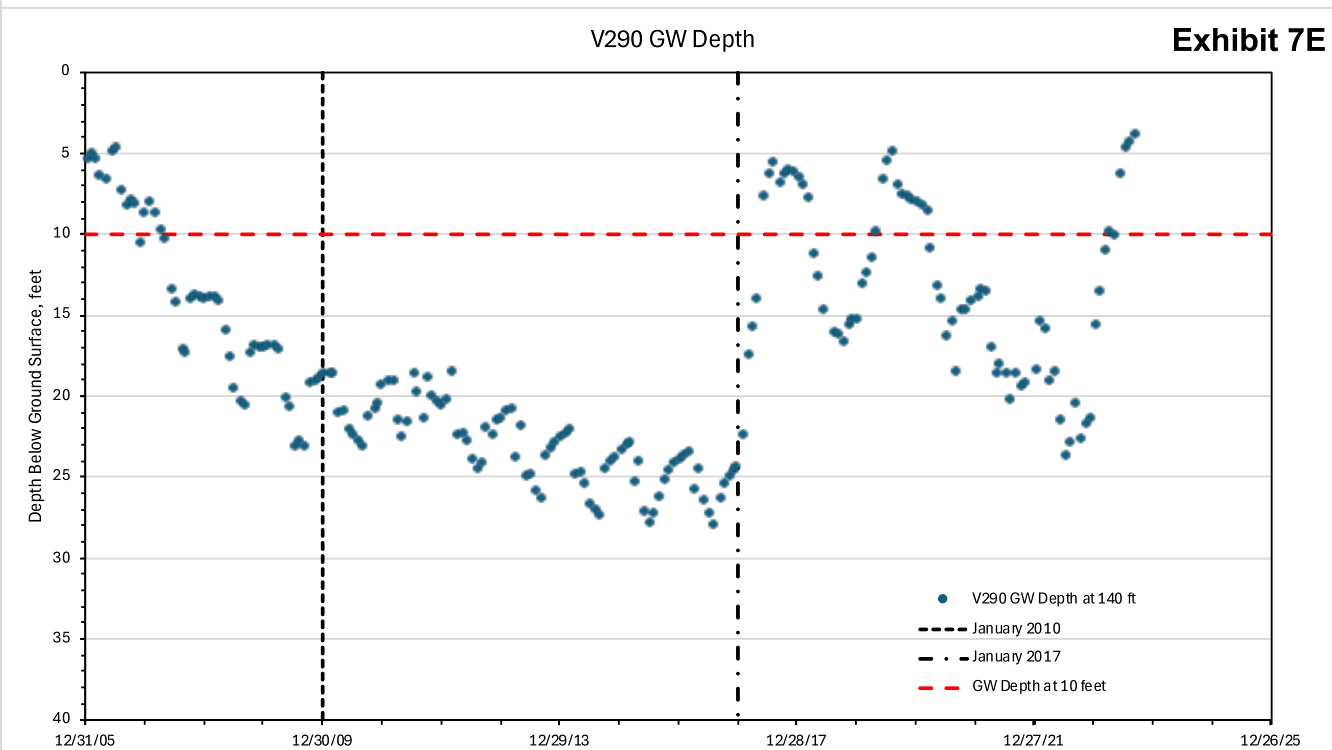
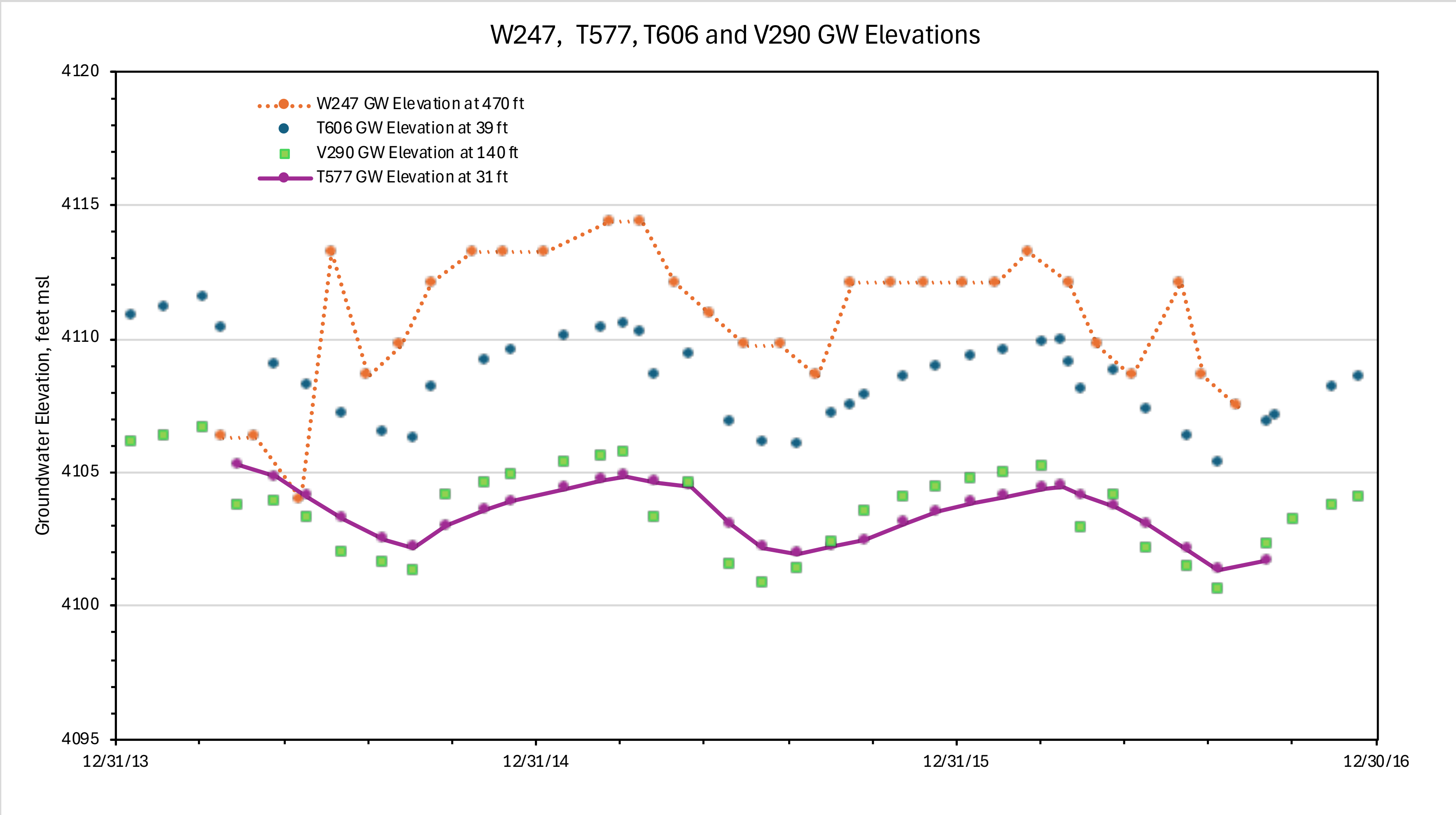


Exhibit 7E



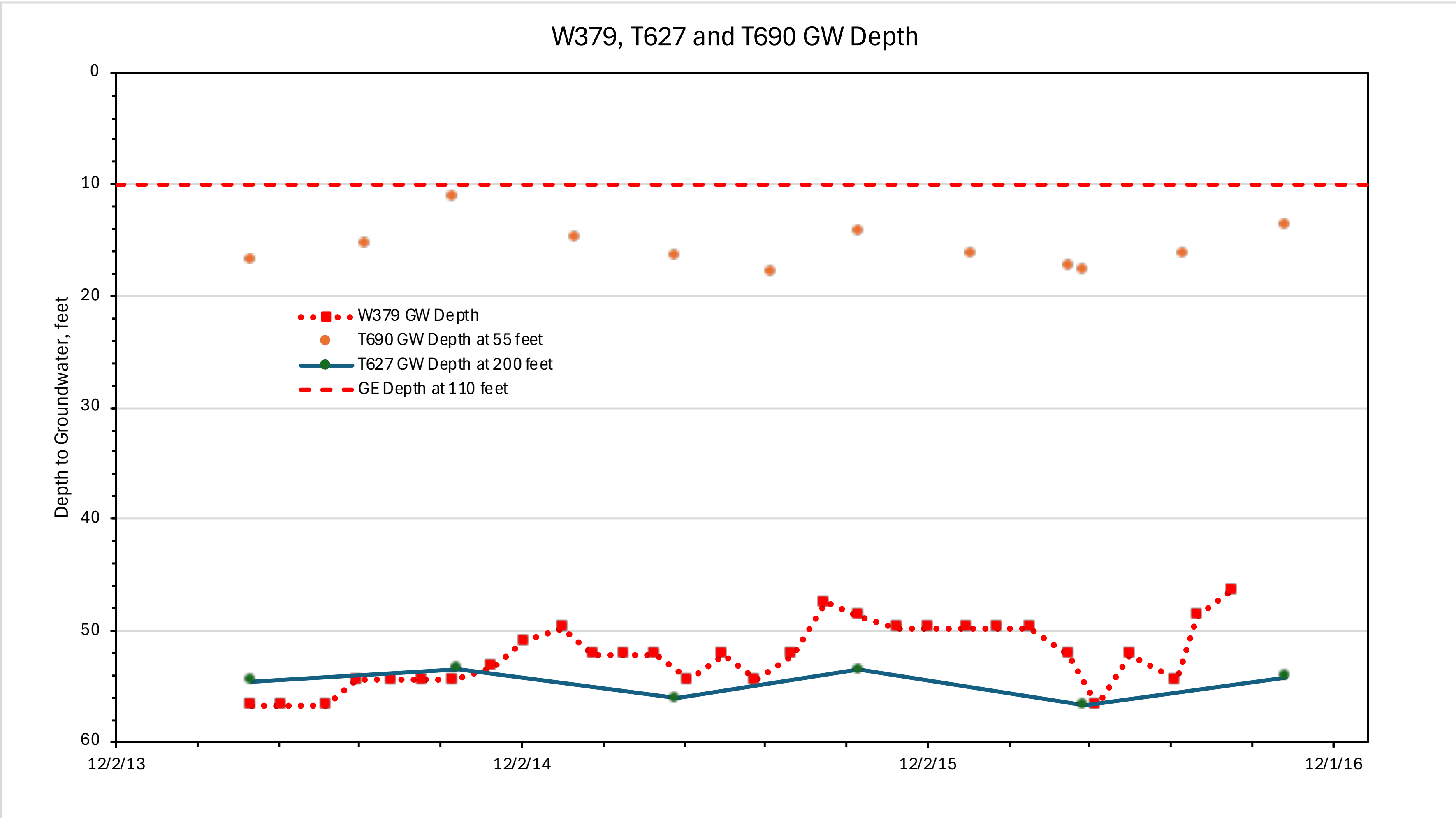
Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 7F



