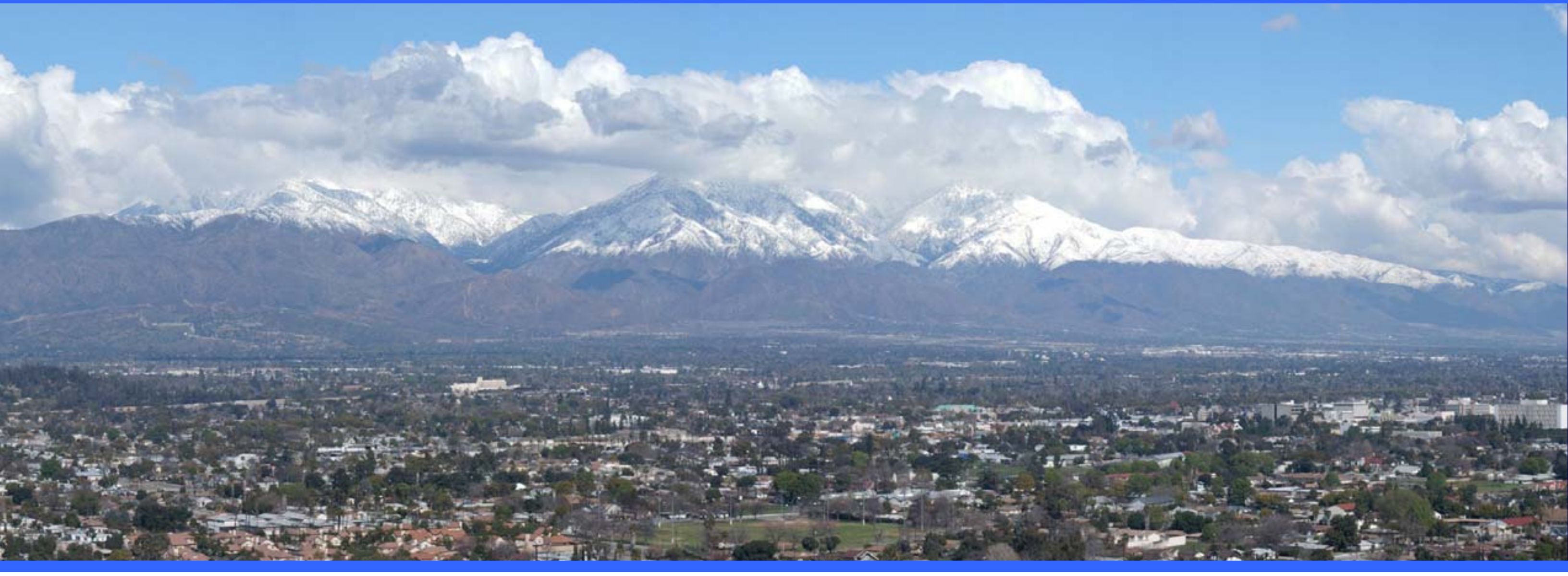
OPTIMUM BASIN MANAGEMENT PROGRAM

Chino Basin Dry-Year Yield Program Expansion

Project Development Report
Volume III

December 2008



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December 15, 2008

Chino Basin Watermaster
Attention: Kenneth R. Manning
Chief Executive Officer
9641 San Bernardino Road
Rancho Cucamonga, CA 91730

Subject: Analysis of Material Physical Injury from the Proposed Expansion of the Dry-Year Yield Program

Dear Mr. Manning:

The objective of this investigation is to determine if there will be a material physical injury to the Chino Basin or a Party to the Judgment from the proposed expansion of the Dry-Year Yield Program (DYYP), hereafter referred to as the DYYP Expansion or Expansion. The criteria used to evaluate material physical injury include groundwater-level changes, the increased potential for subsidence, losses from storage, changes in the direction and speed of known water quality anomalies, and the ability to maintain hydraulic control.

The DYYP is a groundwater storage and recovery program where supplemental water is stored in the Chino Basin during surplus years and extracted during years when the availability of supplemental water is limited. The Chino Basin DYYP was developed jointly by the Chino Basin Watermaster (CBWM), the Inland Empire Utilities Agency (IEUA), and the Metropolitan Water District of Southern California (MWDSC). The DYYP has a maximum storage capacity of 100,000 acre-ft with maximum puts of 25,000 acre-ft/yr and maximum takes of 33,000 acre-ft/yr. The proposed DYYP Expansion evaluated herein is a 150,000 acre-ft storage program with 50,000 acre-ft/yr puts and 50,000 acre-ft/yr takes. The Expansion was developed jointly by the CBWM, the IEUA, the Three Valleys Municipal Water District (TVMWD), the Western Municipal Water District (WMWD), and the MWDSC.

The Black and Veatch Corporation (B&V) was the lead consultant in the development of the facility and related operating plans for DYYP Expansion alternatives. Starting in February 2008, B&V developed a series of preliminary dry-year yield plans with the participating water agencies. The investigation reported herein is an assessment of material physical injury from the specific facilities and operating plans articulated by B&V. The facility and operating plans for the DYYP Expansion have been documented by B&V in Volume I of the DYYP Project Development Report.

To evaluate the criteria listed above, WEI staff utilized the 2007 Watermaster Model (Model). Figure 1 illustrates the extent of the groundwater model (model domain) and the Regional Water Quality Control Board (RWQCB) management zones. The model domain extends into the Temescal Basin as the two basins are hydraulically connected. The Model was used to evaluate a baseline alternative and three proposed Expansion alternatives.

The Baseline Alternative (Baseline) is based on the Peace II Project Description with the existing 100,000 acre-ft DYYP. Moreover, the Baseline is equivalent to Alternative 1C, which was documented in *Response to Condition Subsequent No. 3 from the Order Confirming Motion for Approval of the Peace II Documents* (WEI, 2008). The Baseline was found to cause no material physical injury. The assessment of material injury herein is based on an evaluation of the criteria listed above as well as a comparison to the Baseline Alternative.

The development of the DYYP Expansion project included a determination of how participants would increase or decrease imported water purchases at predetermined amounts to meet program put and take objectives. During put years, the participating retailers would reduce their projected pumping by an amount equal to the put, and the MWDSC would supply a like amount of water to participating retailers as a direct surface water delivery. In a take year, the participating retailers would increase their pumping over their projected amount equal to the take, and the MWDSC would reduce their delivery of surface water by a like amount. Table 1 lists the initial proposed takes, which were determined in a series of meetings with participating agencies. Several preliminary Model simulations were completed to determine the feasibly of these proposed takes. The conclusion of the preliminary simulations is also provided in Table 1. Due to hydraulic limitations, the proposed take for the City of Chino Hills and the WMWD could not be maintained. The City of Chino Hills proposed take was reduced from 2,000 acre-ft/yr to 0 acre-ft/yr. The WMWD proposed take was reduced from 10,000 acre-ft per year to 5,000 acre-ft/yr. These feasible takes are included in the analysis presented herein. With regard to the Chino Hills take, the take was reduced as precautionary piezometric elevations to prevent inelastic subsidence (at piezometer PA-7) could not be maintained. However, the model assumptions for City of Chino Hills were reflective of a conservative scenario relative to "deep well" pumping. In fact, the City of Chino Hills has subsequently shifted 1,448 acre-ft/yr DYY production out of the MZ-1 managed zone. Additionally, the City of Chino Hills contemplates a broader use of shallow well production than initially modeled. This will also be accomplished in conjunction with further monitoring and groundwater basin testing. It is our professional opinion that Chino Hills can participate in the take side of the Expansion Program if its pumping plans take more water from the shallow aquifer system than modeled. Optimizing the Chino Hills pumping plan is beyond the scope of this investigation. This optimization should be included in a subsequent basin-wide analysis of pumping and recharge plans performed by the appropriators and the CBWM. The WMWD take was reduced until groundwater pumping in the JCSD well field could be maintained.

Dry Year Yield Evaluation Criteria

Per the Peace Agreement, material physical injury is defined as: "material injury that is attributable to Recharge, Transfer, storage and recovery, management, movement or Production of water or implementation of the Optimum Basin Management Plan (OBMP) (WEI 1999), including, but not limited to, degradation of water quality, liquefaction, land subsidence, increases in pump lift and adverse impacts associated with rising groundwater" (p. 8).

As indicated above, each proposed Expansion alternative was evaluated with the Model to determine groundwater-level changes at selected representative locations in the basin and the basin as a whole, the increased potential for subsidence through the lowering of piezometric levels in vicinity of the City of Chino, losses of water in storage due to operating the basin at greater storage levels, the change in direction and speed of known water quality anomalies due to the superposition of the put and take periods on otherwise expected basin operations, and the ability to maintain hydraulic control when operating the basin at greater storage levels. The planning period used in this analysis consists of the 27-year period from October 2008 through September 2035. This period corresponds to the 25-year period of the proposed Expansion agreement, which ranges from 2010 through 2035. Groundwater modeling was completed for 2006 through 2060 with the impacts reported for through 2035. The impacts of each alternative were assessed by comparing the model simulation results to the Baseline Alternative. Specifically, information was extracted from the model results to produce:

- Water budget tables to determine outflow from the Chino North Management Zone to the Prado Basin Management Zone and the Santa Ana River, new recharge from the Santa Ana River, and the change in water in storage.
- Maps showing the areal distribution of groundwater elevations and the change in groundwater elevations caused by each proposed Expansion alternative.
- Hydrographs showing projected water level time histories at selected representative wells in the Chino Basin. This includes the PA-7 piezometer located at the CBWM subsidence monitoring station in Ayala Park. The PA-7 piezometer is used to assess the potential for subsidence in the area of subsidence concern within the City of Chino.
- Maps that show plume migration tracks for the dry-year yield Baseline and Expansion over the planning period.
- Detailed groundwater level and flow system maps of the southern part of the basin to assess the state of hydraulic control.

Dry-Year Yield Program Expansion Description

Eight Chino Basin appropriators are anticipated to participate in the Expansion, including the Cities of Chino, Chino Hills, Pomona, Ontario, and Upland; the Cucamonga Valley Water District (CVWD); the Jurupa Community Services District (JCSD); and the Monte Vista Water District (MVWD). The Three Valleys Municipal Water District (TVMWD) and the Western Municipal Water District (WMWD) are also expected to participate through coordination with Chino Basin appropriators. Program participants would increase or decrease imported water purchases at a predetermined amount to meet program put and take objectives. During put years, participating retailers would reduce their projected pumping by an amount equal to the put, and MWDSC would supply a like amount of water to participating retailers as a direct surface water delivery. In take years, the participating retailers would increase their pumping over their projected amount equal to the take, and the MWDSC would reduce their delivery of surface water by a like amount; demands that would have otherwise been met by MWDSC surface water deliveries are met by groundwater extracted from the program storage account.

Tables 2 and 3 list the program participants' existing and anticipated expansion put and/or take contributions. The combined put capacity of these agencies is 50,000 acre-ft/yr. As shown in Table 2, the total committed in-lieu put capacity is approximately 42,500 acre-ft/yr. The 7,500 difference between the committed put and the modeled put is assumed to consist of either additional in-lieu deliveries or wet water recharge. For modeling purposes, this was assumed to consist solely of additional in-lieu deliveries, which were assigned to all participants on a pro-rata basis. Approximately 17,000 acre-ft/yr of the put capacity occurs via aquifer storage and recovery (ASR) injection wells and the remaining approximately 33,000 acre-ft/yr occurs via in-lieu deliveries. The locations of the new ASR wells are shown in Figure 2. During put years, these wells operate as injection wells, and during take and hold years, they operate as extraction wells. The total in-lieu put capacity is approximately the same as the in-lieu capacity of the existing program (33,000 acre-ft/yr). The TVMWD is not a Chino Basin appropriator; therefore, its puts were assigned to the City of Pomona and the City of Upland. As shown in Table 3, the combined take capacity modeled for these agencies is 50,000 acre-ft/yr (inclusive of the existing program). The WMWD is not a Chino Basin appropriator; therefore, its takes were assigned to the JCSD.

Projected Groundwater Production for the Planning Period

The IEUA developed a preliminary groundwater pumping plan (IEUA, 2008a) for the Chino Basin during the summer of 2008. This plan, which is based on the current and future water supply plans provided by the groundwater producers for the period of 2008 through 2035, is the basis of the groundwater pumping plan used in this investigation. The producers' water supply plans include existing and new master-planned wells, planned groundwater treatment facilities, an expanded OBMP desalter program, and the assumption that CBWM will secure access to enough replenishment facilities and water to enable the producers to pump what they need. The groundwater pumping plan was vetted early through the CBWM process and was accepted by the appropriators in September 2008.

Table 4 lists projected groundwater production by party for the period of 2006/07 through 2034/35. The total production of the appropriators during the projection period averages about 180,000 acre-ft/yr and ranges from a low of about 140,000 acre-ft/yr to a high of about 210,000 acre-ft/yr. The total production for the Chino Basin during this period averages about 195,500 acre-ft/yr and ranges from a low of about 170,000 acre-ft/yr to a high of about 220,000 acre-ft/yr. Adjustments were made in some of the individual appropriator pumping plans to reduce well interference and regional drawdown in the center of the basin. The appropriators and the CBWM should conduct a basin-wide analysis of pumping and recharge plans to optimize pumping and groundwater levels. The optimization would consist of determining pumping and recharge operations that minimize drawdown using wells that pump from specific aquifers, wells in specific locations within the basin, and or constructing new wells.

Projected Groundwater Recharge and Replenishment

Replenishment water is recharged to the Chino Basin by the CBWM pursuant to the 1978 Chino Basin Judgment (Case No. RCV 51010, Chino Basin Municipal Water District vs. City of Chino et al.) and the Peace Agreement. Table 5 lists the future replenishment obligation and replenishment water estimates for the Baseline and Expansion Alternatives. The allocation of recharge to individual facilities is based on the requirement to balance recharge and discharge as described in the OBMP Peace Agreement. The CBWM purchases replenishment water when one or more parties overproduces. Typically, the CBWM purchases water from the MWDSC at a replenishment rate, which is made available to the CBWM when the MWDSC has surplus imported water. The availability of replenishment water from the MWDSC has been substantially reduced due to environmental and judicial constraints and drought. There is no official forecast available from MWDSC to characterize the availability of replenishment water. However, MWDSC staff has presented relevant information to its member agencies, as part of an ongoing Regional Groundwater Workshop process (Brandon Goshi, August 29 and October 30 2008), showing the impacts of different water supply and demand scenarios on the availability of surplus water for groundwater replenishment and regional storage purposes. The same information was presented by MWDSC staff at the Chino Basin Watermaster Strategic Planning Meeting (Grace Chan, September 29 2008). These presentations showed that, under the Interim Remedy Order to protect Delta Smelt (U.S. District Court Judge Oliver Wanger, NRDC vs. Kempthorne 2007), surplus water may only be available in approximately three out of ten years. The primary State Water Project supply assumptions underlying this finding is documented in the 2007 State Water Project Delivery Reliability Report from the California Department of Water Resources (DWR, 2007). Although MWDSC staff also presented the impacts of potential improvements to the State Water Project supplies that may occur in the future, it has been assumed for modeling purposes that replenishment water will be available to CBWM in three of ten years and that this water will be provided to the CBWM in the quantities necessary to meet cumulative unmet replenishment obligation limited by the recharge capacity in existing recharge basins. Deliveries of this water were assumed to occur when the MWDSC is doing a put into its DYYP storage account. A 5,000 acre-ft/yr in-lieu program was also assumed to extend the recharge capacity to the amount required to satisfy replenishment obligations.

The estimated volume of new storm water recharged during the planning period is 11,646 acre-ft/yr, which is based on the actual operations of the stormwater recharge facilities in the Chino Basin. This value was used in the Peace II material physical injury analysis.

The volume of recycled water recharged during the planning period is based on IEUA recycled water plans (IEUA, 2007) and discussions with IEUA staff (IEUA, 2008b). Recycled water recharge increases from approximately 1,300 acre-ft in 2006 to 24,000 acre-ft in 2035. Table 5 shows recycled water recharge for the planning period. The availability of recycled water for recharge was based on the following assumptions:

- The IEUA will gain approval to transition from its existing 5-year volumetric average recycled water content of approximately 33% permit condition to a 10-year volumetric average recycled water content of 50% permit condition.
- Imported water will be available 3 out of 10 years for dilution.

When imported water is available, the volume used for replenishment was calculated based on the available recharge capacity and the cumulative unmet replenishment obligation. The available capacity was determined after accounting for storm water and recycled water. The volume of recycled water was determined iteratively with the estimated volume of imported water to satisfy recycled water contribution constraints. No imported water is assumed to be purchased unless there is an unmet replenishment obligation.

Alternative Descriptions

The Baseline Alternative, which represents the DYYP as it is currently being implemented, and three DYYP Expansion Alternatives are described below. The three Expansion Alternatives attempt to bookend all currently envisioned DYYP Expansion concepts.

Baseline Alternative – Expansion of the Desalters, Reoperation, and the 100,000 acre-ft DYYP. The Baseline Alternative includes the planned expansion of the desalters and reoperation—as described in *2007 CBWM Groundwater Model Documentation and Evaluation of the Peace II Project Description* (WEI, 2007a) —and the existing 100,000 acre-ft DYYP. In the existing DYYP, the MWDSC, in consultation with the CBWM and the IEUA, makes surplus water available to the basin, which is then recharged via wet water recharge and in-lieu means (the put). Previously, the MWDSC could recharge up to 25,000 acre-ft/yr in the basin. However, due to the availability of surplus water (3 out of 10 years), the put requirement was increased to 33,000 acre-ft/yr under the direction of the IEUA. When the MWDSC makes a call, appropriators that participate in the program will reduce their demands on the MWDSC's imported supplies and could make up the difference in a number of ways. For modeling purposes, this difference was assumed to be solely by producing more groundwater from Metropolitan's storage account (the take). The puts and takes are listed in Tables 2 and 3, respectively. For the existing 100,000 acre-ft DYYP, the puts are assumed to occur via in-lieu means. This is the preferred method of the appropriators, and it frees up wet water recharge capacity for future replenishment. The take commitments are contractual commitments between the appropriators listed in Table 3 and the IEUA. Figure 3a illustrates the time history of groundwater pumping and storage in the Baseline Alternative through the end of the Peace Agreement. A ten- year cycle was assumed with the first three years being put years, the next four years being hold years and the last three years being take years. The planning period starts off with a three-year take period, as it is currently underway. The ten-year cycle is assumed to repeat itself through 2035.

Alternative 1 – 150,000 acre-ft DYYP. This alternative is identical to the existing DYYP except the puts and takes increase to 50,000 acre-ft/yr and the maximum storage in the MWDSC DYYP storage account is 150,000 acre-ft. The groundwater production modifications required to accomplish the increased puts and takes are shown in Tables 2 and 3. Figure 3b illustrates the time history of groundwater pumping and storage for Alternative 1.

Alternative 2 – 150,000 acre-ft DYYP with 100,000 acre-ft Negative Storage. This alternative is identical to Alternative 1 except the first two cycles are modified to allow five consecutive take years with volume in MWDSC storage account changing from +150,000 acre-ft to -100,000 acre-ft. The objective of this alternative is to estimate the impacts of allowing the MWDSC account to go negative for a period time and subsequently refilling it. Figure 3c illustrates the time history of groundwater pumping and storage for Alternative 2.

Alternative 3 – 150,000 acre-ft DYYP with 300,000 acre-ft Maximum Storage. This alternative is identical to Alternative 1 except the first two cycles are substantially modified to allow the MWDSC storage account to have significant quantities of water in storage and to increase the maximum volume in storage up to approximately 300,000 acre-ft. This alternative also includes small summer (or partial) takes on the order of 6,250 acre-ft in certain years to reduce summer peaking on the Rialto Pipeline. The objective of this alternative is to estimate the impacts of allowing the MWDSC account to hold large quantities of water throughout the anticipated term of the DYYP Expansion contract. Of particular interest are the impacts on water in storage and hydraulic control. Figure 3d illustrates the time history of groundwater pumping and storage for Alternative 3. The 6,250 acre-ft summer takes are visible apart from the large programmatic takes.

Material Physical Injury Analysis

Hydrologic Balance and Storage

The hydrologic water budgets for Chino North, Chino South, Chino East, and Prado Management Zones for the Baseline Alternative, Alternative 1, Alternative 2, and Alternative 3 are shown in Tables 6 through 9, respectively. Overall, the budgets are very similar. The greatest differences lie in how basin storage changes over time and how the basin interacts with the Santa Ana River. Water budget as used herein refers to the accounting of recharge, discharge and water in storage.

There are several recharge and discharge components listed in Tables 6 through 9. A key difference in the water budgets is the inflow from stream recharge and outflow to rising groundwater. The net difference between rising groundwater and stream recharge can be seen in the Santa Ana River discharge at Prado Dam and in basin storage.

Table 10 shows the estimated time history of Santa Ana River discharge for the Baseline and three Expansion Alternatives. Table 10 also shows the difference in surface water discharge caused by the Expansion. Figure 4a illustrates the change in Santa Ana River recharge to the Chino Basin for each alternative relative to the Baseline.

The hydrologic balance for Alternative 1 is almost identical to the baseline with subtle differences showing up in slightly increased streambed recharge in Chino South Management Zone (MZ) and the time history of storage. The hydrologic balance for Alternative 2 is shows decreased streambed recharge in Chino South MZ. This is caused by drawdown associated with negative DYYP storage program. The hydrologic balance for Alternative 3 is shows significant decreased streambed recharge in Chino South MZ. The specific amount of change for each alternative relative to the Baseline is listed below:

- For Alternative 1, the cumulative discharge for the Santa Ana River is increased by a total of about 1,500 acre-ft by 2035.

- For Alternative 2, the cumulative discharge for the Santa Ana River is reduced by a total of about 32,700 acre-ft by 2035 and is equivalent to an average decrease of about a 2 cubic feet per second (cfs) in the Santa Ana River discharge, or about one half of one percent of the total discharge in the Santa Ana River.

- For Alternative 3, the cumulative discharge for the Santa Ana River is increased by a total of about 35,900 acre-ft by 2035 and is equivalent to an average increase of about a 2 cfs in the

Santa Ana River discharge, or also about one half of one percent of the total discharge in the Santa Ana River.

Figure shows cumulative change in storage for each alternative. 4b also illustrates when water levels for each alternative are at their lowest, when the cumulative change in storage is greatest, and when there is no water in the DYYP Expansion storage account. For the planning period, this is 2030 for all alternatives with the exception of Alternative 2 and Alternative 3. Alternative 3 has water in the DYYP storage account throughout the planning period; and approximately 100,000 acre-ft in 2030. Alternative 2 is at its lowest cumulative storage in 2021.

The total storage in the Chino Basin declined similarly for each Alternative relative to the Baseline; however, the storage levels varied more abruptly due to the put and take periods. The decline in storage was at a lower rate during put periods and dropped more steeply during take periods. Figure 4b illustrates the change in storage over the planning period for each alternative. The planning period cumulative change in storage is approximately -407,000 acre-ft for the Baseline, -359,000 acre-ft for Alternative 1, -311,000 acre-ft for Alternative 2, and -359,000 acre-ft for Alternative 3. In 2030, when all storage accounts for have a zero balance except Alternative 3, the change in storage is –459,600, -462,000, -410,000, and –388,500 for Alternative 1, Alternative 2 and Alternative 3, respectively. A. When corrected for the amount of water in the DYYP storage account in 2030, Alternative 3 has a change in storage of -494,500. Note that the change in storage for the Baseline Alternative and Alternative 1 are very similar, within less than 1 percent of each other. Alternative 2 gains more water from the Santa Ana River than the other alternatives and therefore has less cumulative change in storage, approximately 11 percent less than the Baseline Alternative. Alternative 3 does not gain as much water from the Santa Ana River than the other alternatives. When correcting for DYYP water in the storage account in 2030, Alternative 3 has more cumulative change in storage, approximately 8 percent more than the Baseline Alternative.