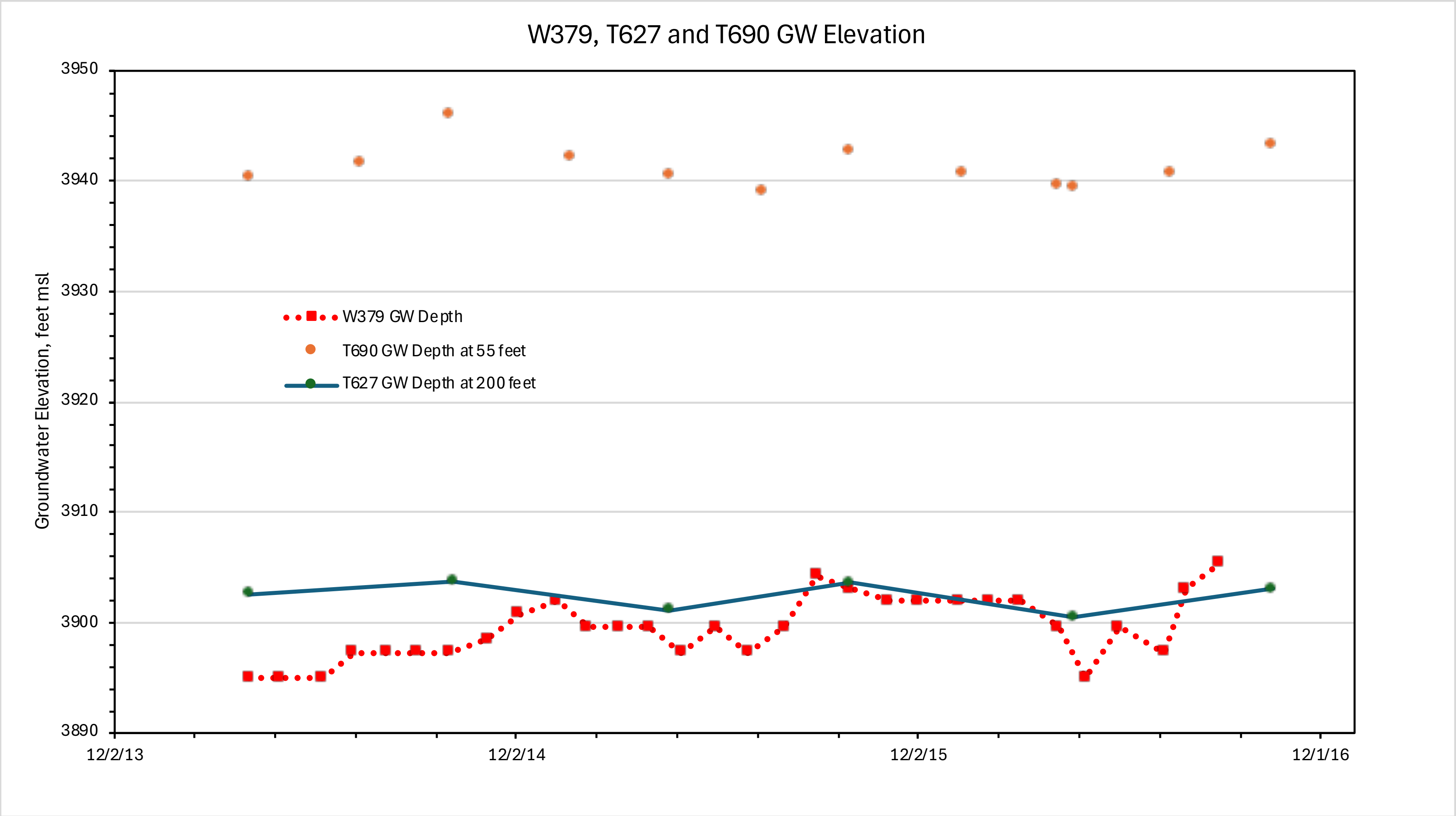
Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 8A



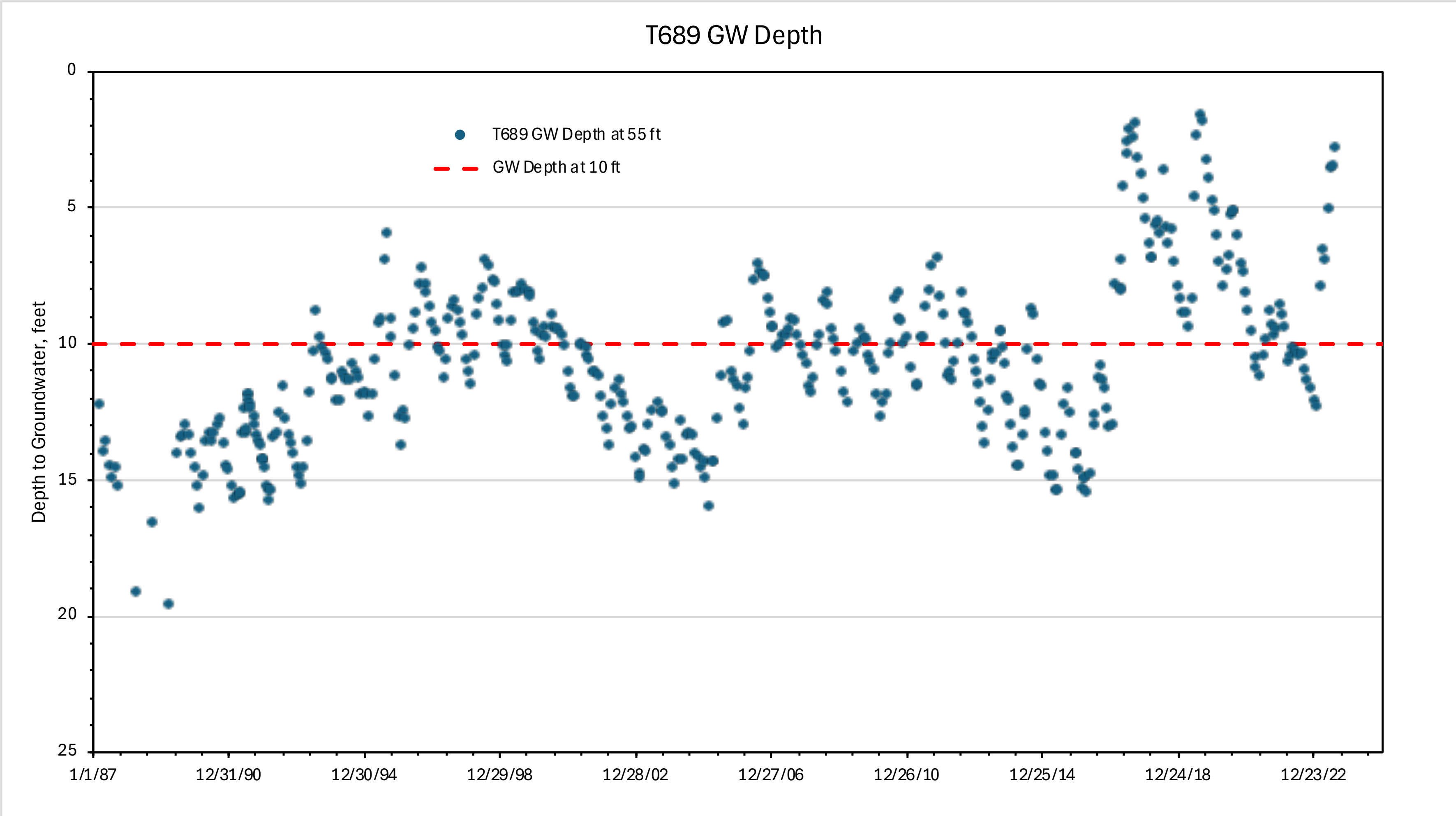
Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 8B



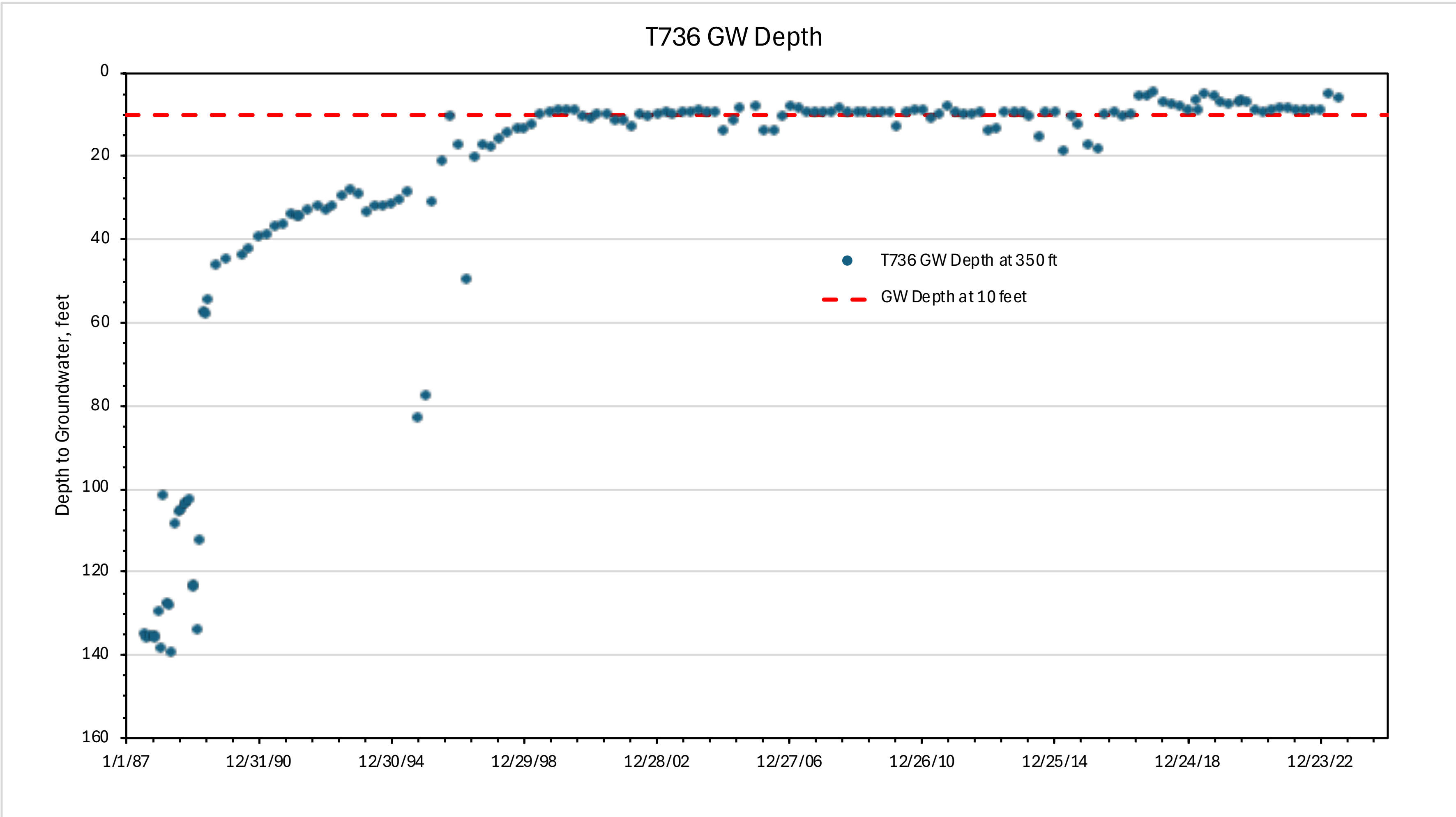
Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 8C



Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 8D



Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

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Exhibit 8E

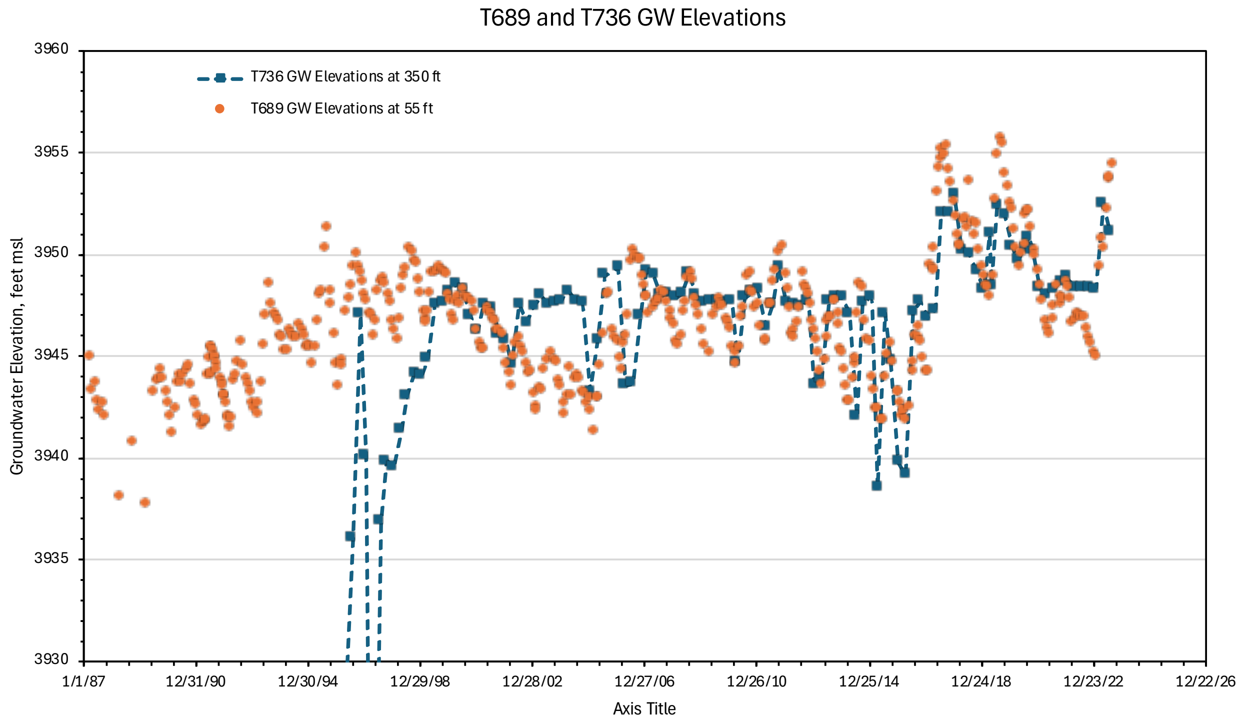
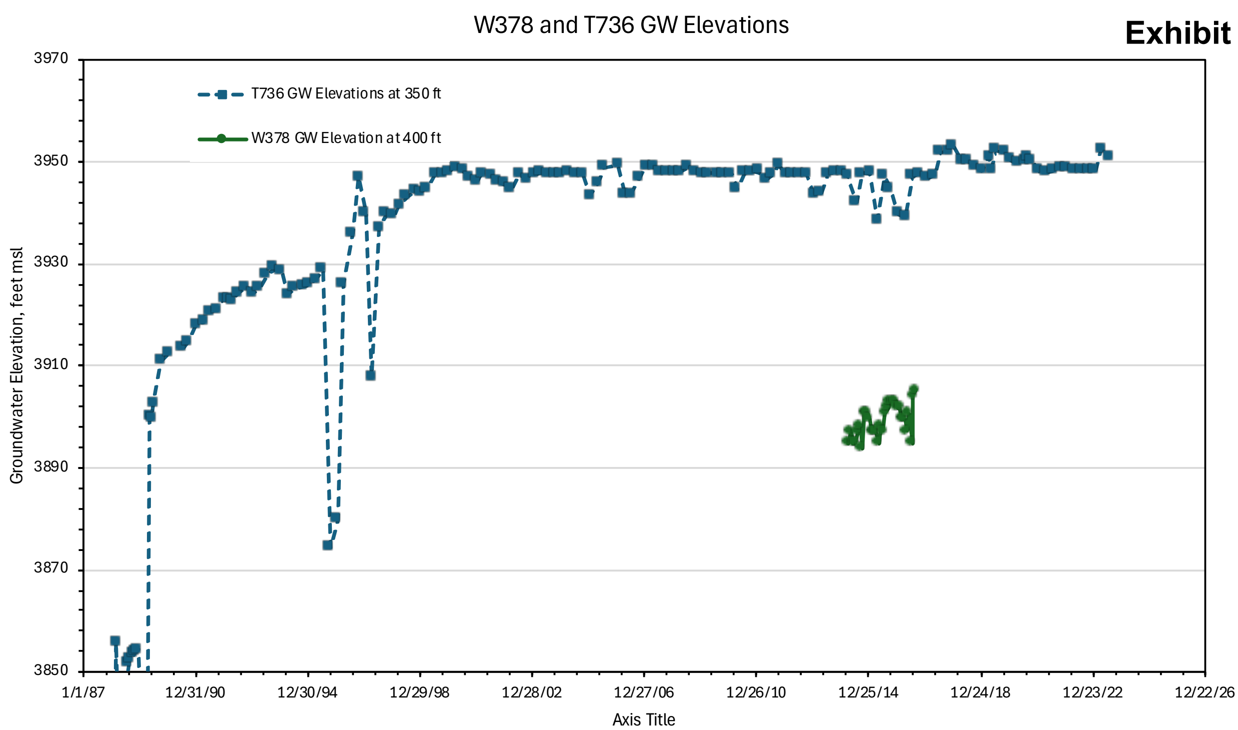


Exhibit 8F



Source: Data downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 9A

4.1.1 Groundwater Monitoring

A review of lithological and geophysical logs of wells near W247R indicates a likely semi-confined aquifer in the northern Laws Wellfield. **Table 1** lists and **Figure 2** shows locations of representative shallow and deep wells that will be monitored during the first season of W247R operation.

To improve understanding of this semi-confinement aquifer, the existing W247 may be converted to a monitoring well, measuring groundwater levels in the deep aquifer.

Table 1 – Monitoring wells to be monitored during the aquifer testing and the initial season of operation

Well Number	Depth (feet)	Direction	Distance (feet)
S009	50 - Shallow	Northwest	250
T577	31 - Shallow	Southeast	1,800
T578	20 – Shallow	North	2,000
T605	21 – Shallow	East	2,500
T606	39- Shallow	Northeast	50
T733	200+ - Deep	Southwest	14,000
T758	575 - Deep	Southwest	16,500
T795	27 - Shallow	Southwest	3,200
V269	98 - Shallow	Southeast	2,100
V275	91 - Shallow	Northeast	4,600
V290	140 - Intermediate	South	750
W247	470 - Deep	East	200
W398	550 - Deep	East	1,300

4.1.2 Surface Water Monitoring

The surface water features are unlikely to be affected by the W247R operation. LADWP conducts regular flow monitoring of the surface water features near W247R. Therefore, no additional monitoring of surface water features is planned.

Source: Well W247R - Replacement for W247 Laws Wellfield, Owens Valley Monitoring Plan For First Season of Operation Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

Exhibit 9B

4.1.1 Groundwater Monitoring

A review of lithological and geophysical logs of wells near W379 indicates a likely semi-confined aquifer in the northern Big Pine area. **Table 1** lists and **Figure 2** shows locations of representative shallow and deep wells that will be monitored during the first season of W379R operation.

Table 1 – Monitoring wells to be monitored during the aquifer testing and the initial season of operation

Well Number	Depth (feet)	Direction	Distance (feet)
T572	21 - Shallow	East	2,500
T627	200+ - Deep	West	250
T689	55 - Shallow	Northwest	750
T690	55 - Shallow	West	200
T691	100 - Shallow	South	3,600
T736	350 - Deep	Northwest	1,300
T936	110 - Shallow	Southwest	7,200
T937	252 - Deep	Southwest	6,500
V013N	92 - Shallow	West	3,000
V210	360 - Deep	Southeast	2,100
V295	620 - Deep	Southeast	5,000

4.1.2 Surface Water Monitoring

None of the surface water features are expected to be affected by W379R operation. LADWP conducts regular flow monitoring of the surface water features near W379R. Therefore, no additional monitoring of surface water features is planned.