Alternative 1 results in a negligible change in storage relative to the Baseline Alternative. Alternative 2 has the greatest difference in Santa Ana River discharge and change in storage when compared to the Baseline. During the negative storage period of Alternative 2, groundwater levels are depressed relative to the Baseline Alternative levels, and this causes greater recharge from the Santa Ana River.

Alternative 3 results in less Santa Ana River recharge compared to the Baseline Alternative because groundwater levels are higher over the planning period compared to groundwater levels in the Baseline Alternative. This has the effect of losses from storage that result from changes in River recharge that were not accounted for in the planning simulations. These losses would have to be mitigated to ensure no material physical injury.

Changes in Groundwater Levels

Figure 5 shows the locations of selected wells for which groundwater level time history were projected for the Expansion Alternatives. The hydrographs for these wells, which are included with this report as Figures 6a through 6j, show how water levels are projected to change over the planning period. The groundwater elevations in 2008 (initial condition) and 2035 were mapped for layers 1, 2, and 3 for each planning alternative. The 2008 groundwater elevations for layers 1, 2, and 3 are illustrated in Figures 7a though 7c. The initial conditions are the same for all alternatives.

Figures 8a through 8c show the Baseline Alternative at the end of the planning period (2035) for layers 1, 2, and 3.

The maximum change in groundwater levels for the Expansion Alternatives is assumed to occur when DYYP storage is exhausted near the end of the planning period (2030) or, in the case of Alternative 2, at the point where DYYP storage reaches its most negative value (2021). Figure 4b illustrates the cumulative change in storage for each alternative. The point of lowest cumulative change in storage is 2030 for the Baseline Alternative and Alternatives 1 and 3. The point of lowest cumulative storage change for Alternative 2 is 2021. The 2030 groundwater elevations for Alternative 1 layers 1, 2, and 3 are shown in Figures 9a through 9c. The 2021 groundwater elevations for Alternative 2 layers 1, 2, and 3 are shown in Figures 10a through 10c. And, the 2030 groundwater elevations for Alternative 3 layers 1, 2, and 3 are shown in Figures 11a though 11c.

Once the lowest groundwater levels were identified for each Expansion Alternative, the differences between the low groundwater levels of the Baseline Alternative and the Expansion Alternatives were calculated. Figures 12a and 12b compare the low groundwater levels for Alternatives 1 and 3 to the Baseline Alternative in 2030. Figures 12c and 12d compare the low groundwater levels for Alternative 2 to the Baseline Alternative in 2021 and 2030.

Table 10 summarizes the water level changes by alternative. The first *Baseline 2030* columns list the groundwater level changes for the Baseline Alternative from 2008 through 2030 by retail water service area. The average change is area-weighted, and the maximum and minimum changes are specific to model cells in the retail service area. *The Alternative 1 2030 + Baseline* columns list similar statistics for the difference between the Baseline Alternative and Alternative 1 in 2030. For example, the average groundwater level change in the CVWD service area for the Baseline is -37 feet, and the difference in 2030 for the average groundwater level between Alternative 1 and the Baseline is an increase of 3 feet over the retail service area. This table contains similar information for Alternatives 2 and 3.

The groundwater elevation changes are not uniform across the basin, and therefore, some retail agencies will experience greater lift and related energy expenses from the proposed Expansion. Note the following localized changes in groundwater elevations for the Baseline Alternative:

- Through fall 2030, groundwater elevations in the MVWD and City of Pomona production area are projected to change by about -15 to -20 feet in layer 1, -40 to -44 feet in layer 2, and -44 to -53 feet in layer 3.
- Through fall 2030, groundwater elevations in the MZ1 subsidence area (the production area for the Cities of Chino and Chino Hills) are projected to change by about -20 feet in layer 1, -38 feet in layer
- 2, and -40 feet in layer 3. The groundwater levels in layers 2 and 3 are above the subsidence threshold, and therefore, new inelastic subsidence is not expected to occur for the Baseline Alternative.
- Through fall 2030 groundwater elevations in the CVWD service area are projected to change by about -37 feet in all layers. A significant pumping depression develops at the cluster of CVWD production wells approximately 0.5 miles north of the Turner Recharge Basins. Through fall 2030,

groundwater elevations in the CVWD service area are projected to change by about -19 feet in all layers.

- Through fall 2030, groundwater elevations in the City of Ontario service area are projected to change by about -40 to -45 feet in all layers.
- Through fall 2030, groundwater elevations in the JCSD production area are projected to change by about -24 to -18 feet in all layers.
- Through fall 2030, groundwater elevations in the FWC production area are projected to change by about -26 feet in layers 1 and 2 and by about -8 feet in layer 3.

Water levels in Layer 1 for Alternatives 1 and 3 are slightly higher than the Baseline in 2030. For layers 2 and 3 water levels are still higher in Cucamonga and Fontana, but tend to be lower over the majority of the Chino Basin. Figures 12c through 12d show how each alterative varies from the baseline. Areas of concentrated put, including part of the CVWD service area, show an increase in groundwater levels, and areas where the take is concentrated, such as Pomona and MVWD, show consistent water level declines regardless of the Expansion Alternative.

The projected groundwater declines that result from the Expansion Alternatives are generally small and sustainable. That said, groundwater level declines are considered material physical injury in the Peace Agreement and will need to be mitigated. A discussion of mitigation is beyond the scope of this investigation.

Changes in Subsidence Potential

WEI has been conducting subsidence investigations in MZ1 for the CBWM since September 2000. As part of this process, WEI has reviewed recent historical subsidence across the basin using InSAR, ground level surveys, controlled pumping tests, and a rigorous review of basin hydrogeology. Figure 13 shows the location of recent subsidence in MZ1 (1996-2000) and defines the southern and central sub-areas of subsidence within MZ1. Figure 14 shows the projected the piezometric elevations at the PA-7 piezometer for all planning alternatives.

The PA-7 piezometer is used in the CBWM's MZ1 Long Term Management Plan. In this plan, basin management activities that maintain piezometric elevations greater than 400-feet at the PA-7 piezometer (corresponding to a depth to water of 245 feet) will not cause inelastic subsidence. In all cases, the projected lowest piezometric elevations are 23 to 48 feet higher than the subsidence threshold elevation of 400 ft for the managed area of MZ1; thus, no inelastic subsidence is projected to occur in this area. No material physical injury related to subsidence from any of the planning alternatives is projected to occur.

Change in Movement of Water Quality Anomalies

Previous Chino Basin water quality discussions (WEI, 2003; WEI, 2007b) have described specific water quality conditions across the entire basin and detailed existing contaminant plumes. These plumes are briefly discussed below. Following this discussion, the Expansion Alternatives' effects on said plumes are articulated.

Chino Airport. The Chino Airport is located approximately four miles east of the City of Chino and six miles south of Ontario International Airport, and occupying about 895 acres. From the early 1940s until 1948, the airport was owned by the Federal Government and used for flight training and aircraft storage. The County of San Bernardino acquired the airport in 1948 and has since operated and/or leased portions of the facility. Past and present businesses and activities at the airport since 1948 have included the modification of military aircraft; crop-dusting; aircraft-engine repair; aircraft painting, stripping, and washing; dispensing of fire-retardant chemicals to fight forest fires; and general aircraft maintenance. The use of organic solvents for various manufacturing and industrial purposes is widespread throughout the airport's history (RWQCB, 1990). From 1986 to 1988, a number of groundwater quality investigations were performed in the vicinity of Chino Airport. Analytical results from groundwater sampling revealed the presence of VOCs above MCLs in six wells down gradient of Chino Airport. The most common VOC detected above its MCL was TCE with concentrations in contaminated wells ranging from 6 to 75 μg/L. The plume is elongate in shape, up to 3,600 feet wide, and extends approximately 14,200 feet from the airport's northern boundary in a south to southwestern direction.

General Electric Flatiron Facility. The General Electric Flatiron Facility (Flatiron Facility) occupied the site at 234 East Main Street, Ontario, California from the early 1900s to 1982. Its operations primarily consisted of manufacturing clothes irons. Currently, the site is occupied by an industrial park. The RWQCB issued an investigative order to General Electric (GE) in 1987 after an inactive well in the City of Ontario was found to contain TCE and chromium above drinking water standards. Analytical results from groundwater sampling have indicated that VOCs and total dissolved chromium are the major groundwater contaminants in this plume. The most common VOC detected at levels significantly above its MCL is TCE, which reached a measured maximum concentration of 3,700 μg/L. Other VOCs—including PCE, toluene, and total xylenes, are periodically detected—but commonly below MCLs (Geomatrix Consultants, 1997). The plume is up to 3,400 feet wide and extends about 9,000 feet south-southwest (hydraulically down gradient) from the southern border of the site. From 2001 to 2006, the maximum TCE concentration in groundwater detected at an individual well within the Flatiron Facility plume was 3,200 μg/L.

General Electric Test Cell Facility. The GE Engine Maintenance Center Test Cell Facility (Test Cell Facility) is located at 1923 East Avon, Ontario, California. The primary operations at the Test Cell Facility include the testing and maintenance of aircraft engines. A soil and groundwater investigation, followed by a subsequent quarterly groundwater monitoring program, began in 1991 (Dames & Moore, 1996). The results of these investigations showed that VOCs exist in the soil and groundwater beneath the Test Cell Facility and that the released VOCs have migrated offsite. Analytical results from subsequent investigations indicated that the most common and abundant VOC detected in groundwater beneath the Test Cell Facility was TCE. The historical maximum TCE concentration measured at an onsite monitoring well (directly beneath the Test Cell Facility) was 1,240 μg/L. The historical maximum TCE concentration measured at an offsite monitoring well (down gradient) was 190 μg/L (BDM International, 1997). Other VOCs that have been detected include PCE; cis-1,2-DCE; 1,2-dicholoropropane; 1,1-DCE; 1,1-DCA; benzene; toluene; xylenes; and others. The plume is elongate in shape, up to 2,400 feet wide, and extends approximately 10,300 feet from the Test Cell Facility in a southwesterly direction. From 2001 to 2006, the maximum TCE and PCE concentrations in groundwater detected at an individual well within the Test Cell Facility plume were 900 μg/L and 17 μg/L, respectively.

Kaiser Steel Fontana Steel Site. Between 1943 and 1983, the Kaiser Steel Corporation (Kaiser) operated an integrated steel manufacturing facility in Fontana. During the first 30 years of the facility's operation (1945-1974), a portion of Kaiser's brine wastewater was discharged to surface impoundments and allowed to percolate into the soil. In the early 1970s, the surface impoundments were lined to eliminate percolation to groundwater (Mark J. Wildermuth, 1991). In July 1983, Kaiser initiated a groundwater investigation that revealed the presence of a plume of degraded groundwater under the facility. In August 1987, the RWQCB issued CAO Number 87-121, which required additional groundwater investigations and remediation activities. The results of these investigations showed that the major constituents of release to groundwater were inorganic dissolved solids and low molecular weight organic compounds. The wells sampled during the groundwater investigations had TDS concentrations ranging from 500 to 1,200 mg/L and TOC concentrations ranging from 1 to 70 mg/L. As of November 1991, the plume had migrated almost entirely off the Kaiser site. Based on a limited number of wells, including City of Ontario Well No. 30, the plume is up to 3,400 feet wide and extends about 17,500 feet from northeast to southwest.

Milliken Landfill. The Milliken Sanitary Landfill (MSL) is a Class III Municipal Solid Waste Management Unit, located near the intersections of Milliken Avenue and Mission Boulevard in the City of Ontario. This facility is owned by the County of San Bernardino and managed by the County's Waste System Division. The facility was opened in 1958 and continues to accept waste within an approximate 140-acre portion of the 196-acre permitted area (GeoLogic Associates, 1998). Groundwater monitoring at the MSL began in 1987 with five monitoring wells as part of a Solid Waste Assessment Test investigation (IT, 1989). The results of this investigation indicated that the MSL had released organic and inorganic compounds to the underlying groundwater. Due to the presence of such compounds, the MSL conducted an Evaluation Monitoring Program (EMP) investigation. Following the completion of the EMP, a total of 29 monitoring wells were drilled to evaluate the nature and extent of the groundwater impacts identified in the vicinity of the MSL (GeoLogic Associates, 1998). Analytical results from groundwater sampling have indicated that VOCs are the major constituents of release. The most common VOCs detected are TCE, PCE, and dichlorodifluoromethane. Other VOCs detected above their MCLs include vinyl chloride; benzene; 1,1-dichloroethane; and 1,2-dichloropropane. The historical maximum total VOC concentration detected at an individual monitoring well is 159.6 μg/L (GeoLogic Associates, 1998). The plume is up to 1,800 feet wide and extends about 2,100 feet south of the MSL's southern border. From 2001 to 2006, the maximum TCE and PCE concentrations detected at an individual well within the MSL plume were 96 μg/L and 44 μg/L, respectively.

Ontario International Airport. A VOC plume, primarily containing TCE, exists south of the Ontario Airport. This plume extends approximately from State Route 60 on the north and Haven Avenue on the east to Cloverdale Road on the south and South Grove Avenue on the west. In July 2005, Draft CAOs were issued by the RWQCB. These CAOs were presented to the companies they named in August 2005. From 2001 to 2006, the maximum TCE concentration detected at an individual well within this plume was 38 μg/L. The plume is up to 17,700 feet wide and 20,450 feet long.

Pomona Area Plume. This is an undocumented VOC plume in the Pomona area. This plume extends approximately from Holt Boulevard on the north and East End Avenue on the east to

Philadelphia Street on the south and Towne Avenue on the west. From 2000 to 2008, the maximum TCE concentration within this plume was 46 µg/L. The plume is up to 5,000 feet wide and 7,900 feet long.

Figure 15 illustrates the locations of groundwater contaminant plumes in Chino Basin at the beginning of the planning period and their estimated locations at the end of the planning period for the Baseline and DYYP Alternatives. The migration of the plumes through the planning period is very similar for each Alternative.

The current locations of the plumes were mapped from recent data. These locations were assumed to be the initial plume locations at the start of the planning period. Initial concentrations were prepared as input files for MT3D (Zheng and Wang, 1999). MT3D is a 3-dimensional solute transport model code for simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. This code, in conjunction with the Model, was used to simulate the movement of the plumes.

With the exception of the Kaiser plume, the plume locations are virtually identical for all the Alternatives, indicating that the change in direction and speed of movement of these plumes caused by the DYYP Expansion is not significant will not contribute to material physical injury. The modeling results suggest that there may be material physical injury from the Expansion alternatives for some wells owned by the City of Ontario.

The simulation results for the Baseline and Expansion Alternatives are discussed below for each contaminant plume:

- Chino Airport – At the beginning of the planning period, the Chino Airport plume underlies and extends southwest of the Chino Airport. In the simulations for the Baseline and Expansion Alternatives, the leading edge of the plume traveled approximately 1.25 miles in the southeasterly direction. The migration of the plume in both alternatives is nearly identical. The primary factors affecting plume migration in the simulations are the regional hydraulic gradient and local Chino Creek Well Field groundwater pumping. At the end of the planning period, the plume location is south and east of Pine and Euclid Avenues, underlying the northern reaches of the Prado Flood Control Basin. The County of San Bernardino is under a Cleanup and Abatement order to remediate this plume.
- General Electric Flatiron Facility – At the beginning of the planning period, the GE Flatiron plume extends south of Mission Boulevard along Euclid Avenue. In the simulations for the Baseline and Expansion Alternatives, the leading edge of the plume traveled approximately 0.4 miles in the easterly direction and 0.6 miles in the southerly direction. There is a negligible difference between the Baseline and Expansion Alternatives plume locations in 2035. The primary factors affecting plume migration in the simulations are the regional hydraulic gradient, local groundwater pumping, and recharge at the Ely Basins. The recharge at Ely Basins deflects the plume to the northwest. GE is under a Cleanup and Abatement order to remediate this plume. It is unlikely that the plume will be allowed to migrate as shown herein.
- General Electric Test Cell Facility – At the beginning of the planning period, the GE Test Cell plume is located south of Ontario Airport, extending southwest of Mission Boulevard to Grove Avenue. In

the simulations for the Baseline and Expansion Alternatives, the leading edge of the plume traveled approximately 0.7 miles in the southeasterly direction around the Ely Basins. There is a negligible difference between the Baseline and Expansion Alternatives plume locations in 2035. The primary factors affecting plume migration in the simulations are the regional hydraulic gradient, local groundwater pumping, and recharge at the Ely Basins. At the end of the planning period, the leading edge of the plume directly underlies State Highway 60 just east of Grove Avenue. GE is under a Cleanup and Abatement order to remediate this plume.

- Kaiser Steel Fontana Steel Site – The location of the Kaiser plume, as shown in Figure 15, was estimated using past modeling studies (through the mid-1980s) and updated through 2008. Kaiser stopped monitoring in the early 1990s. Thus, the projection described herein is approximate. At the beginning of the planning period, the elongated Kaiser plume extends in a southwesterly direction from the former Kaiser Steel site to Mission Boulevard. With the Baseline Alternative, the leading edge of the plume traveled approximately 4.2 miles in the southwesterly direction. With the Expansion Alternatives, the leading edge of the plume traveled approximately 4.2 miles, 3.9 miles, and 4.5 miles in the southwesterly direction for Alternative 1, Alternative 2, and Alternative 3, respectively. City of Ontario Well 50 will be impacted by the Baseline Alternative and each of the Expansion Alternatives. The primary factors affecting plume migration in the simulations are the regional hydraulic gradient and groundwater pumping at wells owned by the City of Ontario, JCSD, and the Chino Desalter Authority. At the end of the planning period, for both the Baseline and Alternatives, the plume is aligned along the west side of Interstate 15 between South Archibald Avenue and South Milliken Avenue, north and south of Highway 60.
- Milliken Landfill – At the beginning of the planning period, the Milliken Landfill plume extends southwest from the landfill site, just north of Mission Boulevard. In the simulations for the Baseline and Expansion Alternatives, the leading edge of the plume traveled approximately 1.3 miles in the southerly direction. There is a negligible difference between the Baseline and Alternative plume locations in 2035. The primary factors affecting plume migration in the simulation are the regional hydraulic gradient and local groundwater pumping. At the end of the planning period, for the Baseline and Expansion Alternatives, the plume is located just southeast of the intersection of East Chino Avenue and Haven Avenue.
- Ontario International Airport – At the beginning of the planning period, the plume underlies a broad area south of Riverside Drive, north of Kimball Avenue, west of Grove Avenue, and east of Archibald Avenue. In the Baseline, the leading edge of the plume did not travel south of its initial (current) position. There is a negligible difference between the Baseline and Expansion Alternative plume locations in 2035. The primary factors affecting plume migration in the simulation are the regional hydraulic gradient and local groundwater pumping, specifically pumping at the Chino-1 Desalter Well Field—the plume is consumed in part by production at the Chino-1 Desalter well field and does not migrate past this well field.
- Pomona Area Plume – At the beginning of the planning period, the plume underlies an area south of Holt Boulevard and north of Philadelphia Street. For the Baseline and all Alternatives, the plume moves approximately 0.5 miles south. There is a negligible difference between the Baseline and the Alternative plume locations in 2035. The primary factors affecting plume migration in the simulation are the regional hydraulic gradient and local groundwater pumping, specifically City of Pomona pumping.

Hydraulic Control

Hydraulic control refers to the elimination or reduction of groundwater discharge from the Chino North MZ to the Santa Ana River to negligible levels. It is a requirement of CBWM and the IEUA's recycled water recharge permit and a condition to gaining access to the assimilative capacity for TDS and nitrogen afforded by the maximum benefit based TDS and nitrogen objectives. Hydraulic control was assessed herein from detailed groundwater elevation contour maps. Hydraulic control was demonstrated for the Baseline Alternative without the DYYP in 2023 in *Response to Condition Subsequent No. 3 from the Order Confirming Motion for Approval of the Peace II Documents* (WEI, 2008). Therefore, the Baseline Alternative (herein with DYYP) was evaluated for hydraulic control in 2023 to determine if it is consistent with the Peace II modeling work.

Hydraulic control is weakest when water levels are highest in the southern portion of the basin. Differences in Santa Ana River recharge are driven by the elevation of groundwater in the southern portion of the basin: lower recharge indicates a period of high groundwater levels, and conversely, greater recharge indicates a period of lower groundwater levels. Figure 4a shows projected Santa Ana River recharge for Alternatives 1, 2, and 3.

Figures 16a through 16d show the groundwater elevation contours for the southern end of the Chino Basin for Layer 1 for the Baseline (2023), Alternative 1 (2030), Alternative 2 (2035), and Alternative 3 (2025), respectively. These maps also show the direction of groundwater flow in the form of unit vectors. These vectors are plotted for every fourth model cell. All planning alternatives result in complete hydraulic control: there are no indications that groundwater from the Chino North Management Zone will discharge to the Santa Ana River.

Conclusions

The objective of this investigation is to determine if the proposed DYYP Expansion will result in material physical injury to the Chino Basin or a party to the Judgment. The criteria used to evaluate material physical injury include groundwater level changes, the increased potential for subsidence, losses due to increased storage, changes in direction and speed of known water quality anomalies, and the ability to maintain hydraulic control. These criteria were evaluated with an enhanced version of the 2007 Watermaster Model and MT3D. Based on our analysis, material physical injury related to storage losses, groundwater level changes, and plume migration will occur; however, this material physical injury can be mitigated.

Storage Losses

Losses from storage will occur as a result of increasing the storage in the basin for Alternative 3. The loss of water in storage is projected to range from about 40,000 acre-ft. This loss in storage water can be mitigated with either reduced takes or by supplemental puts to replace water lost from storage. At present, further discussion of the mitigation is beyond the scope of this investigation.

Groundwater Levels

The Baseline Alternative is essentially Alternative 1C of the Peace II Agreement. The Parties to the Judgment and the Peace II agreement have indicated that they are willing to accept an increase in energy expenses with the expectation of other financial gains and certainties made possible by implementing the Peace II project description, which includes the existing DYYP and other Peace II related agreements. Therefore, no material physical injury is projected to occur from the decline in groundwater levels caused by implementing the Baseline Alternative.

Groundwater production is projected to be maintained with the Baseline and Alternatives; although, some changes in production and replenishment plans may be required. From a production perspective, no material physical injury is projected to occur from the decline in groundwater levels caused by the implementing the Baseline Alternative. The same is true for each of the Expansion Alternatives. Recall that the plan for puts and takes that was analyzed herein reduced the anticipated take for the JCSD/WMWD component and eliminated the take for Chino Hills. These modifications were required to maintain projected pumping and not incur a material physical injury. It is our professional opinion that Chino Hills could participate in the take side of the Expansion Program if it modified its pumping plans to take more water from the shallow aquifer system. Optimizing the Chino Hills pumping plan is beyond the scope of this investigation. This optimization should be included in a subsequent basin-wide analysis of pumping and recharge plans performed by the appropriators and the Watermaster. This subsequent investigation may also indicate that the JCSD/WMWD take could be increased.

The projected groundwater declines in parts of the basin from the Expansion Alternatives are generally small and sustainable. That said, groundwater level declines are by themselves considered material physical injury in the Peace Agreement and need to be mitigated such that they are no longer "material." A discussion of the mitigation is beyond the scope of this investigation.

Change in Direction and Speed of Water Quality Anomalies – Kaiser Plume

In the Baseline Alternative, Alternative 1, and Alternative 3 the leading edge of the Kaiser plume traveled slightly more than 4 miles in a southwesterly direction. In Alternative 1 and Alternative 3, the bottom half of the plume decreased in size, compared to the Baseline Alternative, suggesting that the projected Expansion pumping at City of Ontario well drew in more of the Kaiser plume than was projected to occur in the Baseline Alternative. This suggests that the Expansion may contribute to water quality degradation at the City of Ontario well adjacent to the plume. This is a potential material physical injury that will require mitigation pursuant to the Peace Agreement. A discussion of the mitigation is beyond the scope of this investigation.

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Table 1
Proposed Pumping Adjustments for Takes

Agency	Existing Program Takes (1) (acre-ft/yr)	Proposed Expansion Program Takes (2) (acre-ft/yr)	Proposed Total Takes (1) + (2) = (3) (acre-ft/yr)	Feasible Expansion Program Takes (4) (acre-ft/yr)	Feasible Total Takes (1) + (4) = (5) (acre-ft/yr)
City of Chino	1,159	2,000	3,159	2,000	3,159
City of Chino Hills	1,448	2,000	3,448	0	1,448
City of Ontario	8,076	0	8,076	0	8,076
City of Pomona	2,000	2,000	4,000	2,000	4,000
City of Upland	3,001	1,000	4,001	1,000	4,001
Cucamonga Valley Water District	11,353	0	11,353	0	11,353
Fontana Water Company	0	0	0	0	0
Jurupa Community Services District[1]	2,000	2,000	4,000	2,000	4,000
Monte Vista Water District	3,963	5,000	8,963	5,000	8,963
Three Valleys MWD	0	0	0	0	0
Western Municipal Water District[1]	0	10,000	10,000	5,000	5,000
Total	33,000	24,000	57,000	17,000	50,000

1. Western Municipal Water District take performed by Jurupa Community Services District. The feasible take from the Jurupa Community Services District well field is a total of 9,000 acre-ft.

Table 2
Pumping Adjustments for Puts

Agency	Existing Program		Expanded Program			Total Program	
	4 Years (acre-ft/yr)	Converted to 3 Years (acre-ft/yr)	Expansion puts (acre-ft/yr)	Additional Puts[1] (acre-ft/yr)	Total Puts (acre-ft/yr)	Total ASR puts (acre-ft/yr)	Total In-Lieu Puts (acre-ft/yr)
City of Chino	2,519	3,359	1,000	111	1,111	3,710	809
City of Chino Hills	1,319	1,758	0	0	0	1,823	0
City of Ontario	7,601	10,135	3,000	333	3,333	0	13,615
City of Pomona [2]	7,004	9,339	1,000	111	1,111	0	10,717
City of Upland [2,3]	1,283	1,711	1,000	111	1,111	0	2,711
Cucamonga Valley Water District	2,260	3,014	5,000	556	5,556	7,000	1,307
Fontana Water Company	0	0	0	0	0	0	0
Jurupa Community Services District	0	0	0	0	0	0	0
Monte Vista Water District	3,013	4,017	4,000	444	4,444	4,000	4,310
Three Valleys MWD[2]	0	0	0	0	0	0	0
Sub Totals	*25,000*		*15,000*	*1,667*		*16,533*	*33,467*
Total		33,333			16,667	50,000	

1. Additional puts required to meet 50,000 would be recharged wet water or additional in-lieu. For modeling purposes, this additional put was assumed to be in-lieu and distributed to participating agencies on a pro-rata basis.

2. For modeling purposes, Three Valleys MWD "puts" were distributed to the Cities of Pomona and Upland.

3. When Upland pumping was too low to offset with in-lieu, addition in-lieu was distributed to other agencies on a pro-rata basis.

Table 3
Pumping Adjustments for Takes

Agency	Existing DYY Program Takes (acre-ft/yr)	Expanded Program Takes: Expansion Takes (acre-ft/yr)	Expanded Program Takes: Total Takes (acre-ft/yr)
City of Chino	1,159	2,000	3,159
City of Chino Hills	1,448	0	1,448
City of Ontario	8,076	0	8,076
City of Pomona	2,000	2,000	4,000
City of Upland	3,001	1,000	4,001
Cucamonga Valley Water District	11,353	0	11,353
Fontana Water Company	0	0	0
Jurupa Community Services District[1]	2,000	2,000	9,000
Monte Vista Water District	3,963	5,000	8,963
Three Valleys MWD	0	0	0
Western Municipal Water District[1]	0	5,000	0
Total	33,000	17,000	50,000

1. Western Municipal Water District take performed by Jurupa Community Services District. JCSD's take is 4,000 acre-ft/yr and Western's take is 5,000 acre-ft/yr.

2. Take adjustments were made without optimization of pumping plans. It is possible that Chino Hills and WMWD could participate at higher takes with modifications to pumping plans (wells used and or aquifers pumped from).

Table 4
Groundwater Pumping Projection for the Chino Basin - DYY Expansion Program
(acre-ft/yr)

Producer	Pumping Projection[1] 2009/10 (acre-ft/yr)	2014/15 (acre-ft/yr)	2019/20 (acre-ft/yr)	2024/25 (acre-ft/yr)	2029/30 (acre-ft/yr)	2034/35 (acre-ft/yr)
Overlying Agricultural Pool	*21,492*	*13,251*	*5,010*	*5,010*	*5,010*	*5,010*
Overlying Non-Agricultural Pool						
San Bernardino Cty (Chino Airport)	0	0	0	0	0	0
Ameron Inc	0	0	0	0	0	0
California Steel Industries Inc	1,284	1,284	1,284	1,284	1,284	1,284
Swan Lake Mobile Home Park	0	0	0	0	0	0
Vulcan Materials Company	5	5	5	5	5	5
Space Center Mira Loma Inc.	0	0	0	0	0	0
Angelica Textile Service	29	29	29	29	29	29
Sunkist Growers Inc	147	147	147	147	147	147
Praxair Inc	0	0	0	0	0	0
General Electric Company	451	451	451	451	451	451
California Speedway	621	621	621	621	621	621
Reliant Energy Etiwanda	705	705	705	705	705	705
Subtotal Overlying Non-Agricultural Pool Production	*3,241*	*3,241*	*3,241*	*3,241*	*3,241*	*3,241*
Appropriative Pool						
Arrowhead Mountain Spring Water Company	263	318	335	308	308	308
Chino Desalter Authority	26,356	39,400	39,400	39,400	39,400	39,400
City of Chino	9,971	10,844	11,811	12,777	12,963	12,963
City of Chino Hills[2]	4,823	4,823	4,823	4,823	4,823	4,823
City of Norco	0	0	0	0	0	0
City of Ontario	28,796	27,211	32,360	37,508	42,658	42,658
City of Pomona	13,000	13,000	13,000	13,000	13,000	13,000
City of Upland	1,284	2,140	2,140	2,140	2,140	2,140
Cucamonga Valley Water District	16,598	21,229	26,729	32,229	37,729	37,729
Fontana Union Water Company	0	0	0	0	0	0
Fontana Water Company	13,500	10,000	11,000	11,500	12,000	12,500
Jurupa Community Services District[2]	20,087	18,123	21,616	21,419	21,419	21,419
Inland Empire Utilities Agency	0	0	0	0	0	0
Marygold Mutual Water Company	0	0	0	0	0	0
Metropolitan Water District of Southern California	0	0	0	0	0	0
Monte Vista Irrigation Company	0	0	0	0	0	0
Monte Vista Water District	16,000	17,000	18,500	20,000	21,500	21,500
Mutual Water Company of Glen Avon Heights	0	0	0	0	0	0
Niagara	657	795	838	770	770	770
San Antonio Water Company	894	1,149	1,282	1,244	1,244	1,244
San Bernardino County (Olympic Facility)	13	16	17	15	15	15
Santa Ana River Water Company	263	318	335	308	308	308
Golden State Water Company	329	397	419	385	385	385
West End Consolidated Water Company	0	0	0	0	0	0
West Valley Water District	0	0	0	0	0	0
Subtotal Appropriators	*152,834*	*166,763*	*184,604*	*197,827*	*210,663*	*211,163*
Total Production	177,567	183,255	192,855	206,078	218,914	219,414

1. All production data from IEUA (2008) unless otherwise noted.
2. Black and Veatch, 2008

Table 5
Supplemental Water Deliveries
(acre-ft)

Year	Recycled Water Recharge Used to Reduce Replenishment[1]	Overproduction and Replenishment				
		Net Replenishment Obligation	In-Lieu Deliveries	MWDSC Replenishment Supply	Total Wet Water Recharge	Cumulative Unmet Replenishment Obligation
2006	1,303	-29,339	0	24,759	24,759	-29,339
2007	6,000	-18,977	0	0	0	-73,076
2008	8,000	-17,889	0	0	0	-90,964
2009	8,786	-3,564	0	0	0	-94,528
2010	9,571	-1,261	0	0	0	-95,789
2011	10,357	964	0	0	0	-94,825
2012	11,143	-4,545	0	0	0	-99,371
2013	11,929	-3,148	0	0	0	-102,519
2014	13,500	22,061	0	0	0	-80,457
2015	13,500	27,885	0	0	0	-52,572
2016	13,500	26,332	0	0	0	-26,240
2017	15,000	23,290	5,000	21,809	26,809	-2,950
2018	15,000	22,047	0	0	0	-7,712
2019	15,000	21,038	0	0	0	13,326
2020	15,000	20,151	0	0	0	33,478
2021	15,000	20,478	0	0	0	53,956
2022	15,000	20,843	0	0	0	74,799
2023	16,000	20,469	0	0	0	95,268
2024	16,000	21,296	5,000	82,670	87,670	116,563
2025	22,000	16,195	5,000	76,670	81,670	45,088
2026	22,000	16,886	5,000	20,063	25,063	-19,696
2027	24,000	15,361	5,000	15,361	20,361	-29,398
2028	24,000	15,757	0	0	0	-34,002
2029	24,000	16,184	0	0	0	-17,818
2030	24,000	28,668	0	0	0	10,850
2031	24,000	29,159	0	0	0	40,009
2032	24,000	29,601	0	0	0	69,610
2033	24,000	29,982	0	0	0	99,592
2034	24,000	30,339	5,000	74,670	79,670	129,931
2035	24,000	31,200	5,000	74,670	79,670	81,460
Total	489,589	427,462	35,000	390,672	425,672	na
Average	16,320	14,249	1,167	13,022	14,189	-2,911
Max	24,000	31,200	5,000	82,670	87,670	129,931
Min	1,303	-29,339	0	0	0	-102,519

1. The Replenishment obligation has been reduced do to recycled water recharge.

Table 6
Water Budget for Chino North, Chino East, Chino South, and Prado Basin Management Zones
Baseline Alternative
(acre-ft)

Year	Inflows							Outflows					Inflow-Outflow
					Artificial Recharge								
	Boundary Inflow	Temescal to PBMZ	Deep Percolation	Stream Recharge	Storm	Imported and Recycled Water Replenishment	Subtotal Inflows	Net Pumping	PBMZ to Temescal	ET	Rising Groundwater	Subtotal Outflow	
2006	32,703	6,084	86,301	26,237	11,646	26,110	189,081	153,537	1,883	14,788	15,622	185,830	3,251
2007	32,703	6,262	82,093	29,478	11,646	6,011	168,194	168,334	1,837	14,447	13,981	198,599	-30,406
2008	32,703	5,992	83,012	31,393	11,646	8,014	172,760	205,094	1,792	14,268	13,295	234,450	-61,690
2009	32,703	5,619	83,671	33,084	11,646	8,798	175,521	209,107	1,767	14,063	12,640	237,577	-62,056
2010	32,703	5,212	82,149	34,653	11,646	9,585	175,948	212,373	1,753	13,853	12,049	240,027	-64,078
2011	32,703	4,807	81,849	35,936	11,646	10,372	177,313	146,784	1,740	13,658	11,550	173,732	3,581
2012	32,703	4,409	79,176	36,981	11,646	11,159	176,074	147,431	1,730	13,483	11,125	173,768	2,306
2013	32,703	4,044	78,266	38,119	11,646	11,945	176,723	148,076	1,716	13,275	10,645	173,713	3,011
2014	32,703	3,710	77,834	39,137	11,646	13,519	178,549	182,079	1,704	13,111	10,269	207,163	-28,614
2015	32,703	3,401	77,243	40,249	11,646	13,519	178,760	182,645	1,694	12,980	9,943	207,261	-28,501
2016	32,703	3,113	76,195	41,228	11,646	14,169	179,053	181,675	1,685	12,874	9,695	205,929	-26,876
2017	32,703	2,848	75,760	41,881	11,646	43,255	208,093	176,174	1,677	12,795	9,513	200,159	7,933
2018	32,703	2,604	74,231	42,448	11,646	15,021	178,653	213,258	1,671	12,729	9,363	237,022	-58,369
2019	32,703	2,380	73,530	43,158	11,646	15,021	178,439	212,503	1,666	12,658	9,196	236,022	-57,584
2020	32,703	2,176	71,573	43,982	11,646	15,021	177,101	211,747	1,665	12,587	9,021	235,020	-57,919
2021	32,703	1,993	71,111	44,634	11,646	15,021	177,107	146,037	1,671	12,536	8,898	169,143	7,964
2022	32,703	1,828	70,147	44,953	11,646	15,021	176,298	146,563	1,686	12,513	8,850	169,612	6,686
2023	32,703	1,686	68,771	45,106	11,646	16,023	175,935	147,089	1,712	12,497	8,824	170,121	5,813
2024	32,703	1,564	67,886	45,423	11,646	16,023	175,245	176,014	1,750	12,469	8,761	198,994	-23,749
2025	32,703	1,459	66,933	45,838	11,646	98,727	257,306	176,538	1,794	12,423	8,661	199,417	57,890
2026	32,703	1,369	66,057	46,066	11,646	98,727	256,568	176,761	1,835	12,370	8,576	199,542	57,027
2027	32,703	1,287	65,443	46,095	11,646	98,727	255,901	176,761	1,877	12,328	8,517	199,484	56,417
2028	32,703	1,212	64,549	46,199	11,646	24,034	180,342	214,599	1,925	12,295	8,466	237,285	-56,943
2029	32,703	1,146	64,037	46,612	11,646	24,034	180,177	214,003	1,971	12,243	8,362	236,579	-56,403
2030	32,703	1,086	63,214	47,213	11,646	24,034	179,895	215,769	2,015	12,176	8,227	238,187	-58,292
2031	32,703	1,031	62,919	47,624	11,646	24,034	179,957	149,939	2,058	12,124	8,128	172,249	7,708
2032	32,703	981	62,540	47,702	11,646	24,034	179,606	149,939	2,103	12,109	8,114	172,265	7,341
2033	32,703	937	62,017	47,596	11,646	24,034	178,932	149,939	2,146	12,105	8,117	172,307	6,625
2034	32,703	896	61,798	47,606	11,646	24,034	178,683	178,051	2,188	12,087	8,096	200,422	-21,739
2035	32,703	859	61,535	47,854	11,646	98,727	253,325	178,552	2,226	12,043	8,012	200,833	52,492
Total	981,081	81,993	2,161,841	1,254,485	349,388	846,753	5,675,540	5,347,372	54,936	385,888	294,518	6,082,714	-407,174
Average	32,703	2,733	72,061	41,816	11,646	28,225	189,185	178,246	1,831	12,863	9,817	202,757	-13,572
Maximum	32,703	6,262	86,301	47,854	11,646	98,727	257,306	215,769	2,226	14,788	15,622	240,027	57,890
Minimum	32,703	859	61,535	26,237	11,646	6,011	168,194	146,037	1,665	12,043	8,012	169,143	-64,078

Table 7
Water Budget for Chino North, Chino East, Chino South, and Prado Basin Management Zones
Alternative 1 - 150,000 acre-ft DYYP
(acre-ft)

Year	Inflows							Outflows					Inflow-Outflow
					Artificial Recharge								
	Boundary Inflow	Temescal to PBMZ	Deep Percolation	Stream Recharge	Storm	Imported and Recycled Water Replenishment	Subtotal Inflows	Net Pumping	PBMZ to Temescal	ET	Rising Groundwater	Subtotal Outflow	
2006	32,703	6,084	86,301	26,232	11,646	26,110	189,076	153,518	1,883	14,788	15,622	185,811	3,264
2007	32,703	6,262	82,093	29,463	11,646	6,011	168,178	168,315	1,837	14,445	13,976	198,573	-30,395
2008	32,703	5,992	83,012	31,380	11,646	8,014	172,748	205,551	1,792	14,255	13,251	234,849	-62,101
2009	32,703	5,620	83,671	33,085	11,646	8,798	175,522	209,563	1,767	14,034	12,538	237,901	-62,378
2010	32,703	5,212	82,149	34,678	11,646	9,585	175,973	212,828	1,752	13,812	11,921	240,313	-64,340
2011	32,703	4,808	81,849	35,947	11,646	10,372	177,325	130,084	1,739	13,620	11,443	156,886	20,438
2012	32,703	4,409	79,176	36,954	11,646	11,159	176,047	130,731	1,730	13,461	11,072	156,995	19,052
2013	32,703	4,044	78,266	37,989	11,646	11,945	176,593	131,377	1,716	13,270	10,644	157,007	19,586
2014	32,703	3,709	77,834	38,861	11,646	13,519	178,271	182,059	1,705	13,118	10,301	207,182	-28,911
2015	32,703	3,400	77,243	39,798	11,646	13,519	178,308	182,626	1,694	12,998	10,012	207,329	-29,022
2016	32,703	3,112	76,195	40,644	11,646	14,169	178,469	181,870	1,685	12,904	9,792	206,251	-27,782
2017	32,703	2,846	75,760	41,196	11,646	43,255	207,406	176,154	1,678	12,833	9,634	200,299	7,107
2018	32,703	2,603	74,231	41,855	11,646	15,021	178,059	229,739	1,672	12,764	9,468	253,643	-75,584
2019	32,703	2,381	73,530	43,008	11,646	15,021	178,290	228,982	1,666	12,668	9,208	252,525	-74,235
2020	32,703	2,178	71,573	44,336	11,646	15,021	177,457	228,226	1,665	12,565	8,940	251,396	-73,939
2021	32,703	1,994	71,111	45,304	11,646	15,021	177,779	129,336	1,670	12,493	8,775	152,274	25,505
2022	32,703	1,829	70,147	45,594	11,646	15,021	176,940	129,861	1,685	12,467	8,736	152,749	24,191
2023	32,703	1,687	68,771	45,549	11,646	16,023	176,378	130,387	1,711	12,459	8,739	153,296	23,082
2024	32,703	1,564	67,886	45,615	11,646	16,023	175,437	175,992	1,749	12,445	8,711	198,897	-23,460
2025	32,703	1,459	66,933	45,737	11,646	98,727	257,205	176,516	1,794	12,417	8,654	199,381	57,824
2026	32,703	1,368	66,057	45,759	11,646	98,727	256,261	176,739	1,835	12,378	8,597	199,549	56,712
2027	32,703	1,286	65,443	45,604	11,646	98,727	255,410	176,739	1,878	12,351	8,572	199,540	55,870
2028	32,703	1,212	64,549	45,731	11,646	24,034	179,875	231,078	1,925	12,318	8,515	253,836	-73,961
2029	32,703	1,146	64,037	46,545	11,646	24,034	180,111	231,078	1,971	12,246	8,351	253,646	-73,535
2030	32,703	1,086	63,214	47,664	11,646	24,034	180,347	233,042	2,014	12,149	8,145	255,350	-75,003
2031	32,703	1,032	62,919	48,390	11,646	24,034	180,724	133,626	2,056	12,075	8,013	155,770	24,954
2032	32,703	982	62,540	48,457	11,646	24,034	180,362	133,626	2,101	12,053	8,002	155,782	24,580
2033	32,703	937	62,017	48,160	11,646	24,034	179,496	133,626	2,145	12,058	8,031	155,860	23,637
2034	32,703	896	61,799	47,895	11,646	24,034	178,972	178,707	2,187	12,057	8,041	200,993	-22,021
2035	32,703	859	61,535	47,718	11,646	98,727	253,189	179,207	2,226	12,042	8,017	201,492	51,697
Total	981,081	81,994	2,161,842	1,255,150	349,388	846,753	5,676,208	5,301,182	54,928	385,543	293,721	6,035,375	-359,167
Average	32,703	2,733	72,061	41,838	11,646	28,225	189,207	176,706	1,831	12,851	9,791	201,179	-11,972
Maximum	32,703	6,262	86,301	48,457	11,646	98,727	257,205	233,042	2,226	14,788	15,622	255,350	57,824
Minimum	32,703	859	61,535	26,232	11,646	6,011	168,178	129,336	1,665	12,042	8,002	152,274	-75,584

Table 8
Water Budget for Chino North, Chino East, Chino South, and Prado Basin Management Zones
Alternative 2 - 150,000 acre-ft DYYP with 100,000 acre-ft Negative Storage
(acre-ft)

Year	Inflows							Outflows						Inflow-Outflow
	Boundary Inflow	Temescal to PBMZ	Deep Percolation	Stream Recharge	Artificial Recharge		Subtotal Inflows	Net Pumping	PBMZ to Temescal	ET	Rising Groundwater	Subtotal Outflow	
					Storm	Imported and Recycled Water Replenishment							
2006	32,703	6,084	86,301	26,232	11,646	26,110	189,076	153,518	1,883	14,788	15,622	185,811	3,264
2007	32,703	6,262	82,093	29,463	11,646	6,011	168,178	168,315	1,837	14,445	13,976	198,573	-30,395
2008	32,703	5,992	83,012	31,380	11,646	8,014	172,748	205,551	1,792	14,255	13,251	234,849	-62,101
2009	32,703	5,620	83,671	33,085	11,646	8,798	175,522	209,563	1,767	14,034	12,538	237,901	-62,378
2010	32,703	5,212	82,149	34,678	11,646	9,585	175,973	212,828	1,752	13,812	11,921	240,313	-64,340
2011	32,703	4,808	81,849	35,947	11,646	10,372	177,325	130,084	1,739	13,620	11,443	156,886	20,438
2012	32,703	4,409	79,176	36,954	11,646	11,159	176,047	130,731	1,730	13,461	11,072	156,995	19,052
2013	32,703	4,044	78,266	37,989	11,646	11,945	176,593	131,377	1,716	13,270	10,644	157,007	19,586
2014	32,703	3,709	77,834	39,164	11,646	13,519	178,574	231,440	1,704	13,099	10,234	256,478	-77,904
2015	32,703	3,402	77,243	40,993	11,646	13,519	179,505	232,007	1,693	12,922	9,756	256,378	-76,873
2016	32,703	3,116	76,195	42,861	11,646	14,169	180,691	231,251	1,684	12,754	9,334	255,023	-74,333
2017	32,703	2,852	75,760	44,440	11,646	43,255	210,656	230,495	1,676	12,605	8,999	253,774	-43,118
2018	32,703	2,610	74,231	45,801	11,646	15,021	182,012	229,739	1,669	12,474	8,724	252,606	-70,594
2019	32,703	2,387	73,530	46,727	11,646	15,021	182,015	174,644	1,663	12,376	8,538	197,222	-15,207
2020	32,703	2,181	71,573	47,039	11,646	15,021	180,163	173,890	1,662	12,328	8,460	196,340	-16,177
2021	32,703	1,994	71,111	47,146	11,646	15,021	179,621	157,985	1,668	12,311	8,429	180,392	-772
2022	32,703	1,829	70,147	47,256	11,646	15,021	178,602	129,861	1,683	12,303	8,414	152,262	26,340
2023	32,703	1,686	68,771	47,267	11,646	16,023	178,095	130,387	1,709	12,302	8,416	152,813	25,282
2024	32,703	1,563	67,886	47,281	11,646	16,023	177,101	147,343	1,747	12,301	8,413	169,805	7,296
2025	32,703	1,458	66,933	47,261	11,646	98,727	258,728	176,516	1,792	12,290	8,391	198,988	59,740
2026	32,703	1,367	66,057	47,115	11,646	98,727	257,616	176,739	1,834	12,265	8,363	199,201	58,415
2027	32,703	1,285	65,443	46,879	11,646	98,727	256,684	176,739	1,876	12,244	8,346	199,205	57,478
2028	32,703	1,210	64,549	46,648	11,646	24,034	180,790	176,739	1,924	12,237	8,349	199,248	-18,459
2029	32,703	1,144	64,037	46,780	11,646	24,034	180,343	231,078	1,971	12,209	8,298	253,556	-73,212
2030	32,703	1,084	63,214	47,365	11,646	24,034	180,046	178,706	2,015	12,156	8,179	201,056	-21,010
2031	32,703	1,030	62,919	47,555	11,646	24,034	179,887	162,276	2,059	12,119	8,126	184,580	-4,693
2032	32,703	980	62,540	47,637	11,646	24,034	179,539	162,276	2,104	12,101	8,106	184,587	-5,048
2033	32,703	935	62,017	47,619	11,646	24,034	178,954	133,626	2,147	12,091	8,095	155,959	22,995
2034	32,703	895	61,799	47,511	11,646	24,034	178,587	150,056	2,189	12,086	8,097	172,428	6,159
2035	32,703	858	61,535	47,226	11,646	98,727	252,696	150,557	2,228	12,084	8,107	172,976	79,720
Total	981,081	82,001	2,161,842	1,281,302	349,388	846,753	5,702,367	5,286,318	54,914	383,341	288,640	6,013,213	-310,846
Average	32,703	2,733	72,061	42,710	11,646	28,225	190,079	176,211	1,830	12,778	9,621	200,440	-10,362
Maximum	32,703	6,262	86,301	47,637	11,646	98,727	258,728	232,007	2,228	14,788	15,622	256,478	79,720
Minimum	32,703	858	61,535	26,232	11,646	6,011	168,178	129,861	1,662	12,084	8,095	152,262	-77,904

WILDERMUTH ENVIRONMENTAL INC.