Source: WELL W379 REPLACEMENT (W379R) BIG PINE WELLFIELD PRE-CONSTRUCTION EVALUATION REPORT, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

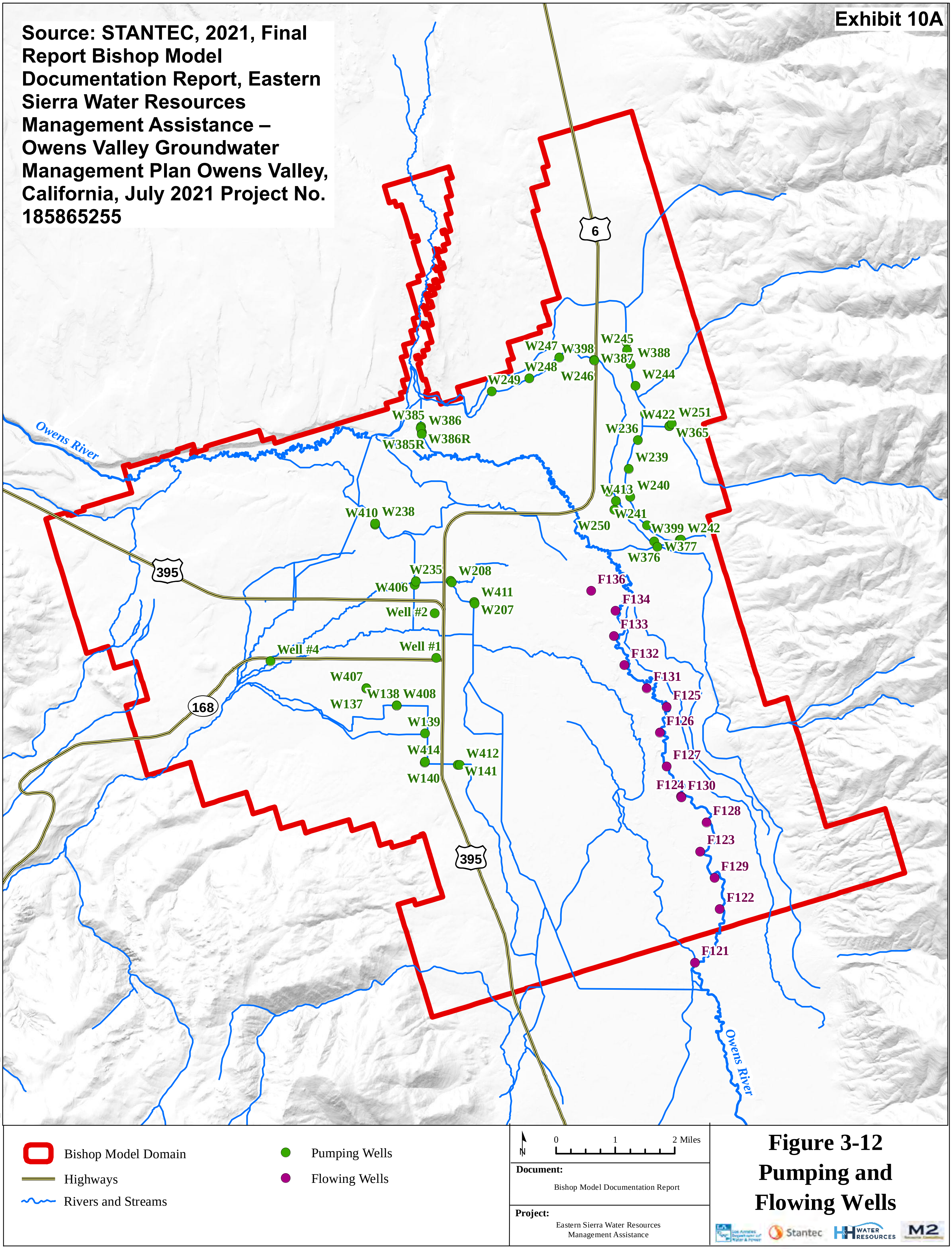


Figure 3-12 Pumping and Flowing Wells

FORM 1452

WELL LOG

auth. 10511-5

Exhibit 10B-1

DEPARTMENT OF WATER & POWER
CITY OF LOS ANGELES

Well Number or Name 247

LOCATION Northwest Laws

SE 1/4, SW 1/4, Sect. 9 T-6-S, R-33-E MAP No. Base

WORK STARTED August 28, 1928 WORK COMPLETED October 15, 1928

495 ft. of 16 in. 8 lb./ga. casing 495 left in well

Type of perforator used Mills

Perforated 470 ft. to 28 ft. 8 holes per ft.

Diameter of perforations 5/8 in., length 3½ in.

Depth at which water was first found 12 ft.

Standing level before perforating 12 ft.

Standing level after perforating 12 ft.

Note your observation of any change in water level while drilling

Date tested , 19

Water level when first started test 12 ft.

Draw down from standing level 12 ft.

G. P. M. at beginning of test 1800

G. P. M. at completion of test 1800

Draw down at completion of test 12 ft.

If reducing strings of casing were cut off, state how cut

Depth from surface cut ft.

Size of casing cut in.

Lap in larger casing ft.

Was adapter or cement used?

If casing was swedged or repaired, state depth, describe repairs and condition in which casing was left and probable future effect:

Is well straight top to bottom, if not, what is the variation? Yes

Will there be any detrimental effect on pump, and if so, what? No

Give any additional data which may be of future value: Will take 85 Ft. 6 Sec. Ft. pump.

Total depth of well 495 ft.

Formation: Mention size of water gravel—

From (ft.)	To (ft.)	Formation
0	20	Yellow clay
20	26	Gravel
26	41	Clay - gravel
41	47	Gravel
47	89	Yellow clay
89	113	Coarse gravel
113	125	Hard tufa
125	140	White, loose tufa
140	152	Coarse gravel
152	170	Sandy blue clay
170	182	Coarse gravel
182	206	Yellow clay
206	217	Gravel
217	220	Blue clay
220	231	Sand rock
231	242	Blue clay
242	253	Gravel
253	292	Yellow clay
292	305	Coarse gravel
305	310	Sand rock
310	316	Sand
316	319	Yellow clay
319	329	Sand rock
329	340	Sand
340	347	Sand - clay
347	374	Yellow clay
374	401	Coarse gravel
401	404	Yellow clay
404	426	Gravel
426	429	Clay
429	437	Gravel
437	440	White pumile
440	446	Yellow clay
446	455	Gravel
455	458	White clay
458	461	Yellow clay
461	470	Gravel
470	494	Yellow clay

(over)

Date of Report , 19

W. J. Glade
Driller.

In charge

SHOW LOCATION ON BACK

Exhibit 10B-2

Source: Well logs downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

1-19-61 LEB 14 RPM (1stg)
12-19-61 Replaced motor thrust bearing
7-12-65 Routine maintenance
7-1-71 - Pump removed to well 108
July 71 - Kimball
5-10-72 - Overhaul
7-7-72 - Remove Kimball - install Gould 12DHHO (2stg)
July 74 - Slab
10-22-69 Photologged (Depth = 447')

Twp. 6 - S Range 33 - E

Section 9

N

0247

Show Location of Well in Section

Source: Well logs downloaded from Owens Valley Groundwater Authority GIS website: https://owens.gladata.com/default.aspx#

Exhibit 10B-3

WELL LOG

DEPARTMENT OF WATER & POWER
CITY OF LOS ANGELES

Well Number or Name 247

LOCATION Northwest Laws.

MAP No.

WORK STARTED August 28, 1928 WORK COMPLETED October 15, 1928

495 ft. of 16 in. 8 lb./ga. casing 495 left in well

Type of perforator used Mills

Perforated 470 ft. to 28 ft. 8 holes per ft.

Diameter of perforations 5/8 in., length 3½ in.

Depth at which water was first found 12 ft.

Standing level before perforating 12 ft.

Standing level after perforating 12 ft.

Note your observation of any change in water level while drilling

Date tested , 19

Water level when first started test 12 ft.

Draw down from standing level 12 ft.

G. P. M. at beginning of test 1800

G. P. M. at completion of test 1800

Draw down at completion of test 12 ft.

If reducing strings of casing were cut off, state how cut

Depth from surface cut ft.

Size of casing cut in.

Lap in larger casing ft.

Was adapter or cement used?

If casing was swedged or repaired, state depth, describe repairs and condition in which casing was left and probable future effect:

Is well straight top to bottom, if not, what is the variation? Yes

Will there be any detrimental effect on pump, and if so, what? No

Give any additional data which may be of future value: Will take 85 ft. 6 sec.ft. pump

Total depth of well 495 ft.

Formation: Mention size of water gravel—

From (ft.)	To (ft.)	Formation
0	20	Yellow clay
20	26	Gravel
26	41	Clay-gravel
41	47	Gravel
47	89	Yellow clay
89	113	Coarse gravel
113	125	Hard tufa
125	140	White, loose tufa
140	152	Coarse gravel
152	170	Sandy blue clay
170	182	Coarse gravel
182	206	Yellow clay
206	217	Gravel
217	220	Blue Clay
220	231	Sand rock
231	242	Blue clay
242	253	Gravel
253	292	Yellow clay
292	305	Coarse gravel
305	310	Sand rock
310	316	Sand
316	319	Yellow clay
319	329	Sand rock
329	340	Sand
340	347	Sand-clay
347	374	Yellow clay
374	401	Coarse gravel
401	404	Yellow clay
404	426	Gravel
426	429	Clay
429	437	Gravel
437	440	White pumile
440	446	Yellow clay
446	455	Gravel
455	458	White clay
458	461	Yellow clay
461	470	Gravel
470	494	Yellow clay

Date of Report , 19

W. J. Glade
Driller.

In charge

SHOW LOCATION ON BACK

ORIGINAL
File with DWR

N of Intent No.
Local Permit No. or Date

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

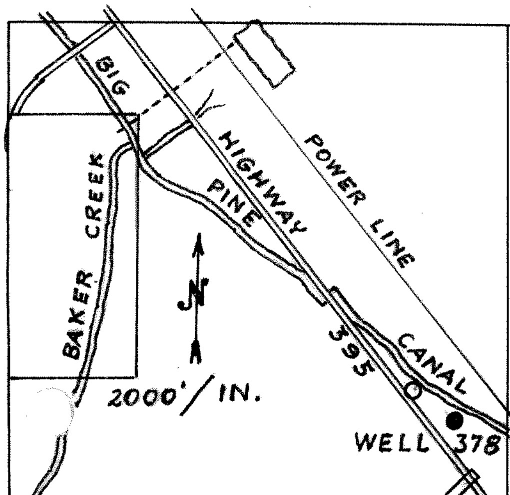
WATER WELL DRILLERS REPORT

Do not fill in
No. 161874

State Well No.
Other Well No. 378

(1) OWNER: Name Department Water/Power, L.A.
Address Post Office Box 111
City Los Angeles, California Zip 90051

(2) LOCATION OF WELL (See instructions):
County Inyo Owner's Well Number 378
Well address if different from above
Township 9 S. Range 34 E. Section 7
Distance from cities, roads, railroads, fences, etc. Big Pine Area



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☐
Irrigation ☒
Industrial ☐
Test Well ☐
Stock ☐
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☐ Reverse ☒
Cable ☐ Air ☐
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☒ No ☐ Size Kern #10
Diameter of bore 28"
Packed from 200 to 410 ft.