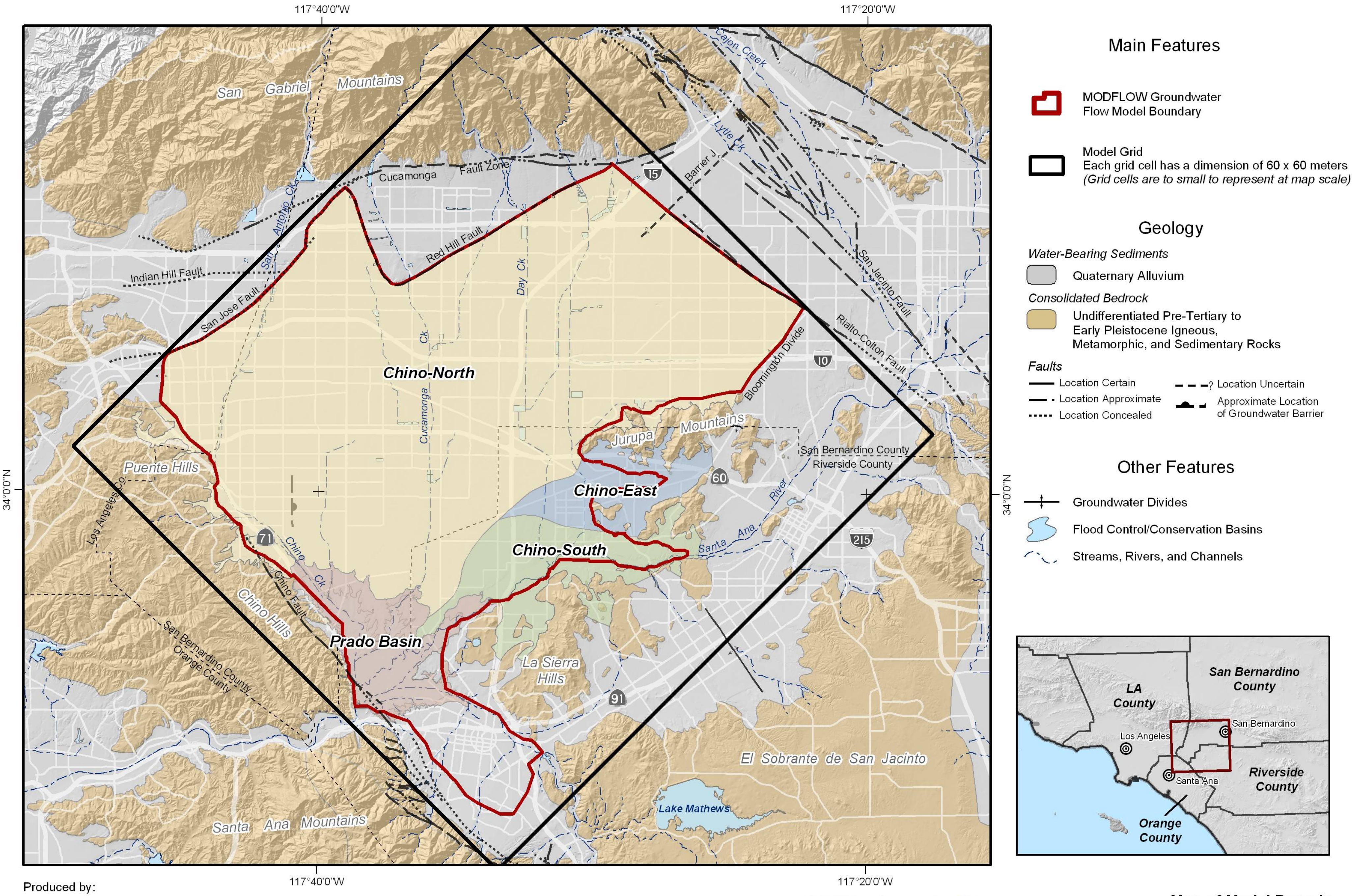
Table 9
Water Budget for Chino North, Chino East, Chino South, and Prado Basin Management Zones
Alternative 3 - 150,000 acre-ft DYYP with 300,000 acre-ft Maximum Storage
(acre-ft)

Year	Inflows							Outflows					Inflow-Outflow
					Artificial Recharge								
	Boundary Inflow	Temescal to PBMZ	Deep Percolation	Stream Recharge	Storm	Imported and Recycled Water Replenishment	Subtotal Inflows	Net Pumping	PBMZ to Temescal	ET	Rising Groundwater	Subtotal Outflow	
2006	32,703	6,084	86,301	26,232	11,646	26,110	189,076	153,518	1,883	14,788	15,622	185,811	3,264
2007	32,703	6,262	82,093	29,463	11,646	6,011	168,178	168,315	1,837	14,445	13,976	198,573	-30,395
2008	32,703	5,991	83,012	31,352	11,646	8,014	172,719	205,073	1,792	14,265	13,285	234,414	-61,695
2009	32,703	5,619	83,671	33,015	11,646	8,798	175,452	209,084	1,767	14,059	12,625	237,534	-62,083
2010	32,703	5,212	82,149	34,563	11,646	9,585	175,858	212,349	1,753	13,848	12,040	239,990	-64,132
2011	32,703	4,807	81,849	35,855	11,646	10,372	177,232	130,084	1,740	13,655	11,548	157,027	20,205
2012	32,703	4,409	79,176	36,894	11,646	11,159	175,986	130,731	1,730	13,484	11,138	157,084	18,903
2013	32,703	4,044	78,266	37,951	11,646	11,945	176,556	131,377	1,716	13,284	10,681	157,059	19,497
2014	32,703	3,709	77,834	38,816	11,646	13,519	178,227	182,059	1,705	13,129	10,333	207,225	-28,999
2015	32,703	3,400	77,243	39,743	11,646	13,519	178,253	182,626	1,694	13,009	10,040	207,369	-29,116
2016	32,703	3,111	76,195	40,583	11,646	14,169	178,408	181,870	1,685	12,916	9,819	206,290	-27,882
2017	32,703	2,846	75,760	41,160	11,646	43,255	207,370	182,146	1,678	12,843	9,655	206,322	1,048
2018	32,703	2,603	74,231	41,615	11,646	15,021	177,819	186,349	1,672	12,787	9,533	210,340	-32,521
2019	32,703	2,380	73,530	42,040	11,646	15,021	177,320	185,592	1,667	12,738	9,421	209,418	-32,098
2020	32,703	2,174	71,573	42,436	11,646	15,021	175,554	178,845	1,667	12,699	9,329	202,539	-26,985
2021	32,703	1,989	71,111	42,718	11,646	15,021	175,189	129,336	1,673	12,680	9,284	152,972	22,216
2022	32,703	1,826	70,147	42,844	11,646	15,021	174,187	129,861	1,688	12,677	9,286	153,513	20,674
2023	32,703	1,685	68,771	42,851	11,646	16,023	173,678	130,387	1,715	12,674	9,298	154,074	19,604
2024	32,703	1,562	67,886	43,024	11,646	16,023	172,845	181,983	1,753	12,657	9,255	205,649	-32,804
2025	32,703	1,459	66,933	43,347	11,646	98,727	254,815	182,507	1,798	12,617	9,154	206,076	48,739
2026	32,703	1,369	66,057	43,544	11,646	98,727	254,046	182,731	1,839	12,566	9,063	206,199	47,847
2027	32,703	1,287	65,443	43,604	11,646	98,727	253,411	182,730	1,882	12,523	8,994	206,129	47,282
2028	32,703	1,213	64,549	43,912	11,646	24,034	178,056	231,078	1,929	12,475	8,894	254,376	-76,320
2029	32,703	1,148	64,037	44,852	11,646	24,034	178,419	231,078	1,973	12,391	8,675	254,117	-75,698
2030	32,703	1,088	63,214	46,057	11,646	24,034	178,741	233,042	2,016	12,286	8,430	255,774	-77,033
2031	32,703	1,033	62,919	46,874	11,646	24,034	179,209	133,626	2,058	12,207	8,270	156,161	23,048
2032	32,703	983	62,540	47,087	11,646	24,034	178,993	167,230	2,103	12,172	8,230	189,735	-10,742
2033	32,703	938	62,017	47,159	11,646	24,034	178,497	167,230	2,146	12,142	8,189	189,707	-11,210
2034	32,703	898	61,799	47,316	11,646	24,034	178,395	178,707	2,187	12,106	8,129	201,129	-22,733
2035	32,703	860	61,535	47,403	11,646	98,727	252,875	179,207	2,226	12,070	8,067	201,570	51,304
Total	981,081	81,988	2,161,842	1,224,309	349,388	846,753	5,645,361	5,260,751	54,970	388,190	300,265	6,004,176	-358,815
Average	32,703	2,733	72,061	40,810	11,646	28,225	188,179	175,358	1,832	12,940	10,009	200,139	-11,960
Maximum	32,703	6,262	86,301	47,403	11,646	98,727	254,815	233,042	2,226	14,788	15,622	255,774	51,304
Minimum	32,703	860	61,535	26,232	11,646	6,011	168,178	129,336	1,667	12,070	8,067	152,972	-77,033

Table 10
Comparison of Projected Annual Discharge at Prado Dam Through 2035
(acre-ft)

Year	Santa Ana River Discharge at Prado[1]				Difference		
	Baseline	Alternative 1	Alternative 2	Alternative 3	Baseline - Alterntive 1	Baseline - Alterntive 2	Baseline - Alterntive 3
2006	237,156	237,161	237,161	237,161	-5	-5	-5
2007	237,412	237,422	237,422	237,422	-10	-10	-10
2008	241,895	241,862	241,862	241,925	32	32	-30
2009	245,326	245,222	245,222	245,379	104	104	-53
2010	248,942	248,789	248,789	249,023	153	153	-82
2011	251,523	251,405	251,405	251,603	118	118	-79
2012	257,244	257,219	257,219	257,345	25	25	-101
2013	261,405	261,533	261,533	261,608	-129	-129	-203
2014	265,787	266,096	265,726	266,172	-309	61	-385
2015	268,603	269,124	267,673	269,207	-521	931	-603
2016	274,677	275,358	272,683	275,446	-681	1,995	-769
2017	279,619	280,426	276,546	280,483	-807	3,073	-864
2018	284,680	285,378	280,688	285,683	-698	3,992	-1,003
2019	287,948	288,110	283,721	289,291	-162	4,227	-1,343
2020	294,358	293,923	290,741	296,212	435	3,617	-1,854
2021	299,361	298,567	296,380	301,662	794	2,982	-2,301
2022	304,771	304,016	302,032	307,316	756	2,740	-2,545
2023	308,629	308,100	306,060	311,358	529	2,569	-2,729
2024	315,766	315,524	313,561	318,659	242	2,205	-2,893
2025	320,363	320,456	318,669	323,347	-94	1,694	-2,984
2026	320,049	320,377	318,787	323,058	-328	1,262	-3,010
2027	318,168	318,712	317,212	321,135	-545	956	-2,967
2028	319,807	320,323	319,240	322,522	-517	567	-2,715
2029	319,290	319,346	319,057	321,362	-56	233	-2,072
2030	318,554	318,020	318,353	319,913	534	201	-1,359
2031	316,249	315,367	316,315	317,141	881	-66	-892
2032	317,951	317,084	318,009	318,683	867	-57	-732
2033	318,060	317,410	318,015	318,570	650	45	-510
2034	318,029	317,686	318,125	318,352	343	-96	-323
2035	315,903	316,044	316,625	316,410	-141	-723	-507
Total	8,192,956	8,191,479	8,160,246	8,228,863	1,477	32,711	-35,907
Average	292,606	292,553	291,437	293,888	53	1,168	-1,282
Max	320,363	320,456	319,240	323,347	881	4,227	-30
Min	241,895	241,862	241,862	241,925	-807	-723	-3,010

1. Expected value discharge.



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0 1 2 3 4 5 Miles
0 2 4 6 KM

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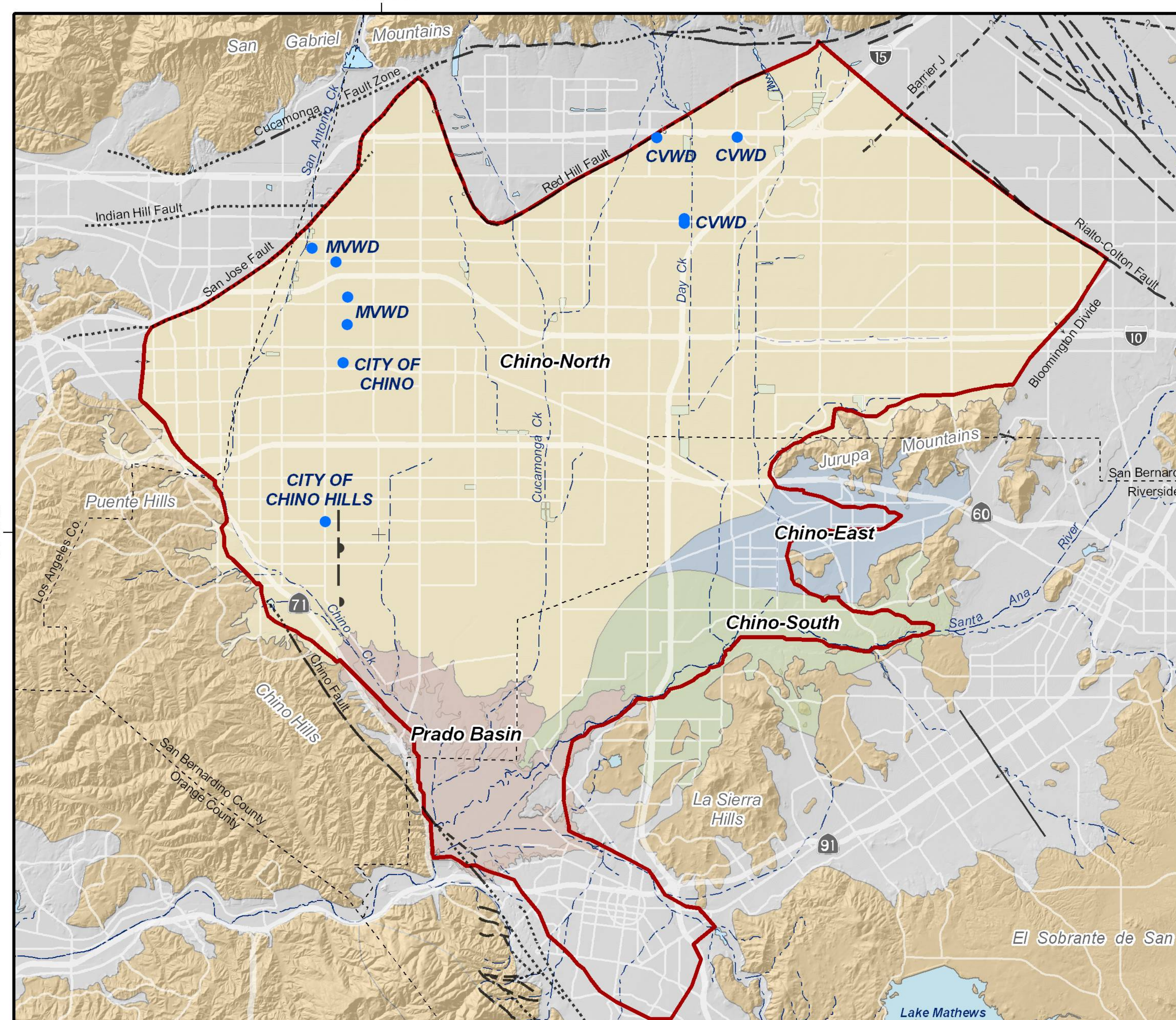
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Map of Model Domain and Chino Basin Management Zones

Figure 1



Main Features

New Aquifer Storage and Recovery Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

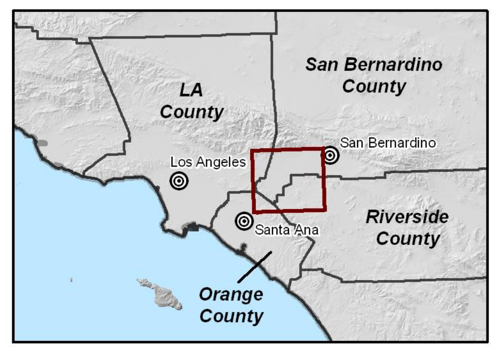
- Location Certain
- Location Approximate
- Location Concealed
- ? Location Uncertain
- Approximate Location of Groundwater Barrier

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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0 2 4 Miles
0 2 4 6 KM

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Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Location Map of New Aquifer Storage and Recovery Wells

Figure 2

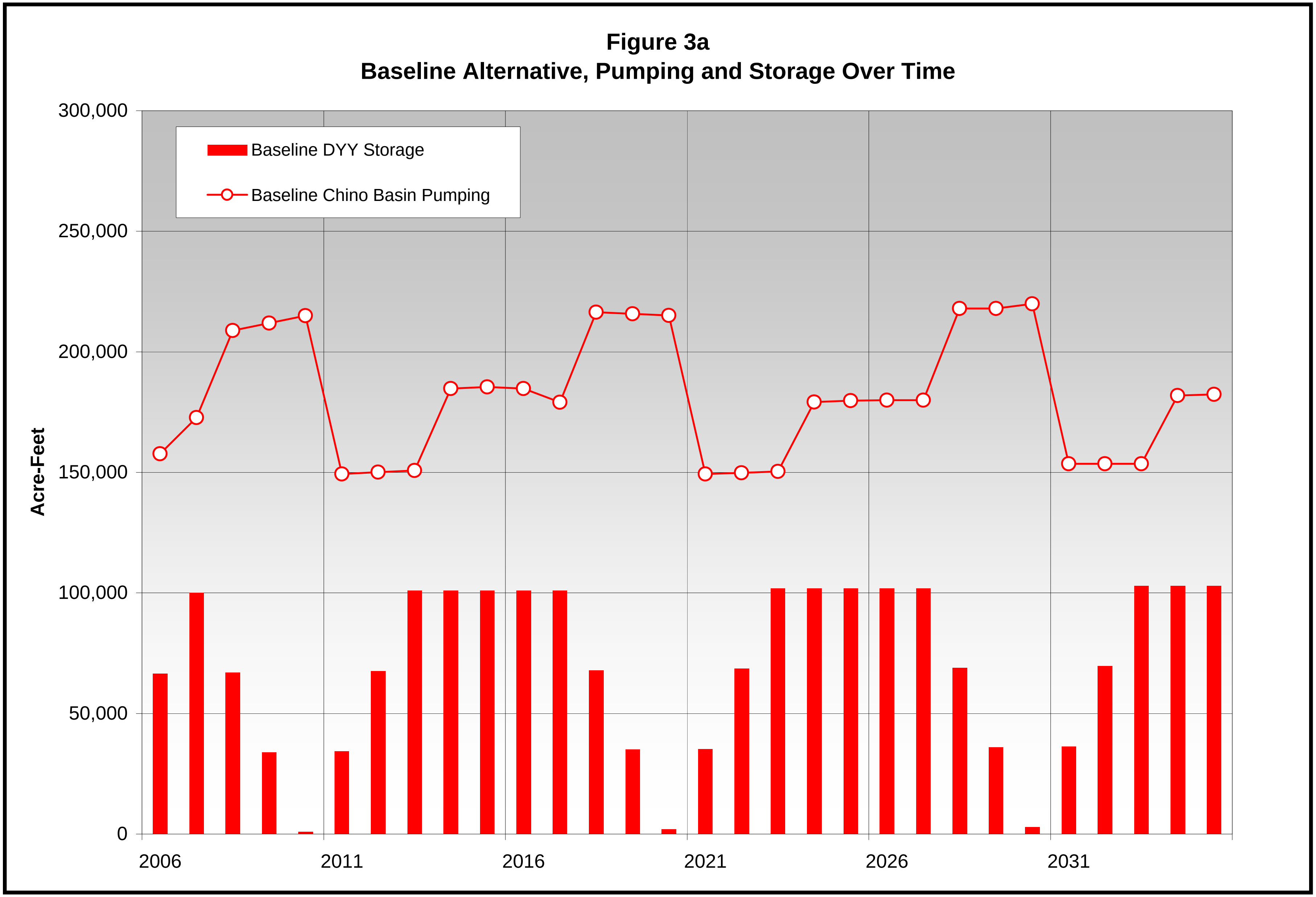
Figure 3a
Baseline Alternative, Pumping and Storage Over Time
Baseline DYY Storage
Baseline Chino Basin Pumping
Acre-Feet
300,000
250,000
200,000
150,000
100,000
50,000
0
2006
2011
2016
2021
2026
2031

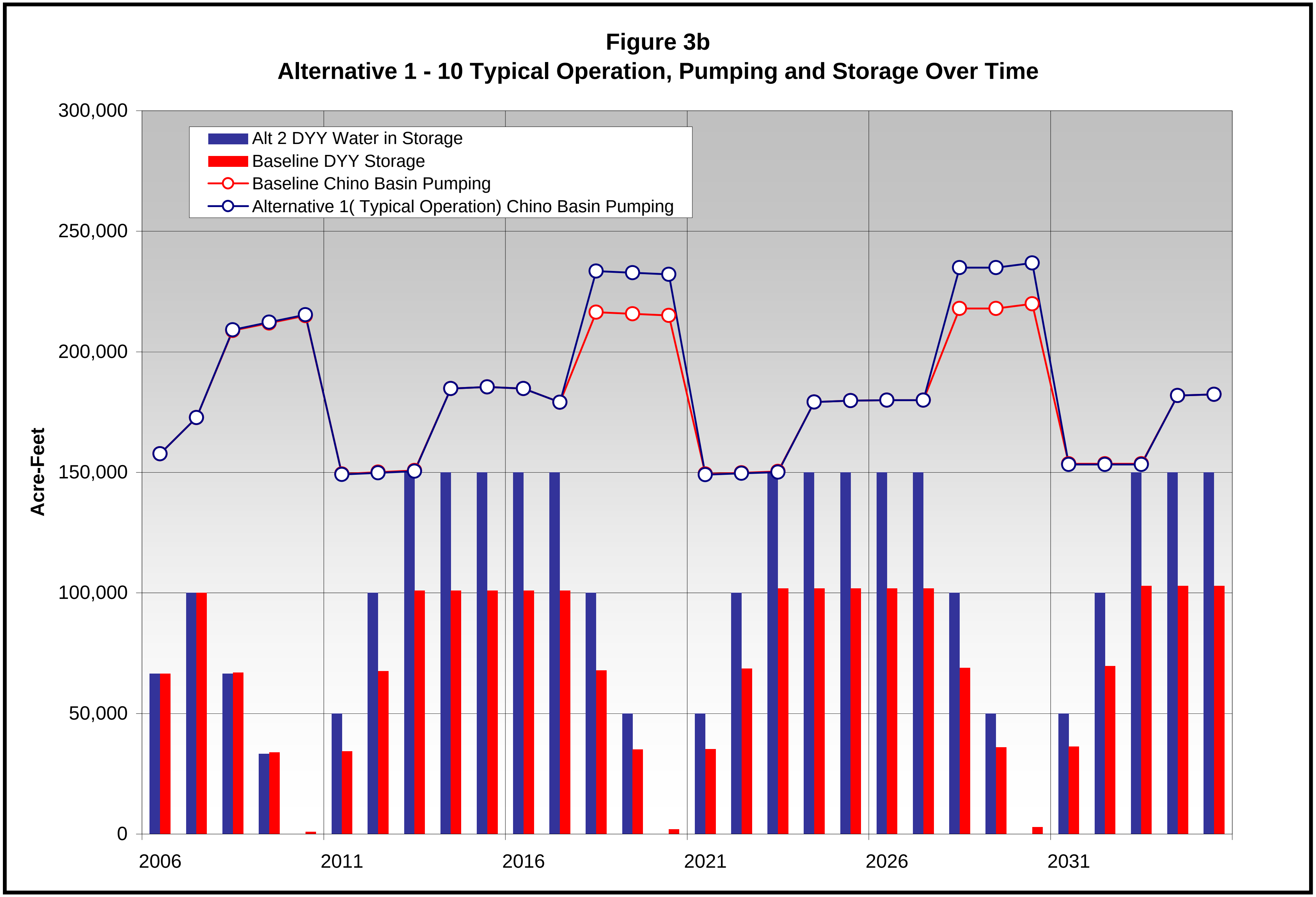

Figure 3a to 3d.xls

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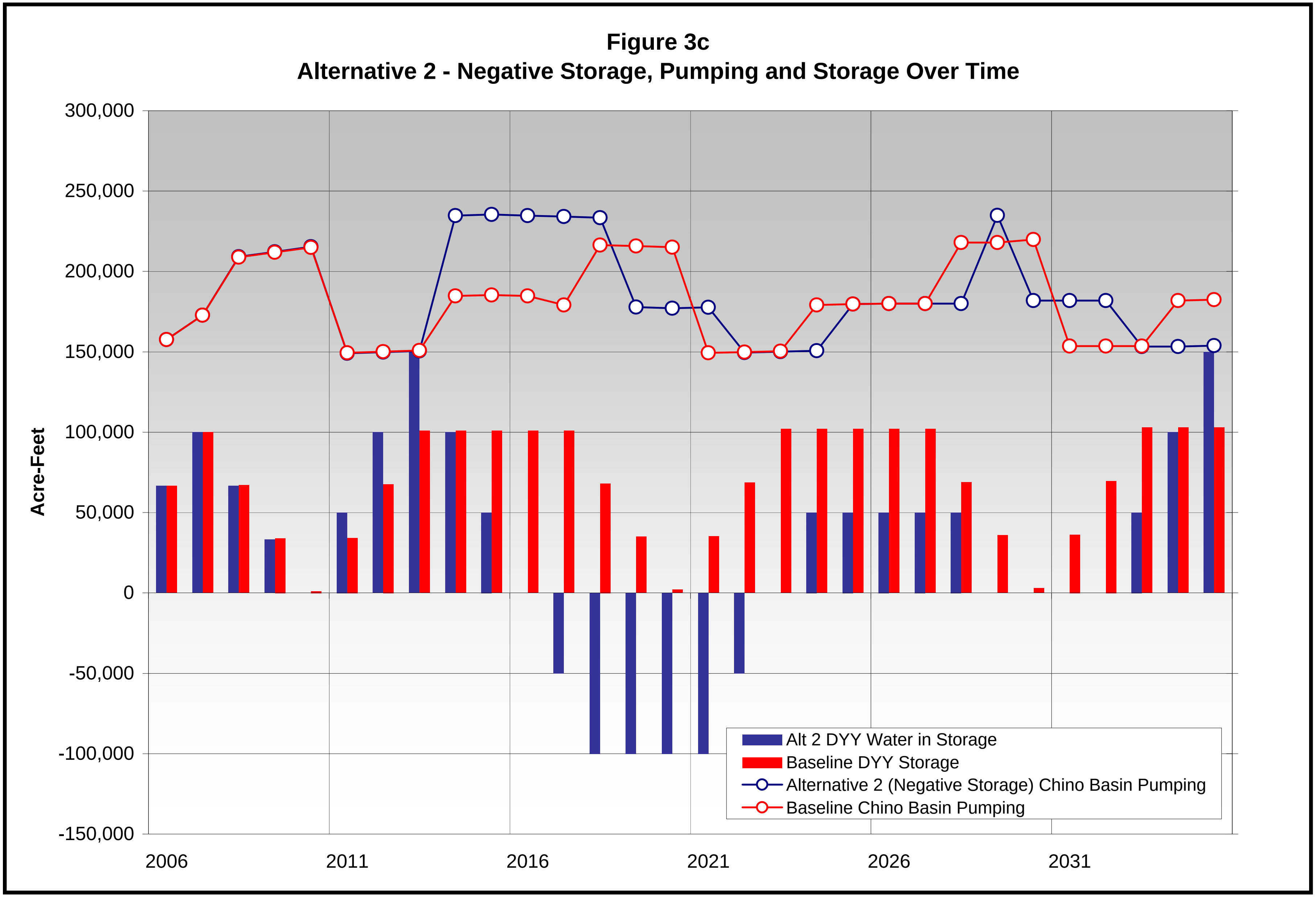


Figure 3c
Alternative 2 - Negative Storage, Pumping and Storage Over Time
Acre-Feet
300,000
250,000
200,000
150,000
100,000
50,000
0
-50,000
-100,000
-150,000
2006
2011
2016
2021
2026
2031
Alt 2 DYY Water in Storage
Baseline DYY Storage
Alternative 2 (Negative Storage) Chino Basin Pumping
Baseline Chino Basin Pumping

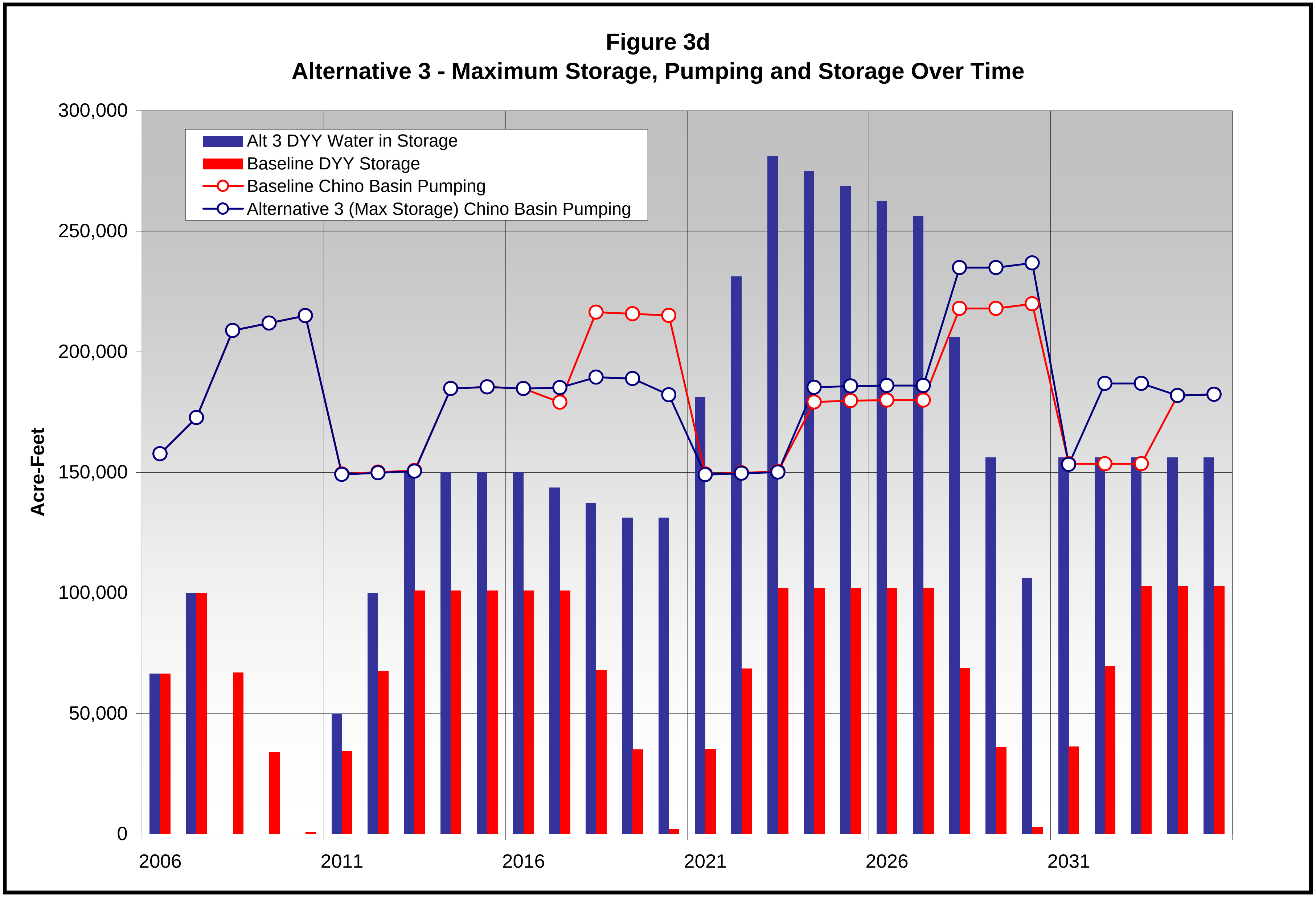


Figure 3a to 3d.xls

Figure 4a
Comparison of Projected Annual Time Histories of Santa Ana River Recharge the the Chino Basin for the Dry-Year Yield Expansion Program Alternatives Relative to the Baseline Alternative

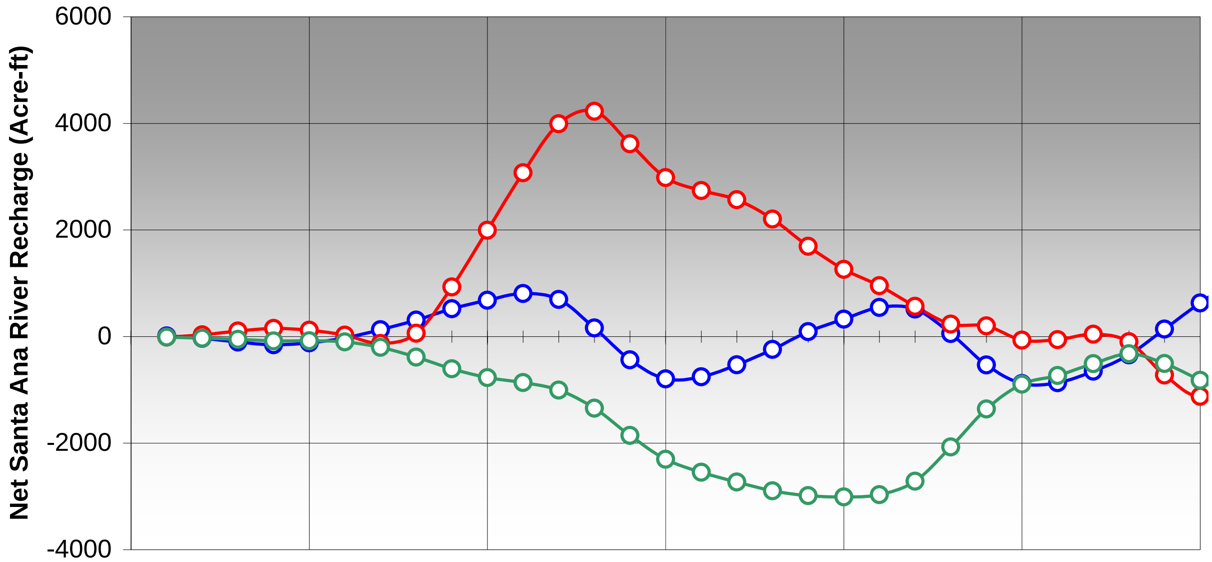
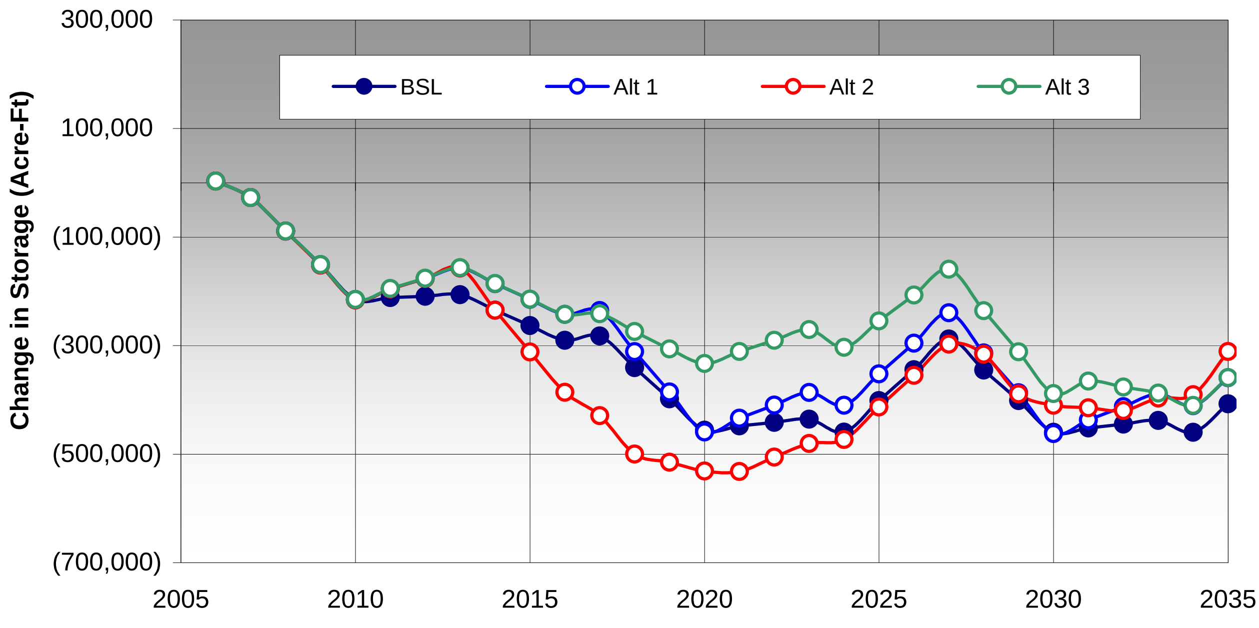


Figure 4b
Cumulative Change in Chino Basin Groundwater Strorage For Each Alternative



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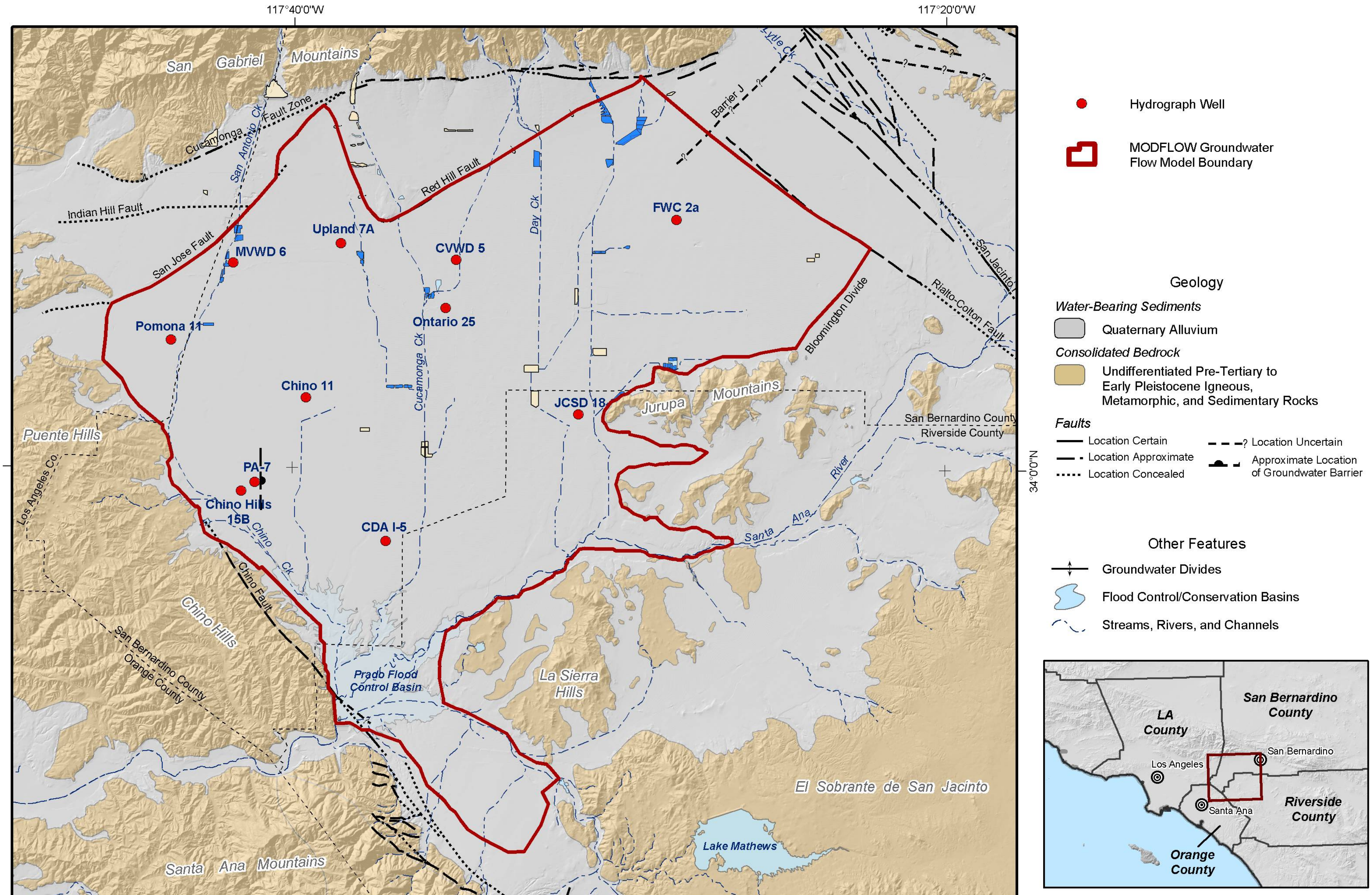

Hydrograph Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

- Location Certain
- Location Approximate
- Location Concealed
- ? Location Uncertain
- Approximate Location of Groundwater Barrier

Other Features

- Groundwater Divides
- Flood Control/Conservation Basins
- Streams, Rivers, and Channels

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0 1 2 3 4 Miles
0 2 4 6 KM

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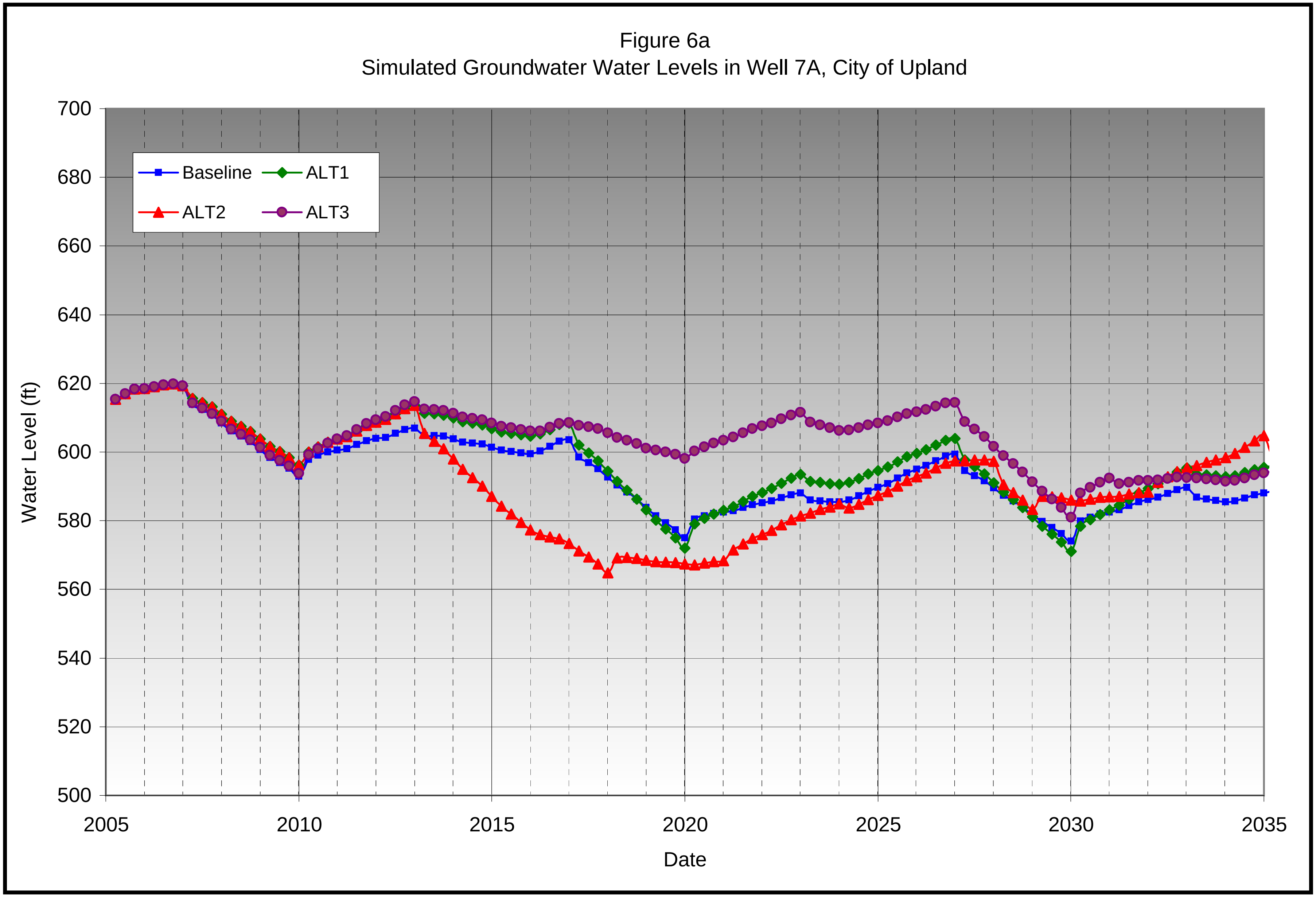
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Planning Alternative Hydrograph Well Location Map