(7) CASING INSTALLED:
Steel ☒ Plastic ☐ Concrete ☐

(8) PERFORATIONS:
Type of perforation or size of screen Moss Ful-flo

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	410	18	.312	200	400	.080

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 50 ft.
Were strata sealed against pollution? Yes ☒ No ☐ Interval 0 - 50 ft.
Method of sealing 9 sack grout

(10) WATER LEVELS:
Depth of first water, if known 43 ft.
Standing level after well completion 50 ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? Beylik Drill
Type of test Pump ☒ Bailer ☐ Air lift ☐
Depth to water at start of test 43 ft. At end of test 50 ft
Discharge 3500 gal/min after 20 hours Water temperature
Chemical analysis made? Yes ☐ No ☒ If yes, by whom?
Was electric log made? Yes ☒ No ☐ If yes, attach copy to this report

(12) WELL LOG: Total depth 430 ft. Depth of completed well 410 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	40	dirt, fine sand
40	50	fine sand, some gravel
50	80	ft. sand
80	100	med gravel, sand
100	130	med. gravel, small gravel, sand
130	150	med. gravel, sand
150	190	med. gravel, small gravel, sand
190	200	med. gravel, sand
200	250	fine and med. sand
250	280	med. sand, little gravel
280	310	fine/med. sand, gravel, chips, rock
310	330	coarse sands, rock chips
330	340	coarse rounded gravel, some sand
340	350	clear gravel, sand
350	390	sand and gravel, clear gravels
390	420	fine sand, clear gravels
420	430	coarse sand, little fine sand

Work started May 2 1986 Completed Aug. 19 1986

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED [signature] (Well Driller)

NAME BEYLIK DRILLING, INC
(Person, firm, or corporation) (Typed or printed)
Address 591 S. Walnut Street
City La Habra, Calif. Zip 90631
License No. 306291C57 & SC-61 Date of this report Jan. 6, 1987

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well produced 3500 gallons per mnute after 20 Hrs. with a drawdown of 50 and specific yield of 70 ft.

 lley Groundwater Authority GIS website:
https://owens.gladata.com/default.aspx#
Exhibit 10D

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

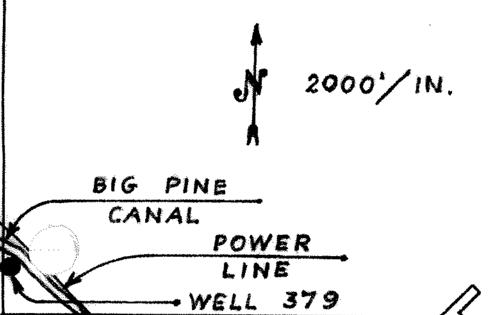
Do not fill in
No. 161875

Notice of Intent No. ______
Local Permit No. or Date ______

State Well No. ______
Other Well No. 379

(1) OWNER: Name L.A. Dept. Water & Power
Address Post Office Box 111
City Los Angeles Calif. Zip 90051

(2) LOCATION OF WELL (See instructions):
County Inyo Owner's Well Number 379
Well address if different from above ______
Township 9 S. Range 34 E. Section 8
Distance from cities, roads, railroads, fences, etc. Big Pine Area



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [X]
Industrial [ ]
Test Well [ ]
Stock [X]
Municipal [ ]
Other [ ]

(5) EQUIPMENT:
Rotary [ ] Reverse [X]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK: KERN
Yes [X] No [ ] Size #10
Diameter of bore 28"
Packed from 200 to 400 ft.

(7) CASING INSTALLED:
Steel [X] Plastic [ ] Concrete [ ]

(8) PERFORATIONS: Johnson wire-wound
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	200	18	.312	200	400	.080
400	410	18	.312			

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 180 ft.
Were strata sealed against pollution? Yes [X] No [ ] Interval 0-180 ft.
Method of sealing 9 sack grout

(10) WATER LEVELS:
Depth of first water, if known 45 ft.
Standing level after well completion 48 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? BEYLIK DRILL.
Type of test Pump [X] Bailer [ ] Air lift [ ]
Depth to water at start of test 45 ft. At end of test 48 ft
Discharge 2500 gal/min after 40-1/2 hours Water temperature ______
Chemical analysis made? Yes [ ] No [X] If yes, by whom? ______
Was electric log made? Yes [X] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth 420 ft. Depth of completed well 410 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	20	fine sand
20	40	fine snad,fine gravel
40	60	med.gravel,sand
60	90	med. gravel
90	120	loose gravel/med.size
120	150	med.small gravel
150	170	med. gravel
170	180	med.small gravel
180	210	med.sand,small gravel
210	230	med.sand,small gravel, rock chips
230	250	fine/med.sand,rock chips
250	260	fine sand/rock chips,hard sand
260	290	hard packed sand,fine sand,chips
290	310	fine/med.sand,small gravel
310	330	coarse sand/gravel,rock chips
330	350	coarse sand,hard sand/rock chips
350	380	fine sand,gravel,clear/white sand
380	390	fine sand/small gravel
390	400	med.sand/fine gravel
400	420	fine sand,fine gravel,clear white

Work started May 19 19 86 Completed Aug 30 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED [signature] (Well Driller)
NAME BEYLIK DRILLING, INC
(Person, firm, or corporation) (Typed or printed)
Address 591 S. Walnut Street
City La Habra, Calif. Zip 90631
License No. 306291C57&SC-61 Date of this report Jan. 6, 1987

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well produced 2500 gpm with drawdown of 150 after 40-1/2 hrs. and specific yield: 16.66 ft.

 ılley Groundwater Authority GIS website:
https://owens.gladata.com/default.aspx#

Exhibit 10E

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. 160638

Notice of Intent No. ______
Local Permit No. or Date ______

State Well No. ______
Other Well No. TH690T

(1) OWNER: Name Department of Water & Power
Address 873 N. Main Street
City Bishop, Calif. Zip 93514

(2) LOCATION OF WELL (See instructions):
County Inyo Owner's Well Number 690T
Well address if different from above ______
Township 9S Range 34E Section SW¼, SEC 8
Distance from cities, roads, railroads, fences, etc. 58" E/O Well 379

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [ ]
Industrial [ ]
Test Well [X]
Stock [ ]
Municipal [ ]
Other [ ]

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [X] No [ ] Size Hiatt well mix
Diameter of bore 6"
Packed from 5 to 55 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	55	2"	SCH40	45	55	0.020"

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 5 ft.
Were strata sealed against pollution? Yes [ ] No [ ] Interval ______ ft.
Method of sealing Concrete

(10) WATER LEVELS:
Depth of first water, if known ______ ft.
Standing level after well completion ______ ft.

(11) WELL TESTS:
Was well test made? Yes [ ] No [ ] If yes, by whom? ______
Type of test Pump [ ] Bailer [ ] Air lift [ ]
Depth to water at start of test ______ ft. At end of test ______ ft
Discharge ______ gal/min after ______ hours Water temperature ______
Chemical analysis made? Yes [ ] No [ ] If yes, by whom? ______
Was electric log made? Yes [ ] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth ______ ft. Depth of completed well 55 ft.
from ft. to ft. Formation (Describe by color, character, size or material)

0 – 55 Silty Sand & Layered Gravel

Work started ______ 19____ Completed Nov. 19 86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED [signature] (Well Driller)

NAME Datum Explorations
(Person, firm, or corporation) (Typed or printed)
Address 3320 Airport Way
City Long Beach, Calif. Zip 90806
License No. 480802 Date of this report ______

Exhibit 11A

Appendix Table A – Groundwater pumping from LADWP wells in Laws Wellfield (AF/year)

Runoff Year	W236	W239	W240	W241	W242	W243	W244	W245	W246	W247	W248	W249	W365	W385	W386	W398	W399	Total
1971	1,506	908	1,213	925	1,194	463	1,166	1,272	1,219	560	1,855	1,124						13,405
1972	2,802	2,325	2,277	1,668	793	1,810	2,111	2,156	2,086	2,901	3,183	3,033						27,145
1973	1,762	1,487	626	483	551	989	1,349	1,532	1,061	1,644	1,516	1,619						14,619
1974	680	379	80	413	482	548	499	636	0	0	0	0						3,717
1975	1,322	1,060	1,217	1,365	1,082	1,337	415	1,946	1	125	99	83						10,052
1976	2,688	2,439	2,262	1,550	683	1,521	1,868	2,297	0	0	0	0						15,308
1977	2,312	2,008	1,582	1,204	840	1,946	2,001	1,804	5	1	1	3	1,311					15,018
1978	0	0	0	0	0	0	0	0	0	0	0	0	907					907
1979	1,796	1,639	1,488	1,186	931	1,649	1,482	1,374	682	1,609	1,220	1,116	1,726					17,898
1980	0	0	0	0	0	0	0	0	0	10	0	0	1,218					1,228
1981	2,015	1,888	1,807	1,448	1,031	2,020	1,878	1,723	1,467	3,169	2,680	2,382	1,775					25,283
1982	0	0	27	21	15	54	54	84	21	48	45	41	946					1,356
1983	0	1	0	1	0	0	0	0	0	2	0	0	1,085					1,089
1984	969	836	713	569	404	662	984	847	0	0	0	128	1,265					7,377
1985	2,134	2,052	1,745	1,036	972	1,957	1,847	1,693	364	947	710	852	1,030					17,339
1986	712	618	532	404	322	592	407	431	372	1,455	731	654	1,343					8,573
1987	2,506	2,218	1,940	1,307	830	2,009	552	1,256	1,742	3,009	3,422	3,012	1,360	1,148	1,817			28,128
1988	2,542	2,377	1,969	1,054	817	2,044	937	1,172	1,639	3,262	2,962	2,611	1,245	2,525	3,248			30,404
1989	1,969	2,255	1,710	762	933	1,814	1,995	915	1,288	3,062	2,604	2,521	1,172	0	63			23,063
1990	726	751	1,032	546	519	567	634	687	0	578	2	0	581	0	0			6,623
1991	1	0	882	500	392	0	0	602	0	385	0	1	739	3	2			3,507
1992	31	0	886	435		18	0	433		359	0	0	502	0	0	0	380	3,044
1993	1	1	705	646		0	0	312		1,760	1,585	1,334	2	1,344	754	0	475	8,919
1994	1	2	1,487	725		1	1	818		1,818	1,675	1,368	1	0	0	1,008	541	9,446
1995	244	171	0	0		152	11	74		581	1,638	1,282	87	1	1	136	0	4,378
1996	0	0	0	0		0	0	0		535	799	0	0	0	0	0	0	1,334
1997	0	0	0	0		0	0	0		538	0	0	0	0	0	0	33	571

Source: Well W247R - Replacement for W247 Laws Wellfield, Owens Valley Monitoring Plan For First Season of Operation Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