Figure 5



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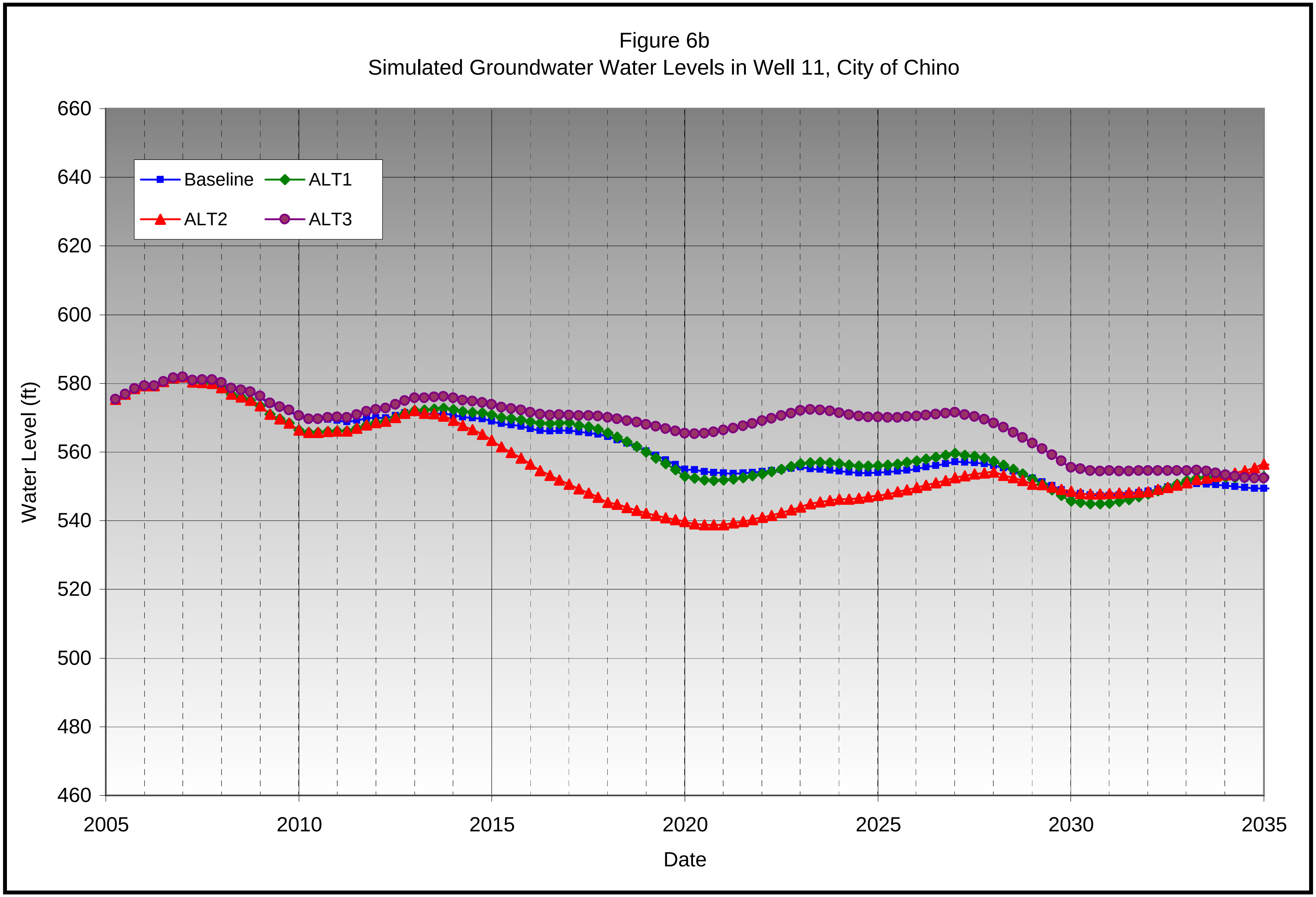

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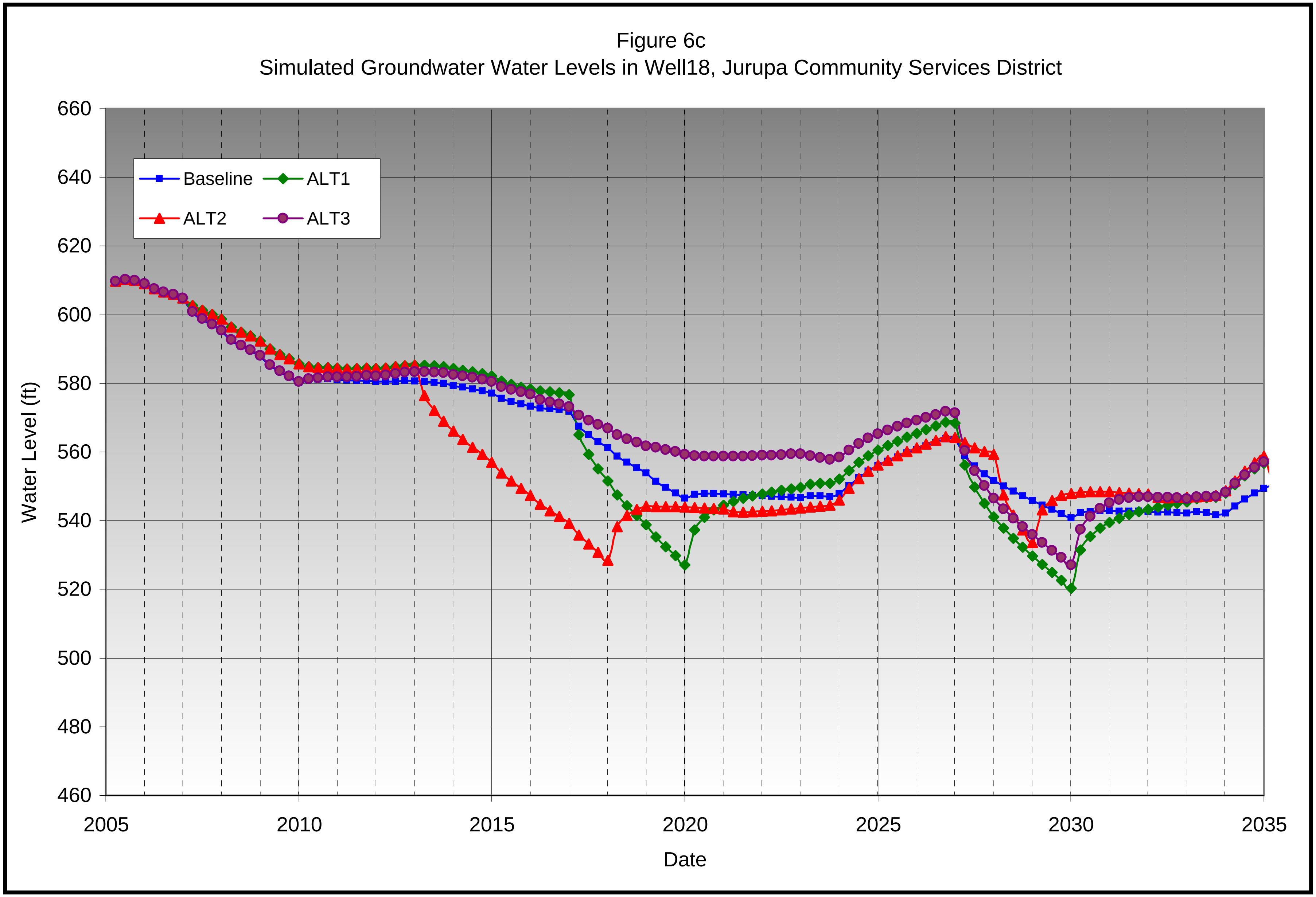

Figure 6 and Figure 14.xls

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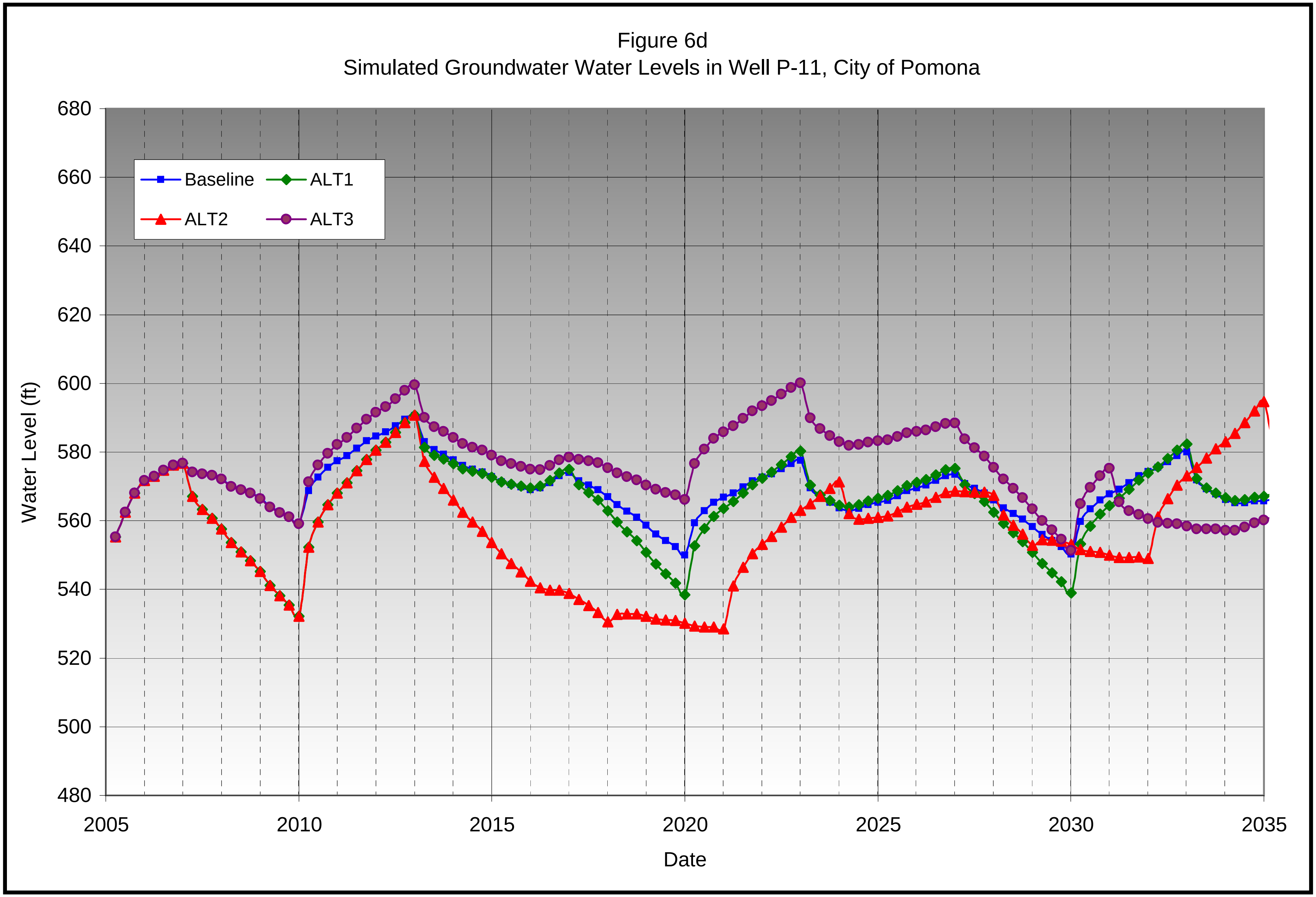

Figure 6 and Figure 14.xls

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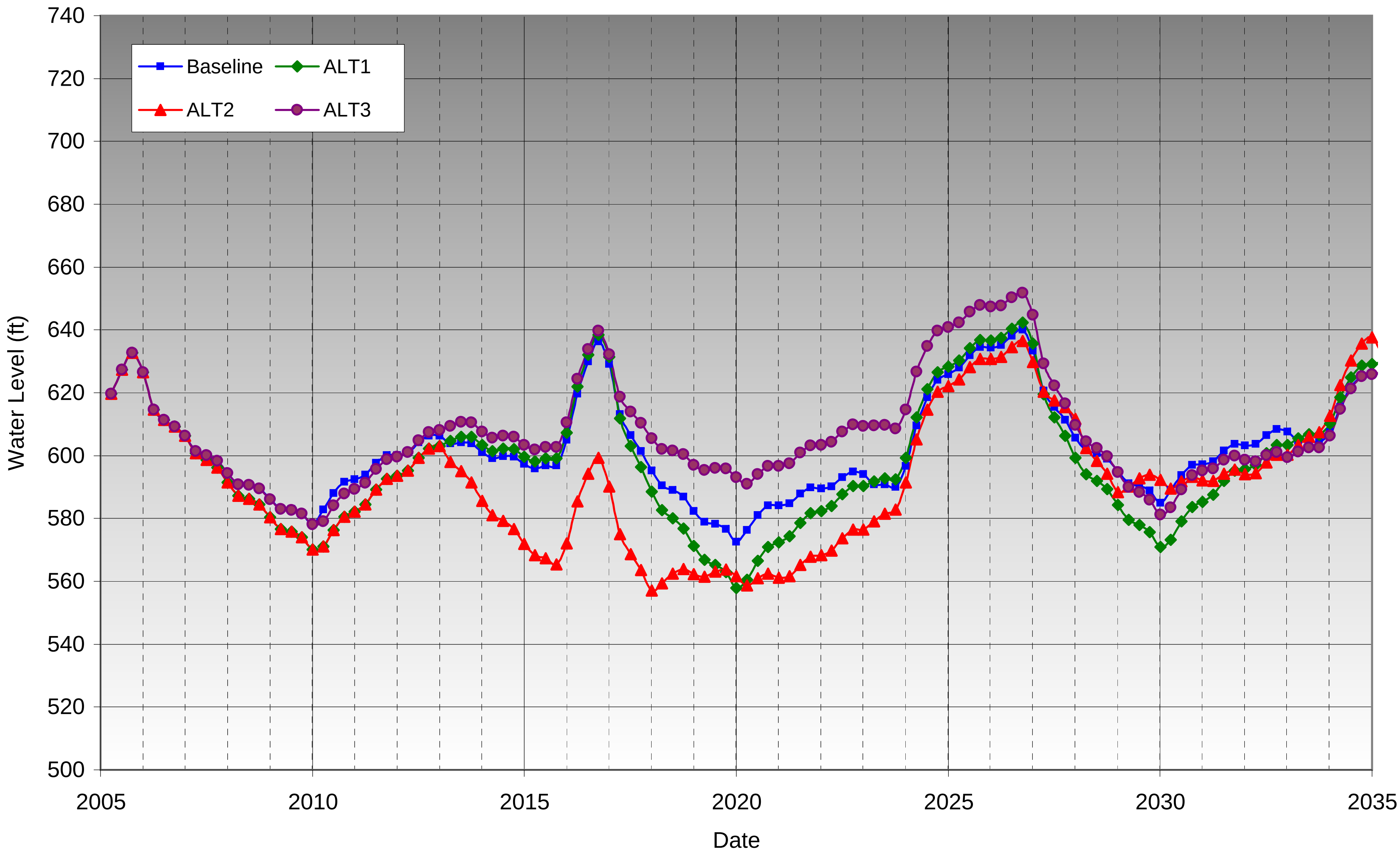
Figure 6e
Simulated Groundwater Water Levels in Well 6, Monte Vista Water District



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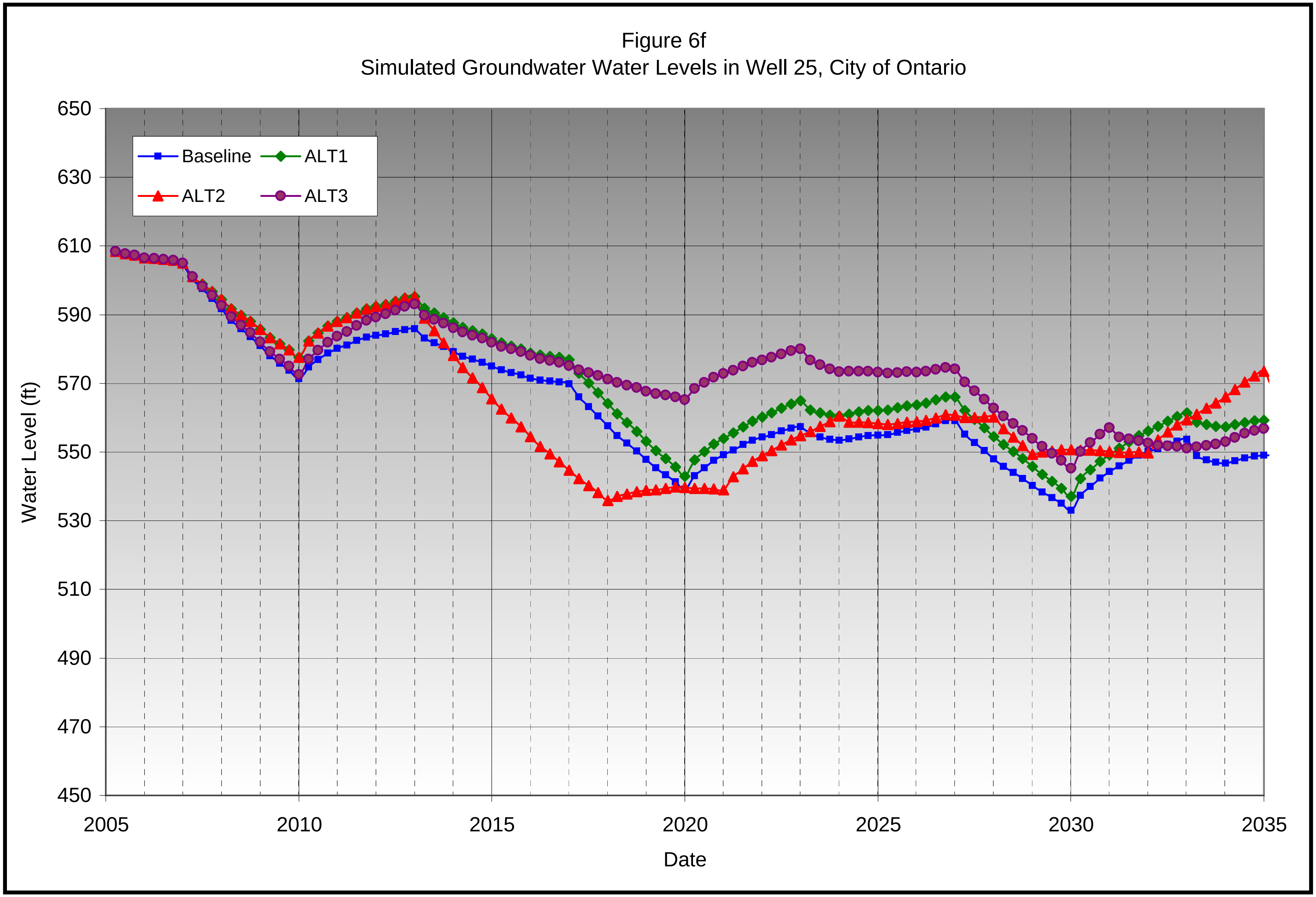

Figure 6 and Figure 14.xls

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Figure 6g

Simulated Groundwater Water Levels in Well CB-5, Cucamonga Valley Water District

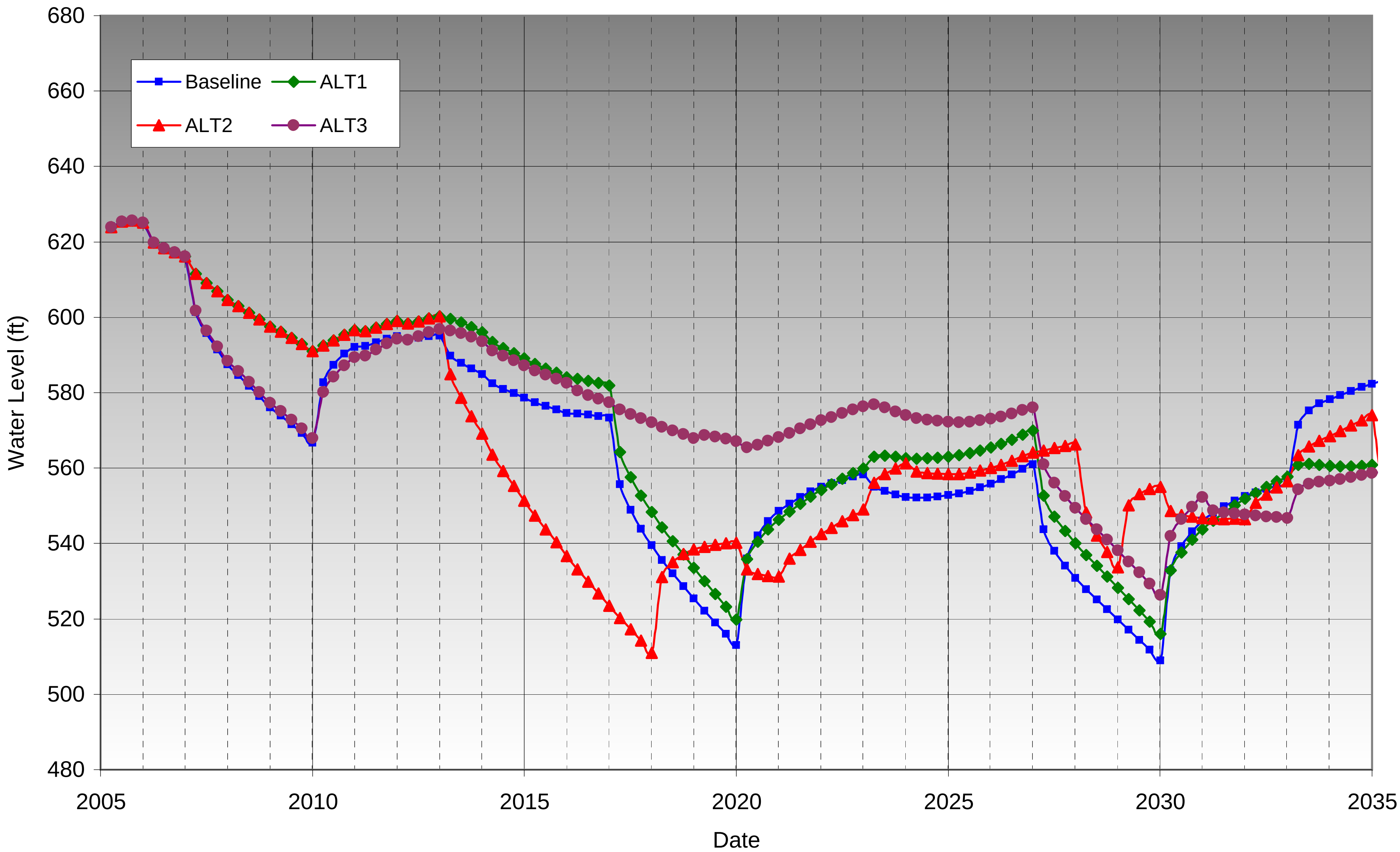

Figure 6 and Figure 14.xls

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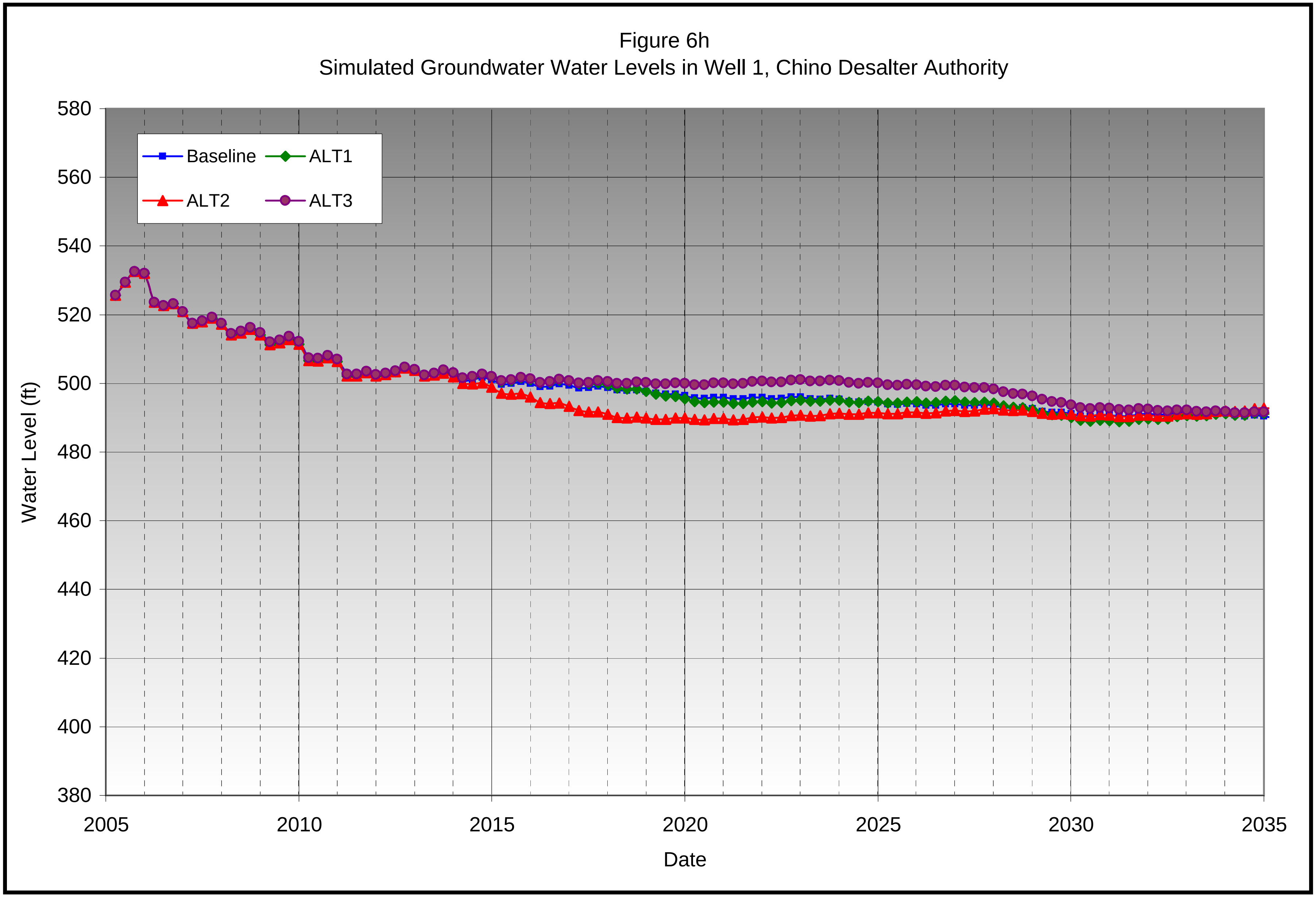
Figure 6h
Simulated Groundwater Water Levels in Well 1, Chino Desalter Authority
Baseline
ALT1
ALT2
ALT3
Water Level (ft)
580
560
540
520
500
480
460
440
420
400
380
2005
2010
2015
2020
2025
2030
2035
Date