Exhibit 11B

Runoff Year	W236	W239	W240	W241	W242	W243	W244	W245	W246	W247	W248	W249	W365	W385	W386	W398	W399	Total
1998	0	0	0	0		0	0	0		426	0	0	0	0	0	0	0	426
1999	0	0	0	0		0	0	133		382	0	0	0	0	0	0	14	529
2000	0	0	0	0		0	0	487		318	0	0	597	0	0	0	0	1,402
2001	0	0	0	2		0	0	290		438	0	0	236	0	0	0	0	966
2002	0	0	0	0		0	0	413		404	0	0	1,624	0	0	0	0	2,441
2003	1,626	959	0	0		0	869	120		329	0	0	836	0	0	0	0	4,739
2004	1,293	732	0	0		0	1,019	389		281	0	0	512	0	0	0	0	4,226
2005	1,021	50	0	0		0	135	81		464	0	0	449	0	0	0	0	2,200
2006	1,293	0	0	0		0	0	130		0	513	736	466	0	0	0	6	3,144
2007	1,107	0	0	0		0	0	622		451	0	0	543	0	0	0	17	2,740
2008	962	0	0	0		0	7	668		787	0	0	732	1	0	0	18	3,175
2009	1,066	0	0	0		0	432	442		745	0	0	609	0	0	0	3	3,297
2010	993	197	0	0		0	579	687		0	0	0	673	0	0	0	0	3,129
2011	2,175	1,321	503	0		0	1,526	562		0	0	0	350	0	0	0	12	6,449
2012	1,371	917	51	57		0	418	521		0	0	0	199	0	0	0	43	3,578
2013	1,315	546	0	0		0	551	507		0	0	0	496	0	0	0	10	3,427
2014	1,160	492	0	0		0	579	255		0	0	0	286	0	0	0	5	2,781
2015	1,023	746	0	0		0	368	330		0	0	0	0	1	0	0	24	2,496
2016	1,040	946	0	0		0	511	60		0	0	0	0	0	0	0	26	2,585
2017	1,104	6.015	0	0		0	0	0		0	0	0	0	0	0	0	54	1,165
2018	686	918	920	821		0	657	610		953	980	1,030	0	0	0	0	29	7,609
2019	1,188	184	492	132			80	61		0	233	1,241	0	463	0	0	86	4,164
2020	307	1,101	479	453			878	496		942	19	1,077	0	0	0	0	38	5,789
2021	827	1,145	70	0			608	685		1,186	937	844	0	0	0	0	25	6,327
2022	854	508	288	130			601	487		783	324	386	0	0	0	0	15	4,376
1993-2022 Average	755	365	166	99	0	6	328	341	0	471	290	310	290	60	25	38	49	3,594

Table excludes domestic supply and enhancement/mitigation pumping wells   Gray cell indicates well was either offline or not yet constructed

Source: Well W247R - Replacement for W247 Laws Wellfield, Owens Valley Monitoring Plan For First Season of Operation Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

Exhibit 11C

TABLE 2 – GROUNDWATER PUMPING FROM WELLS IN THE VICINITY OF W379 IN BIG PINE WELLFIELD (AFY)

Runoff Year	W210	W352	W378	W379	W389	Big Pine Area
1971	902					45,781
1972	1,555	102				38,120
1973	21	48				8,943
1974	0	166				22,506
1975	9	546				30,998
1976	180	561				27,306
1977	964	1,385				38,001
1978	0	851				24,418
1979	0	729				27,639
1980	0	0				24,211
1981	0	1,055				28,462
1982	26	53				22,351
1983	0	506				28,119
1984	0	1				28,067
1985	0	51				25,911
1986	0	412				25,934
1987	664	192	3,000	2,933	3,000	48,663
1988	1,535	190	1,465	885	1,465	42,817
1989	173	58	102	175	102	34,027
1990	0	230	13	0	13	19,908
1991	0	41	0	39	0	24,880
1992	0	0	0	0	0	24,400
1993	0	74	3	3	3	23,061
1994	0	7	2	2	2	24,388
1995		1	1,201	1,360	1,201	24,511
1996		239	0	0	0	22,152
1997		46	536	624	536	24,654
1999		203	0	0	0	22,645
1999		1	0	0	0	19,512
2000		2	0	0	0	25,378
2001		41	2	0	2	26,397
2002		2	0	0	0	26,318
2003		6	0	0	0	26,400
2004		15	0	0	0	22,045
2005		23	0	0	0	20,316
2006		4	0	0	0	20,657
2007		5	0	0	0	20,406
2008		7	0	0	0	21,073

Source: WELL W379 REPLACEMENT (W379R) BIG PINE WELLFIELD PRE-CONSTRUCTION EVALUATION REPORT, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

Exhibit 11D

Runoff Year	W210	W352	W378	W379	W389	Big Pine Area
2009		6	0	0	0	23,427
2010		19	0	0	0	23,413
2011		11	0	0	0	28,654
2012		5	0	0	0	26,452
2013		15	0	0	0	23,871
2014		2	0	0	0	21,635
2015		1	0	0	0	20,578
2016		28	0	0	0	23,598
2017		9	0	0	0	21,705
2018		21	0	0	0	23,065
2019		74	0	0	0	19,821
2020		26	0	0	0	14,573
2021		26	0	0	0	16,490
2022		24	0	0	0	16,445
1992-2022 Average	0	31	58	66	58	22,591

Note: Gray cells indicate well were offline

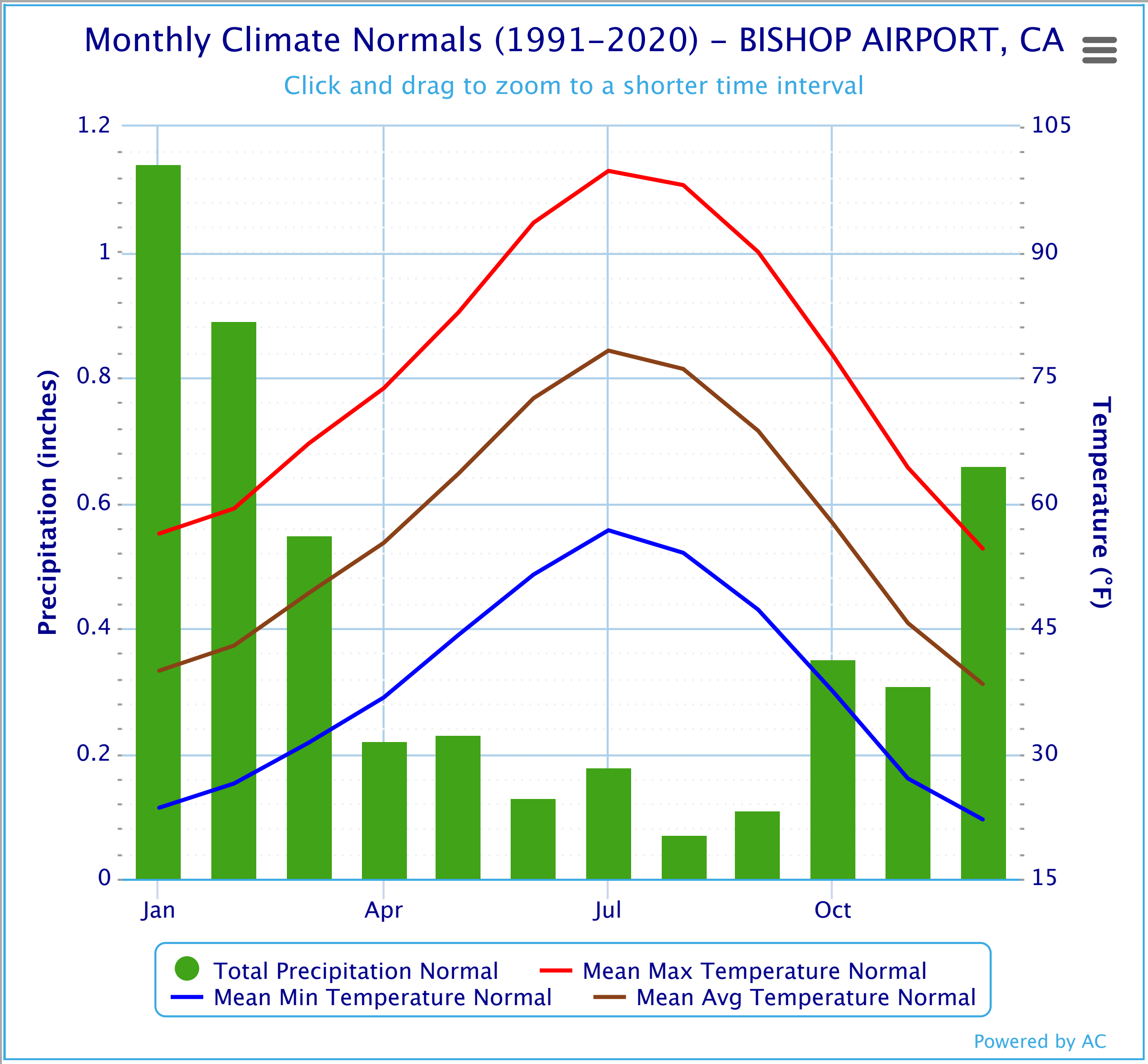
3.2.2 Surface Water

The main water features in Big Pine Wellfield include Owens River, Tinemaha Reservoir, Big Pine Creek, Baker Creek, and Big Pine Canal, which recharge the groundwater aquifer. The weather station at LADWP's Big Pine Powerhouse Weather Yard is the closest station to W379, with long-term average precipitation (from 1991 to 2022 hydro years) of 9.0 inches per year, higher than the historical average precipitation in the Owens Valley.

The major flow gauges and their associated flows in Big Pine Wellfield are listed in **Table 3**. The locations of the flow gauges are presented in the **Figure 4** map. Some of the flow gauges listed in **Table 3** are outside of the area presented in the map in **Figure 4**. Big Pine Wellfield receives the second-highest volume of water in its creeks and ditches.

Source: WELL W379 REPLACEMENT (W379R) BIG PINE WELLFIELD PRE-CONSTRUCTION EVALUATION REPORT, Eastern Sierra Environmental Group Water Operations Division Los Angeles Department of Water and Power, May 2024

Exhibit 12A



Month	Total Precipitation Normal (inches)	Mean Max Temperature Normal (°F)	Mean Min Temperature Normal (°F)	Mean Avg Temperature Normal (°F)
January	1.14	56.3	23.5	39.9
February	0.89	59.3	26.4	42.9
March	0.55	67.1	31.3	49.2
April	0.22	73.7	36.7	55.2
May	0.23	82.8	44.2	63.5
June	0.13	93.5	51.4	72.5
July	0.18	99.7	56.7	78.2
August	0.07	98.0	54.0	76.0
September	0.11	90.0	47.2	68.6
October	0.35	77.6	37.4	57.5
November	0.31	64.2	27.0	45.6
December	0.66	54.5	22.1	38.3
Annual	4.84	76.4	38.2	57.3