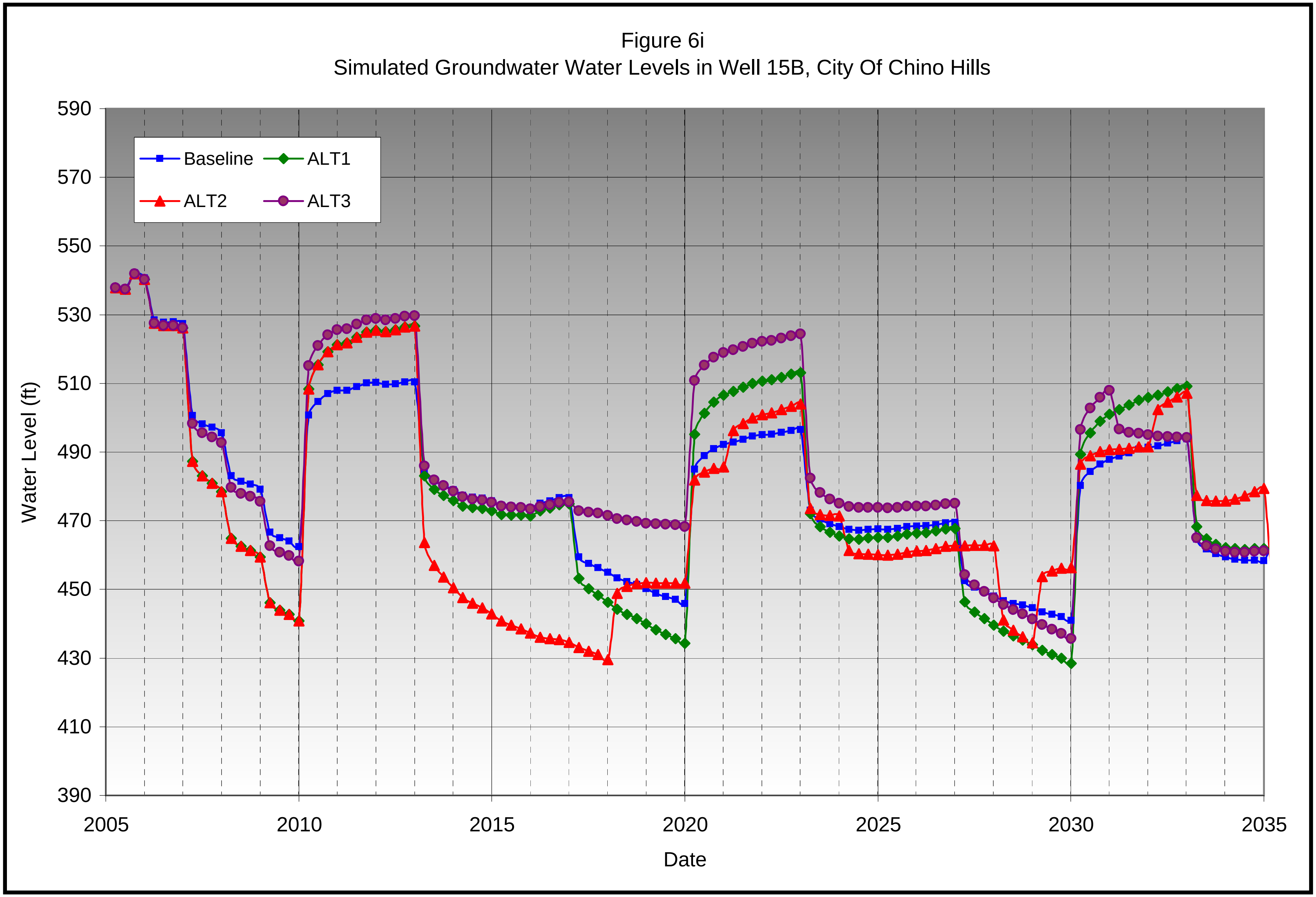

Figure 6 and Figure 14.xls

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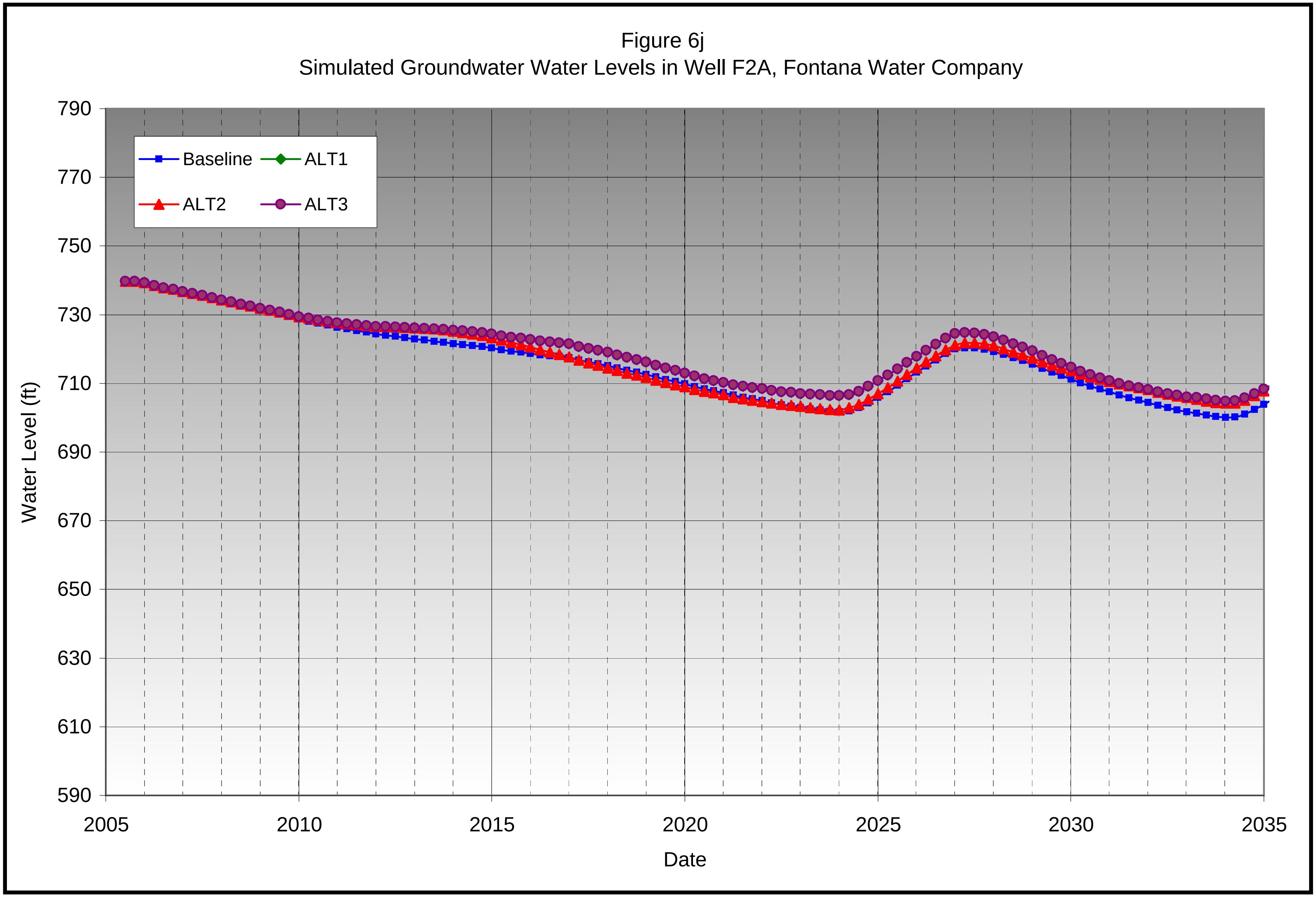

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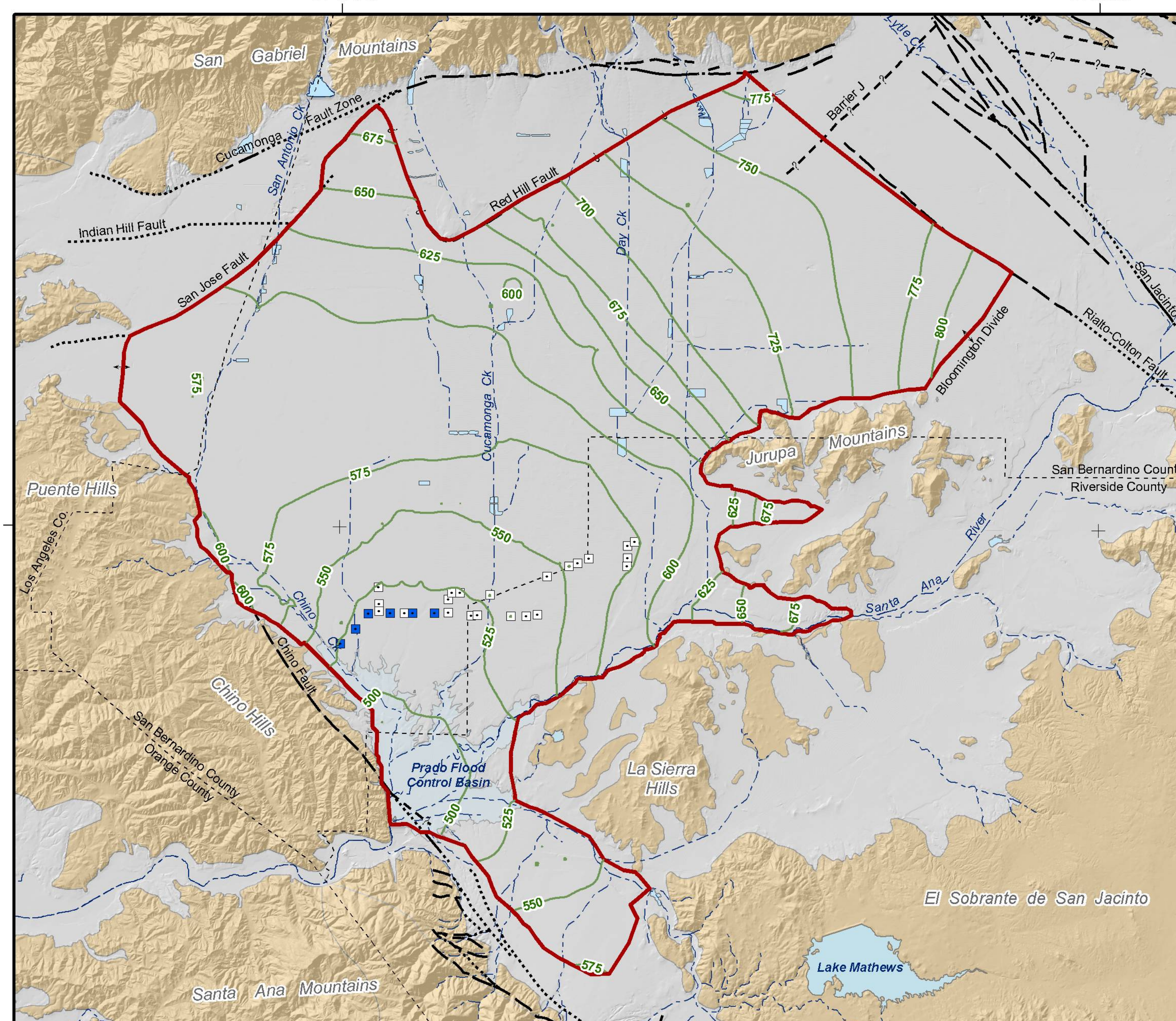

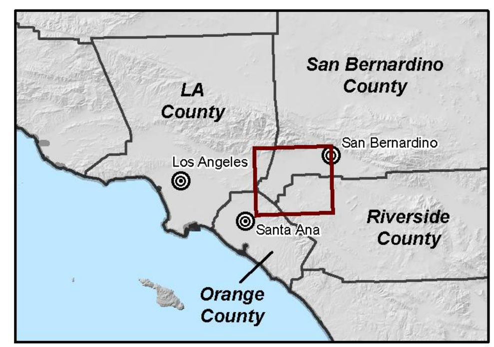

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0 1 2 3 4 Miles
0 2 4 6 KM

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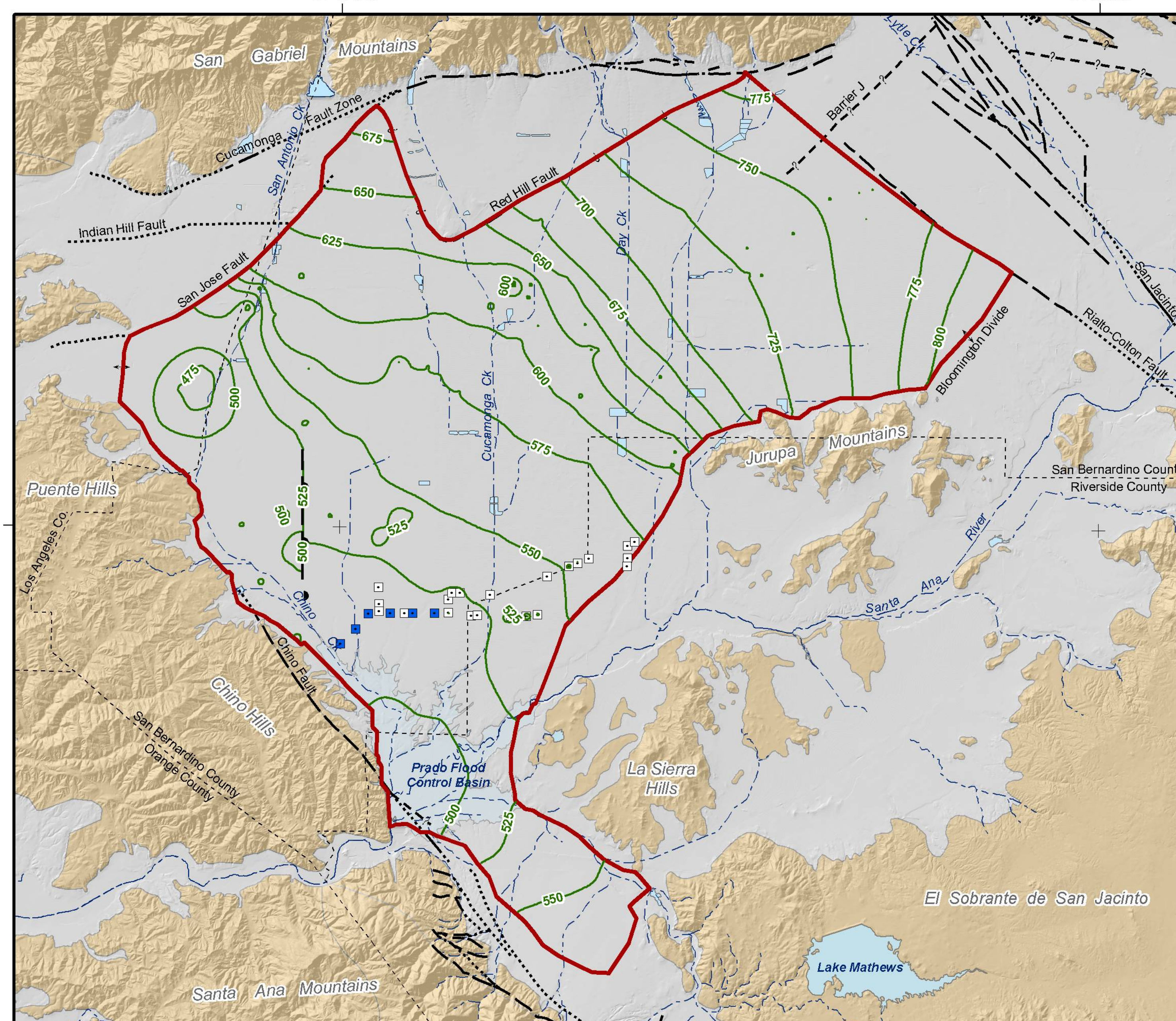
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Assumed Groundwater Elevations for Layer 1

Start of the Baseline Period in 2008

Figure 7a



Groundwater Elevation Contours *(feet above mean sea-level)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Concealed

Location Uncertain

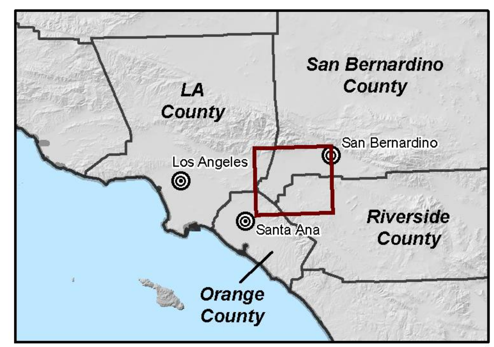
Approximate Location of Groundwater Barrier

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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0 1 2 3 4 Miles

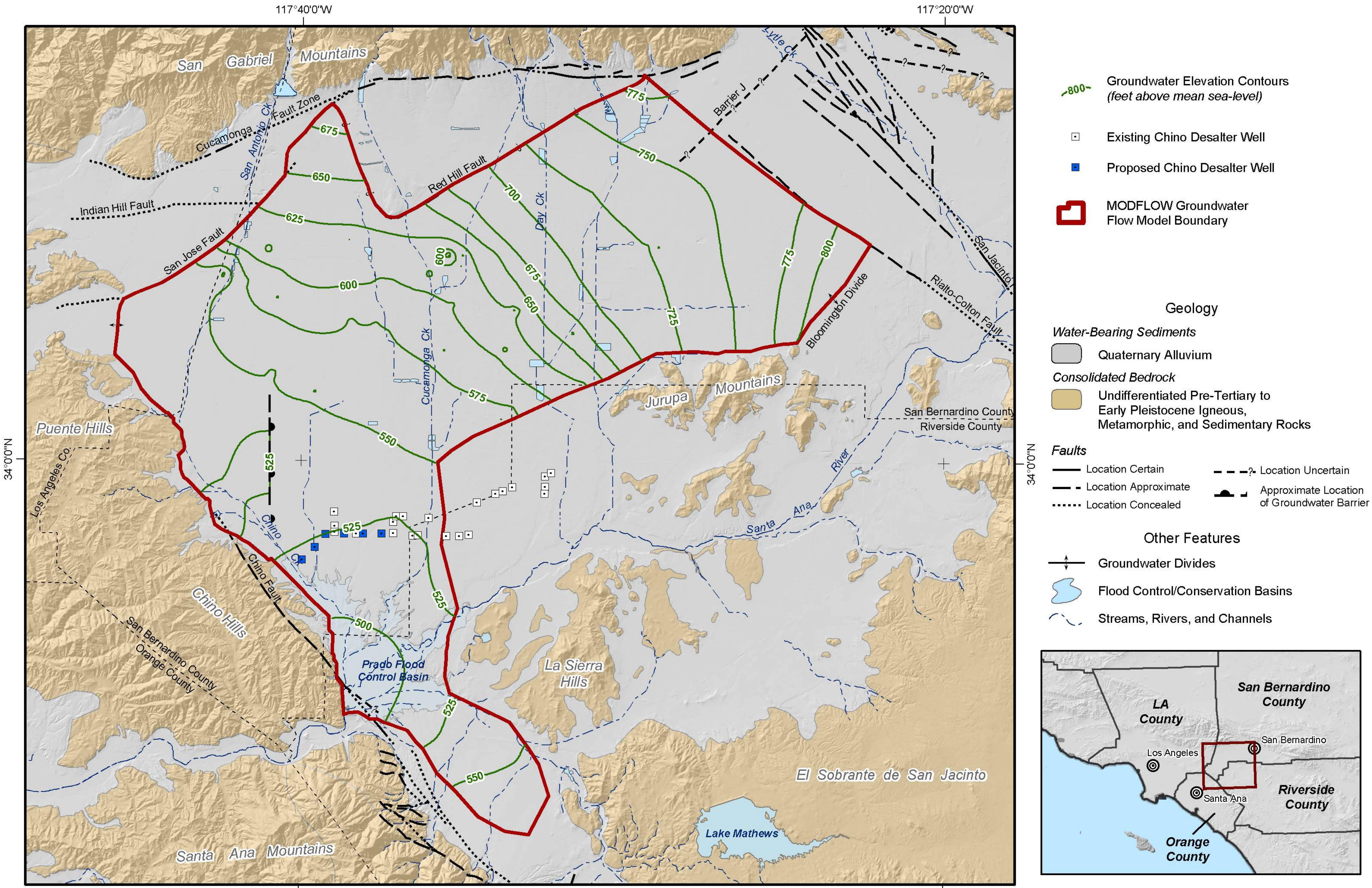
0 2 4 6 KM

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Assumed Groundwater Elevations for Layer 2