Source: https://www.weather.gov/wrh/Climate?wfo=vef

Exhibit 12B

Monthly Total Precipitation for BISHOP AIRPORT, CA

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1970	0.71	0.54	0.05	0.44	T	0.04	0.03	0.01	0.00	0.00	1.64	0.22	3.68
1971	0.01	0.11	0.27	0.06	1.04	0.00	0.14	0.13	0.01	0.01	0.04	1.85	3.67
1972	T	0.00	0.00	T	0.11	0.25	0.04	0.09	0.36	0.90	0.68	0.01	2.44
1973	3.02	1.59	0.32	0.00	0.09	0.14	0.00	0.01	0.00	0.00	1.94	0.60	7.71
1974	1.48	0.00	1.75	0.21	0.33	0.00	0.16	T	0.00	0.80	T	0.64	5.37
1975	T	0.20	0.69	0.20	T	0.07	T	0.10	1.18	0.09	0.02	0.00	2.55
1976	0.00	1.37	0.05	0.05	0.59	0.17	1.47	T	0.94	0.02	0.00	T	4.66
1977	0.77	0.22	0.04	0.02	0.60	0.61	T	0.51	T	T	0.05	2.53	5.35
1978	2.68	3.33	1.64	0.22	0.00	0.02	0.02	0.01	0.51	0.18	0.51	0.50	9.62
1979	0.45	0.64	0.49	T	T	T	0.03	0.02	0.25	0.07	0.13	0.57	2.65
1980	1.56	2.72	0.28	0.43	0.10	T	0.35	0.00	0.14	T	0.08	1.25	6.91
1981	0.65	0.11	0.85	0.68	0.88	0.00	0.00	0.04	0.03	0.09	1.30	0.11	4.74
1982	1.43	0.02	0.50	1.62	0.08	1.29	0.00	0.51	0.74	0.68	0.87	2.67	10.41
1983	1.82	1.29	1.20	0.22	0.00	T	0.05	0.64	0.40	0.08	1.31	1.14	8.15
1984	T	0.36	0.09	0.02	T	0.04	1.04	0.58	T	0.16	1.97	0.85	5.11
1985	0.25	0.01	0.06	0.00	0.00	0.67	0.31	0.00	0.34	0.05	0.95	0.55	3.19
1986	0.86	3.04	1.00	0.65	T	0.00	0.31	0.06	0.12	0.00	0.03	0.08	6.15
1987	0.42	0.31	0.03	0.04	0.54	0.16	0.18	0.03	0.01	0.13	1.67	0.60	4.12
1988	0.87	0.30	0.07	0.63	0.12	0.23	T	T	0.50	0.00	0.12	0.68	3.52
1989	0.06	0.12	0.04	0.00	1.04	0.04	0.00	0.01	0.24	0.00	0.26	0.00	1.81
1990	0.95	0.50	0.00	0.56	0.21	0.15	0.26	0.45	0.28	0.00	0.00	0.00	3.36
1991	T	0.07	2.94	0.07	T	0.02	0.00	0.00	0.21	0.69	0.00	0.58	4.58
1992	0.38	1.31	0.67	0.00	0.06	0.30	0.12	0.06	0.05	0.53	0.00	1.50	4.98
1993	2.03	M	0.91	0.00	0.04	0.00	0.00	T	0.00	0.06	0.12	0.08	M
1994	0.04	1.33	0.57	0.03	0.54	0.00	0.00	0.00	1.28	0.24	0.05	0.25	4.33
1995	3.08	0.60	2.28	0.07	0.72	0.20	0.23	0.01	T	T	0.02	1.06	8.27
1996	0.38	0.30	0.79	0.43	0.02	0.00	0.12	T	T	0.77	0.78	0.39	3.98
1997	2.26	T	0.00	0.00	0.01	0.47	0.23	T	0.24	T	0.25	0.48	3.94
1998	0.55	5.16	0.85	0.28	0.57	1.31	0.01	0.03	0.28	0.17	0.01	0.06	9.28
1999	1.10	0.41	0.01	0.38	0.08	0.02	0.04	0.19	0.15	0.00	0.02	0.00	2.40
2000	0.30	0.98	0.29	0.45	T	T	T	0.30	0.02	0.25	0.00	0.00	2.59
Mean	0.91	0.90	0.60	0.25	0.25	0.20	0.17	0.12	0.27	0.19	0.48	0.62	4.98
Max	3.08 1995	5.16 1998	2.94 1991	1.62 1982	1.04 1971	1.31 1998	1.47 1976	0.64 1983	1.28 1994	0.90 1972	1.97 1984	2.67 1982	10.41 1982
Min	0.00 1976	0.00 1974	0.00 1997	0.00 1997	0.00 1985	0.00 1996	0.00 1994	0.00 1994	0.00 1993	0.00 1999	0.00 2000	0.00 2000	1.81 1989

Source: https://www.weather.gov/wrh/Climate?wfo=vef

Exhibit 12C

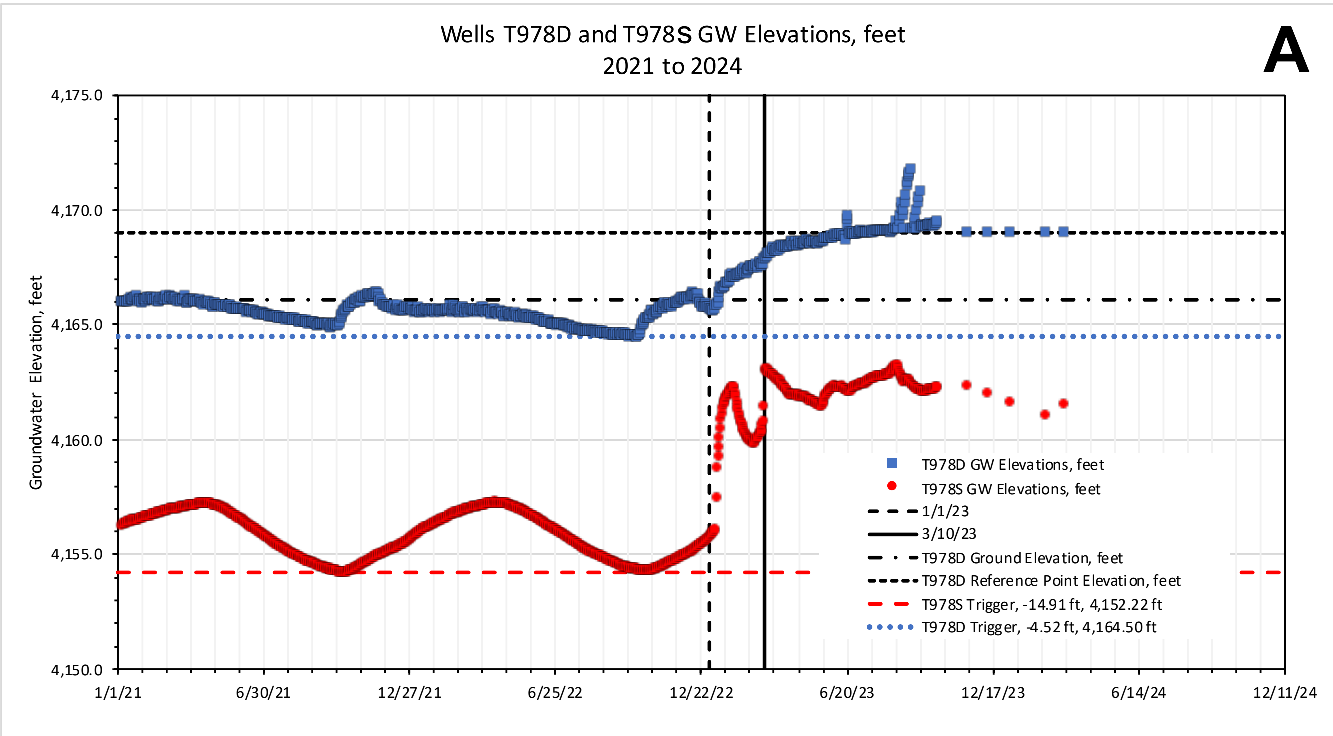
Monthly Total Precipitation for BISHOP AIRPORT, CA

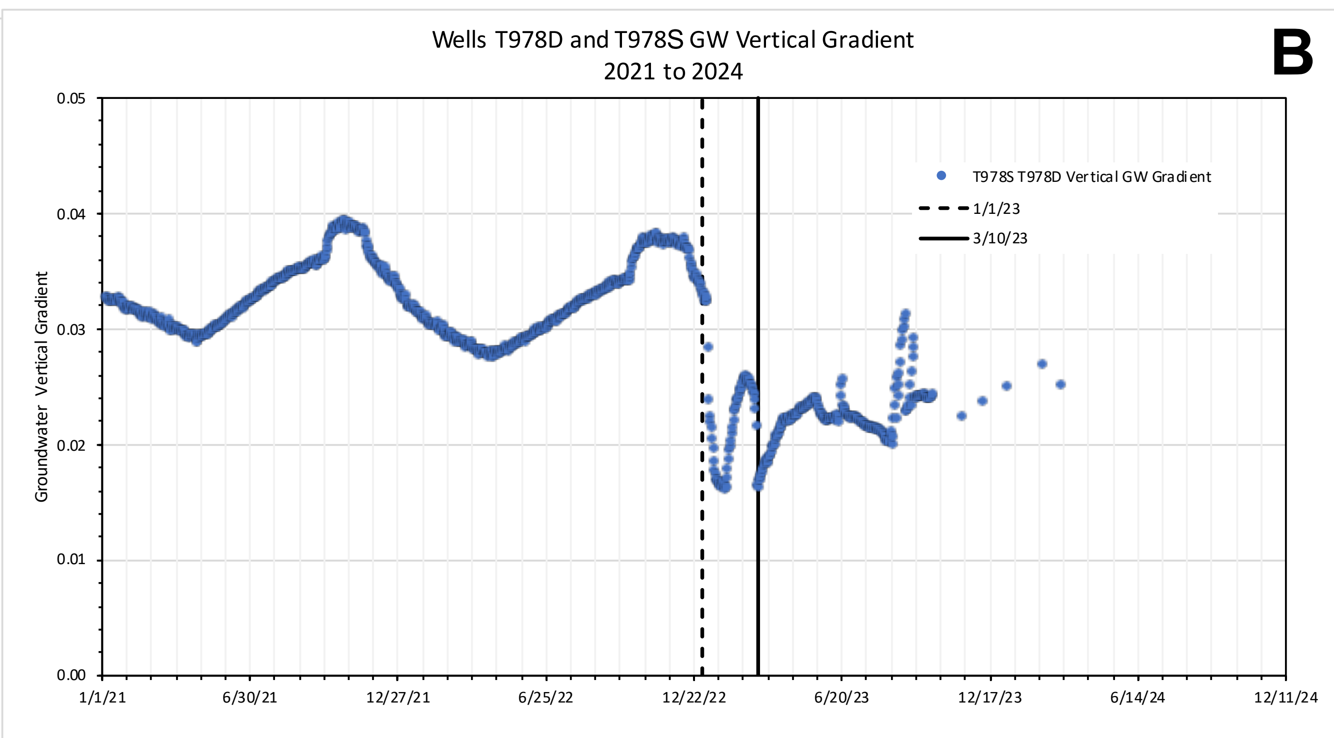
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	0.30	0.98	0.29	0.45	T	T	T	0.30	0.02	0.25	0.00	0.00	2.59
2001	0.79	1.40	0.37	0.41	0.12	T	0.73	T	0.00	T	1.02	0.21	5.05
2002	0.03	T	0.01	0.04	0.00	T	0.05	T	0.01	T	1.68	0.86	2.68
2003	0.04	0.46	0.57	0.21	T	T	T	T	T	0.00	0.88	0.30	2.46
2004	0.03	1.34	0.10	0.10	T	0.07	0.02	0.01	T	1.26	1.13	1.80	5.86
2005	3.78	0.83	1.23	T	0.25	0.00	0.02	0.58	0.36	0.28	T	2.16	9.49
2006	3.01	0.79	0.18	0.39	0.08	0.06	0.26	0.00	0.00	0.52	0.00	0.05	5.34
2007	0.35	0.12	0.03	0.17	0.00	0.00	0.39	0.17	0.22	0.01	0.03	0.37	1.86
2008	4.82	1.24	0.00	0.00	0.15	0.00	0.15	0.00	0.08	T	0.70	0.61	7.75
2009	0.03	0.53	0.04	0.02	0.12	0.58	0.11	0.12	0.01	1.77	0.07	1.30	4.70
2010	1.28	0.39	0.02	0.39	T	0.00	0.08	T	0.00	1.33	0.28	5.37	9.14
2011	0.02	0.94	1.00	0.04	0.06	0.01	0.08	T	0.16	0.74	0.14	T	3.19
2012	1.43	0.05	0.29	0.23	T	0.00	T	0.25	0.00	0.42	0.04	0.77	3.48
2013	T	T	T	T	0.47	T	0.48	0.16	T	0.16	0.03	0.03	1.33
2014	0.20	1.71	0.04	0.07	0.24	T	0.15	0.20	0.16	T	T	0.46	3.23
2015	0.09	0.17	0.01	0.01	1.39	0.39	0.47	0.02	0.01	0.75	T	0.06	3.37
2016	1.06	0.06	0.07	1.04	0.34	0.50	T	T	T	0.09	T	0.27	3.43
2017	5.23	2.21	0.09	0.92	0.35	T	T	0.02	T	0.00	0.16	T	8.98
2018	0.04	T	M	0.40	0.27	0.00	1.52	0.01	0.06	0.40	0.91	0.26	M
2019	1.89	2.42	1.92	T	0.89	0.03	T	T	0.01	0.00	0.91	0.19	8.26
2020	0.06	0.16	0.45	0.48	T	T	T	T	T	0.00	T	0.21	1.36
2021	1.09	0.31	0.01	T	T	T	0.06	0.01	T	0.65	0.13	3.72	5.98
2022	0.00	T	0.25	T	0.00	T	0.17	0.72	1.09	T	0.46	2.56	5.25
2023	5.55	1.13	3.96	0.00	T	0.73	0.13	2.08	0.36	0.18	0.07	0.36	14.55
2024	0.08	3.40	0.35	0.01	T	T	M	M	M	M	M	M	M
Mean	1.25	0.83	0.47	0.22	0.19	0.09	0.20	0.19	0.11	0.37	0.36	0.91	5.19
Max	5.55 2023	3.40 2024	3.96 2023	1.04 2016	1.39 2015	0.73 2023	1.52 2018	2.08 2023	1.09 2022	1.77 2009	1.68 2002	5.37 2010	14.55 2023
Min	0.00 2022	T 2022	0.00 2008	0.00 2023	0.00 2022	0.00 2018	T 2020	0.00 2008	0.00 2012	0.00 2020	0.00 2006	0.00 2000	1.33 2013

Source: https://www.weather.gov/wrh/Climate?wfo=vef

Docusign Envelope ID: E7F2E342-8146-4549-BCEA-16A4151244B7

Exhibit 13A

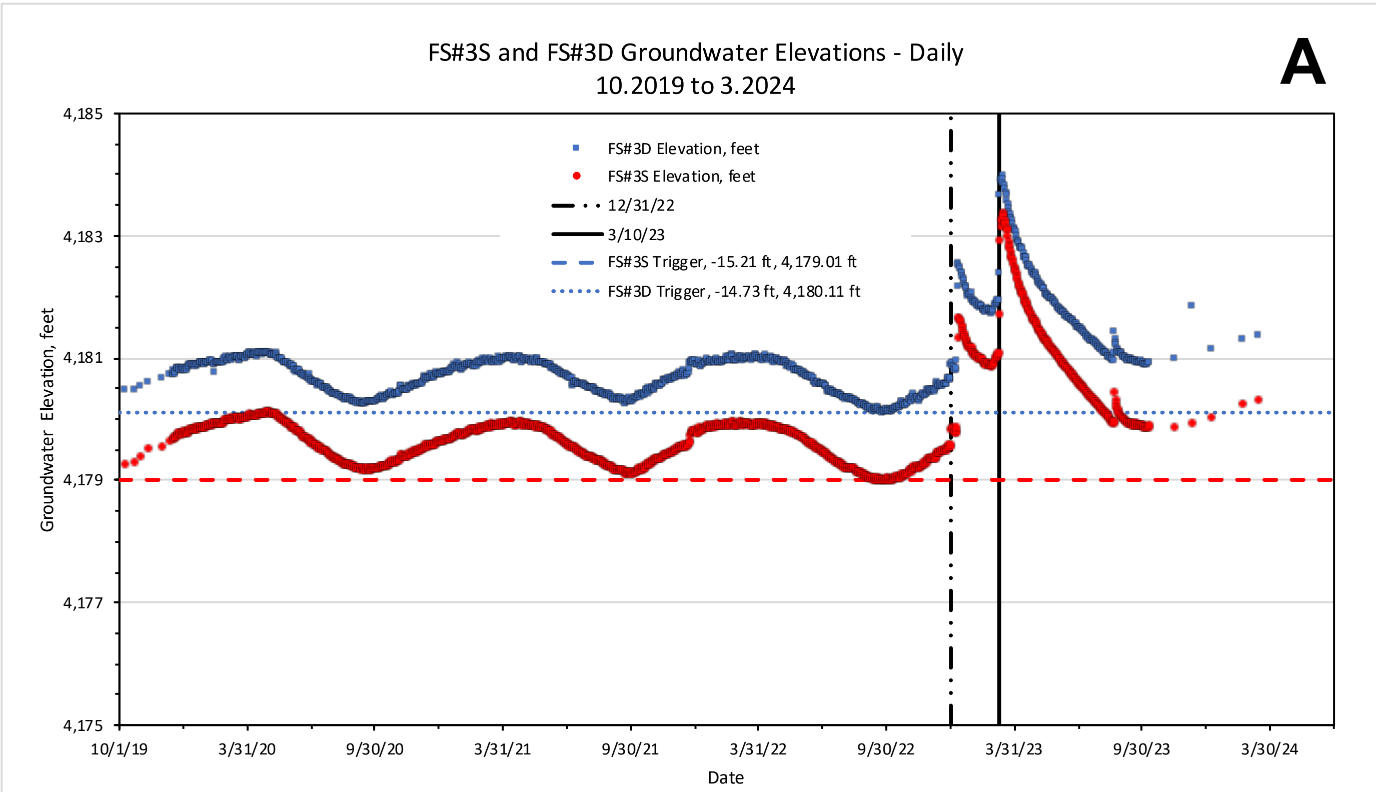


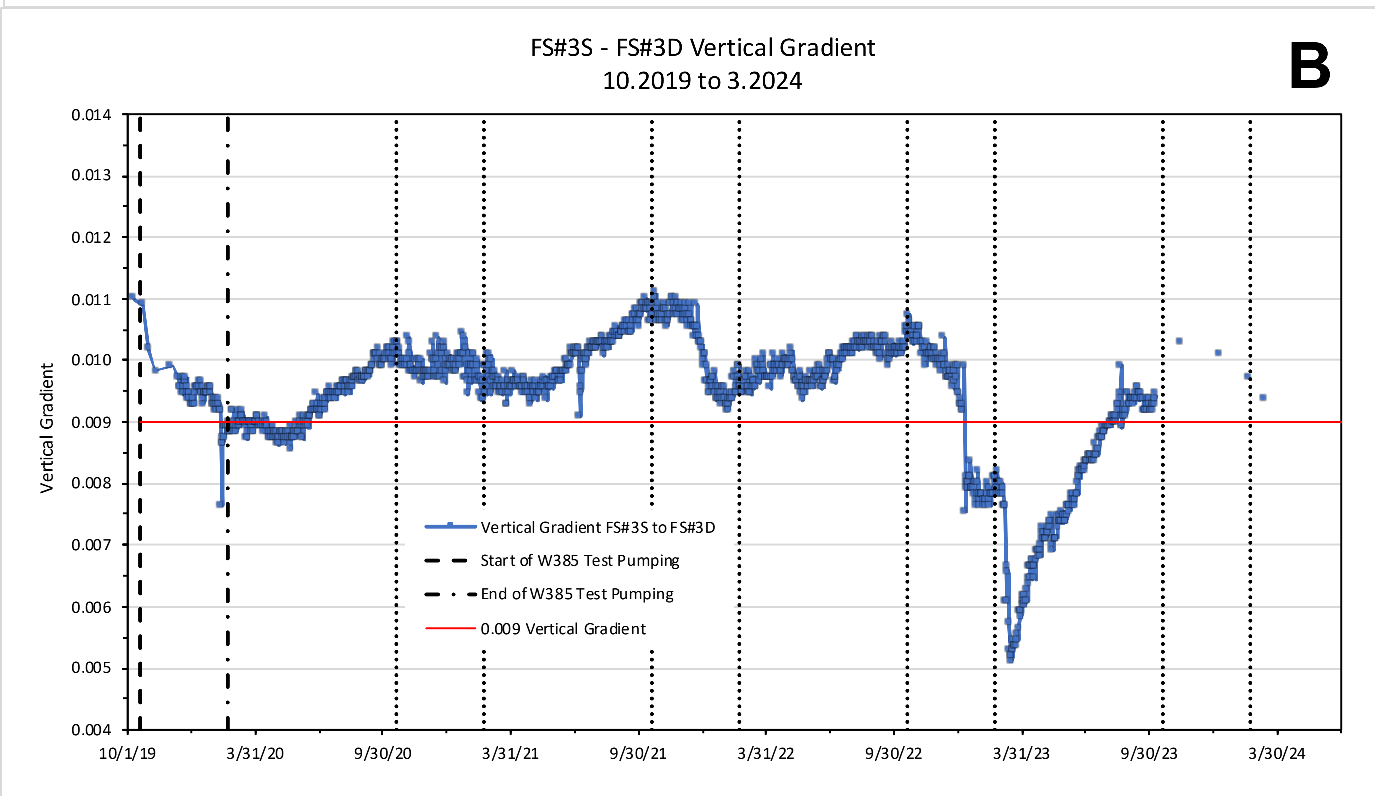


Source: California Department of Fish and Wildlife, September 24, 2024, Review of Well W386R Operational Test Testing Plan and Recommendations for Additional Monitoring, to Adam Perez, LADWP, and Holly Alpert, ICWD, p. 21, with Attachments and Exhibits.

Docusign Envelope ID: E7F2E342-8146-4549-BCEA-16A4151244B7

Exhibit 13B





Source: California Department of Fish and Wildlife, September 24, 2024, Review of Well W386R Operational Test Testing Plan and Recommendations for Additional Monitoring, to Adam Perez, LADWP, and Holly Alpert, ICWD, p. 21, with Attachments and Exhibits.