Start of the Baseline Period in 2008

Figure 7b



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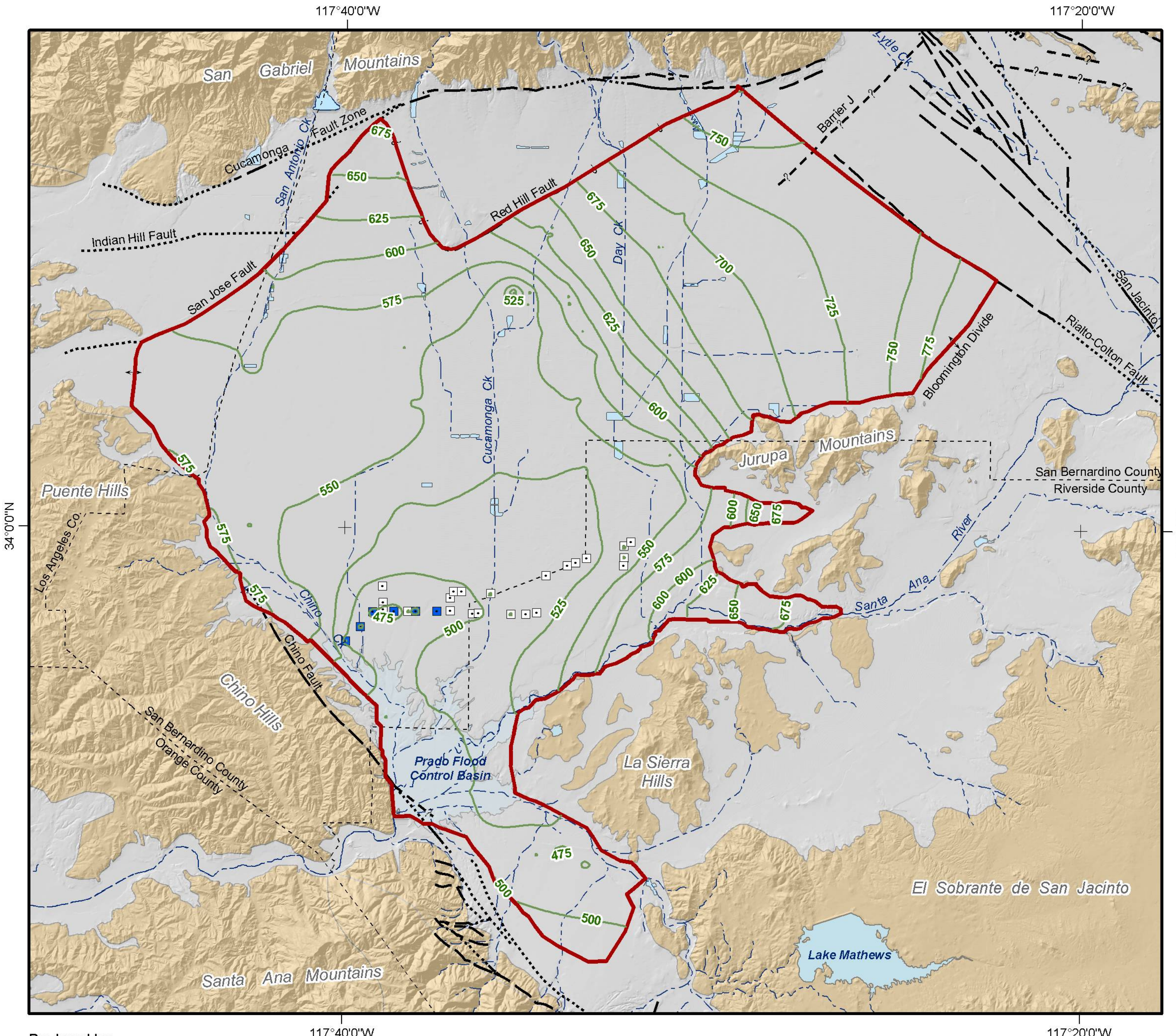
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Assumed Groundwater Elevations for Layer 3

Start of the Baseline Period in 2008

Figure 7c



Groundwater Elevation Contours *(feet above mean sea-level)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Uncertain

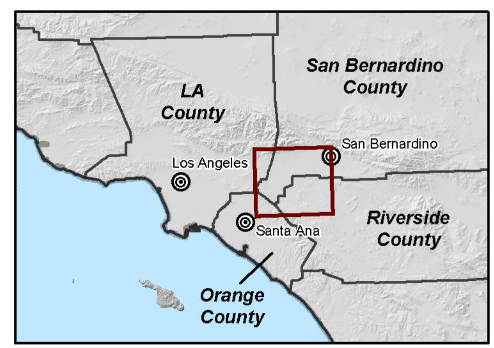
Location Concealed

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



Projected Groundwater Elevations for Layer 1

Baseline Alternative in 2035

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0 1 2 3 4 Miles

0 2 4 6 KM

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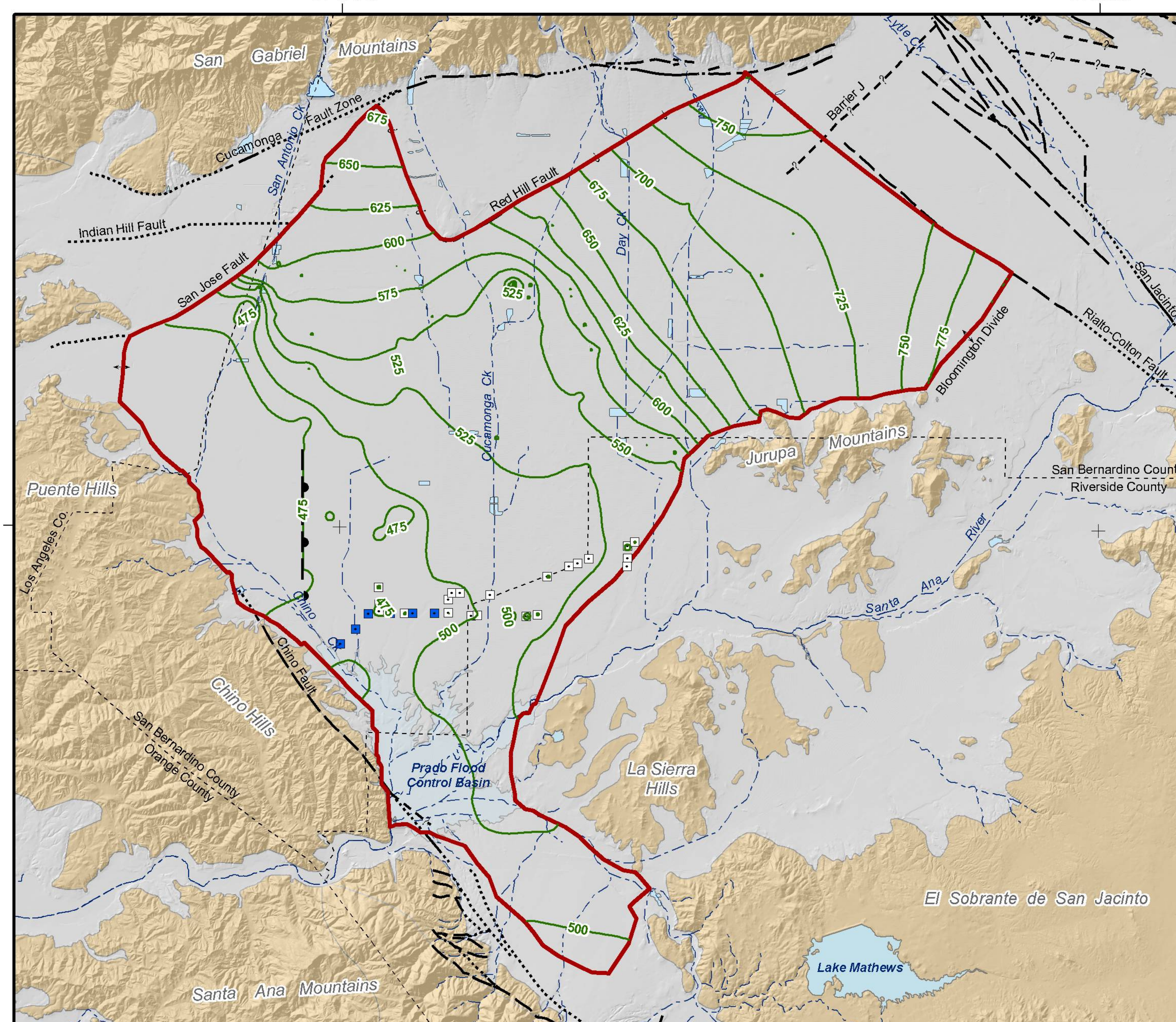
Western Municipal Water District

Three Valleys Municipal Water District

Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Figure 8a



Groundwater Elevation Contours (*feet above mean sea-level*)

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

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Faults

Location Certain

Location Approximate

Location Concealed

Location Uncertain

Approximate Location of Groundwater Barrier

Other Features

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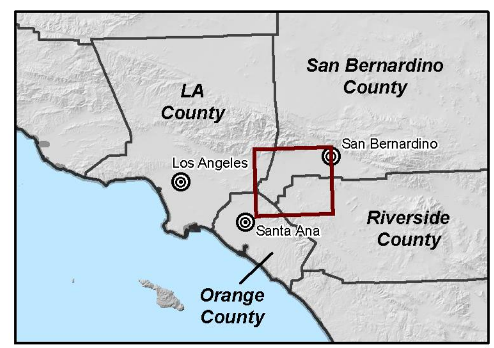

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0 1 2 3 4 Miles

0 2 4 6 KM

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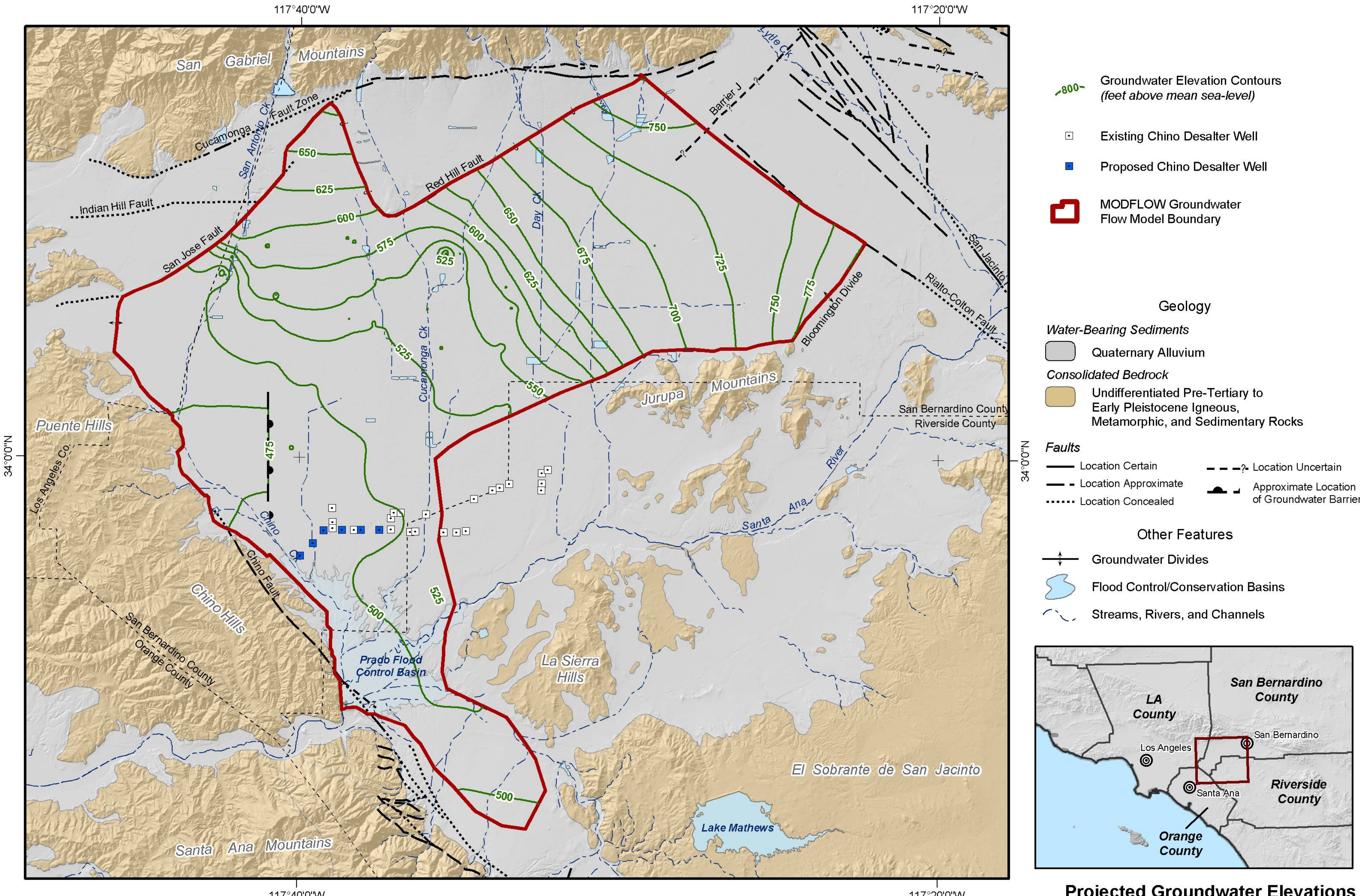
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 2

Baseline Alternative in 2035

Figure 8b



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0 1 2 3 4 Miles
0 2 4 6 KM

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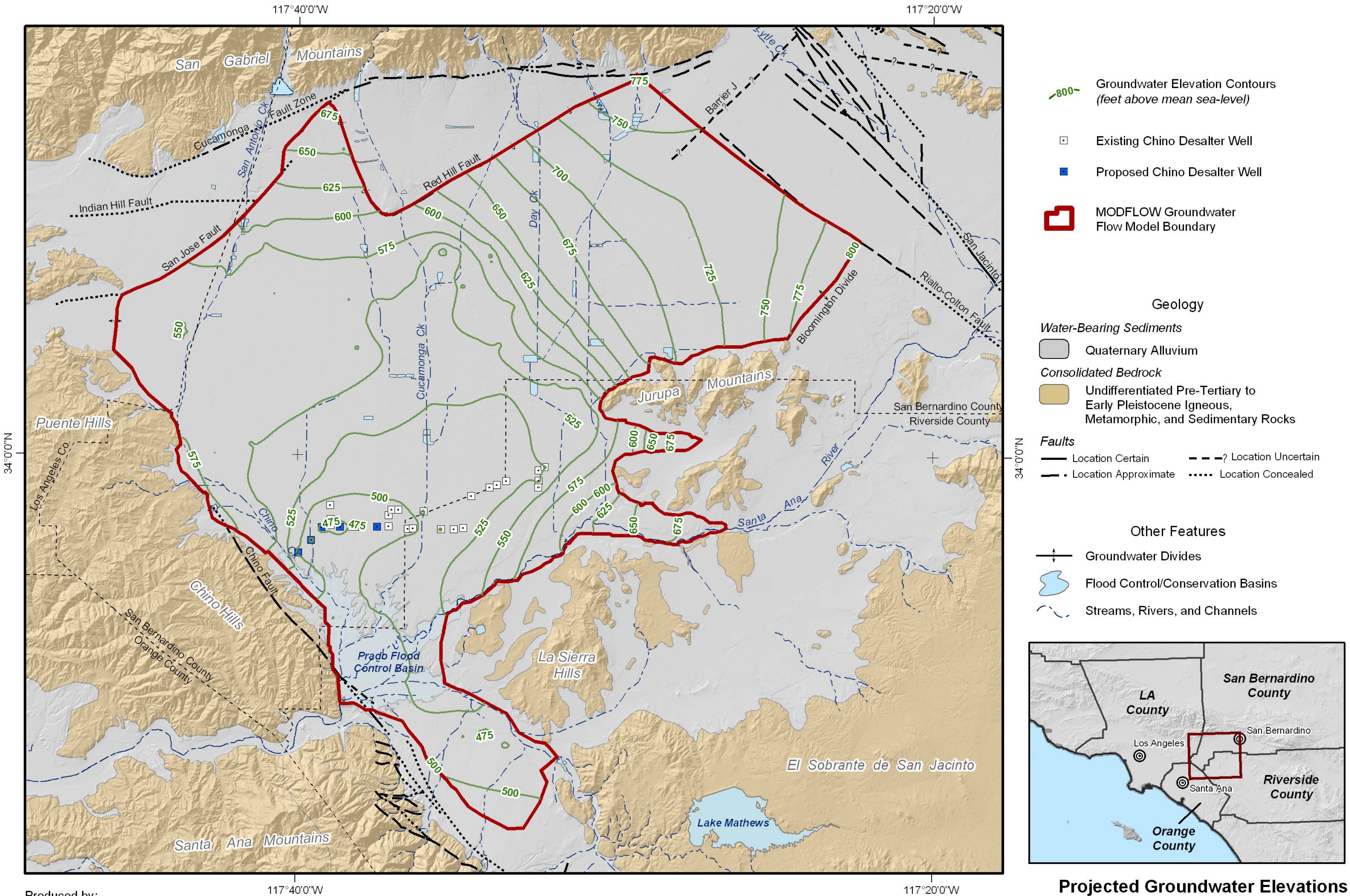
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 3

Baseline Alternative in 2035

Figure 8c



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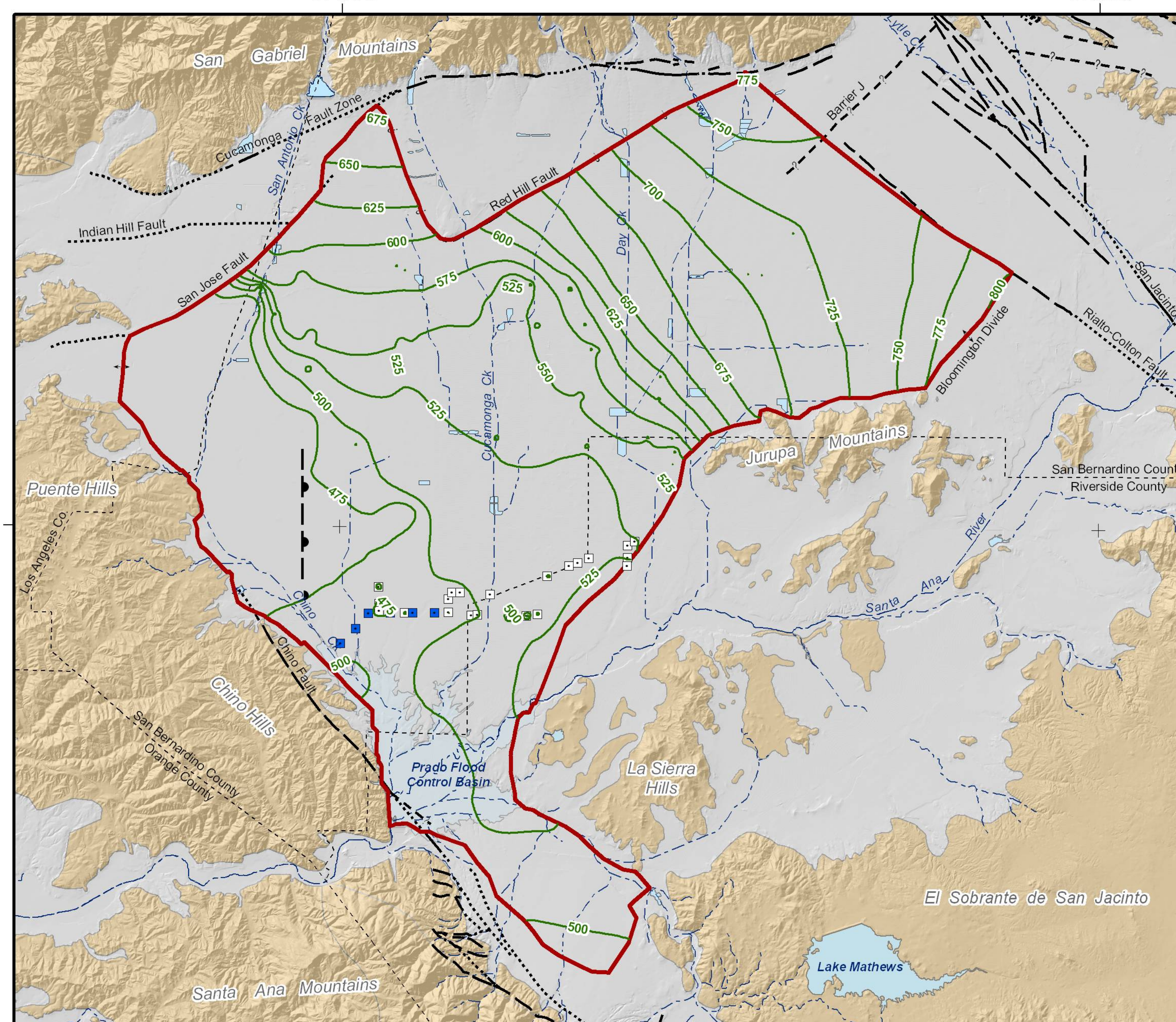
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 1

Alternative 1 in 2030

Figure 9a



Groundwater Elevation Contours (feet above mean sea-level)

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Concealed

Location Uncertain

Approximate Location of Groundwater Barrier

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels

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Date: 20081024

File: Figure_9b.mxd

0 1 2 3 4 Miles

0 2 4 6 KM

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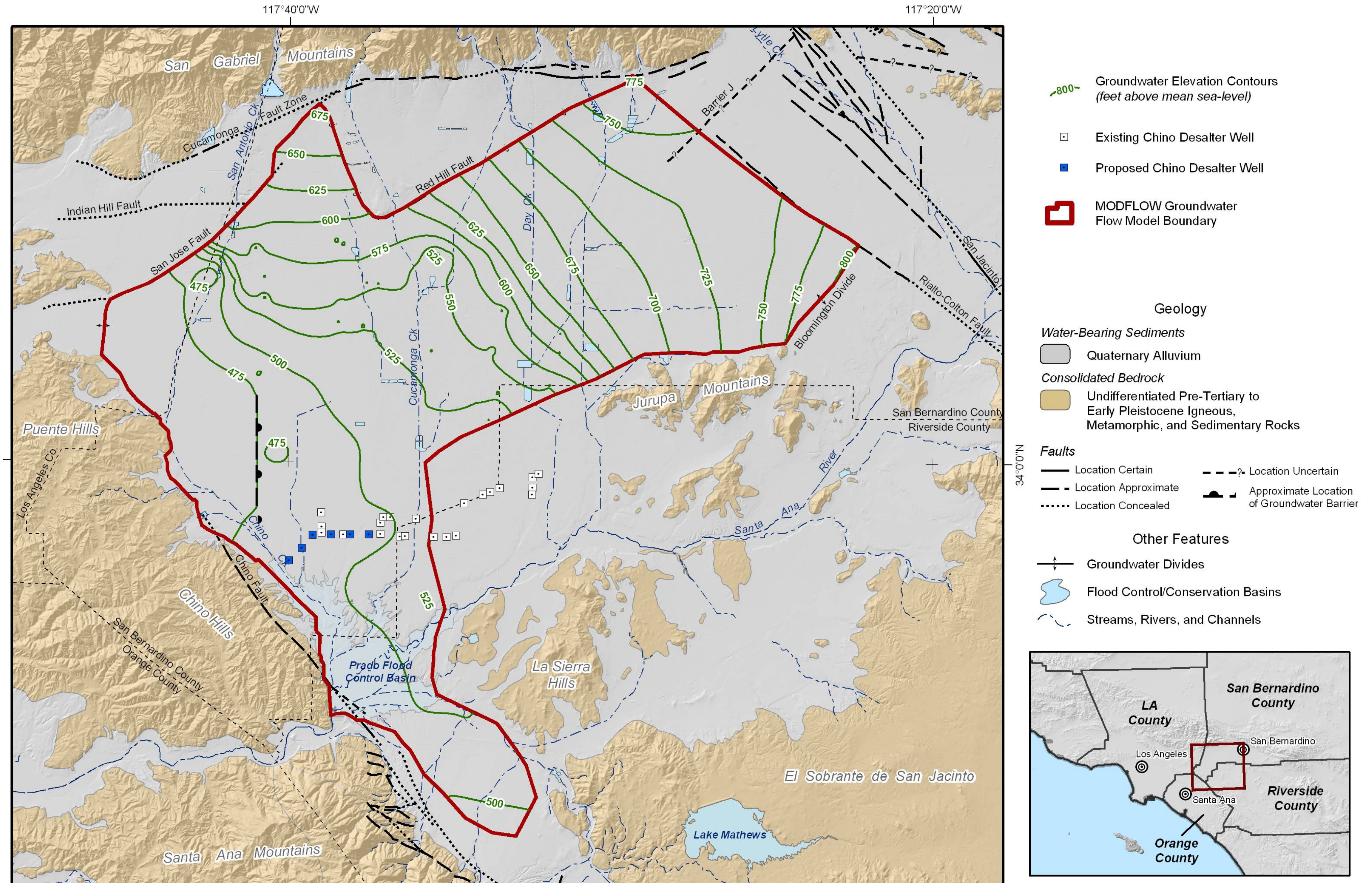
Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Projected Groundwater Elevations for Layer 2

Alternative 1 in 2030

Figure 9b



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File: Figure_9c.mxd

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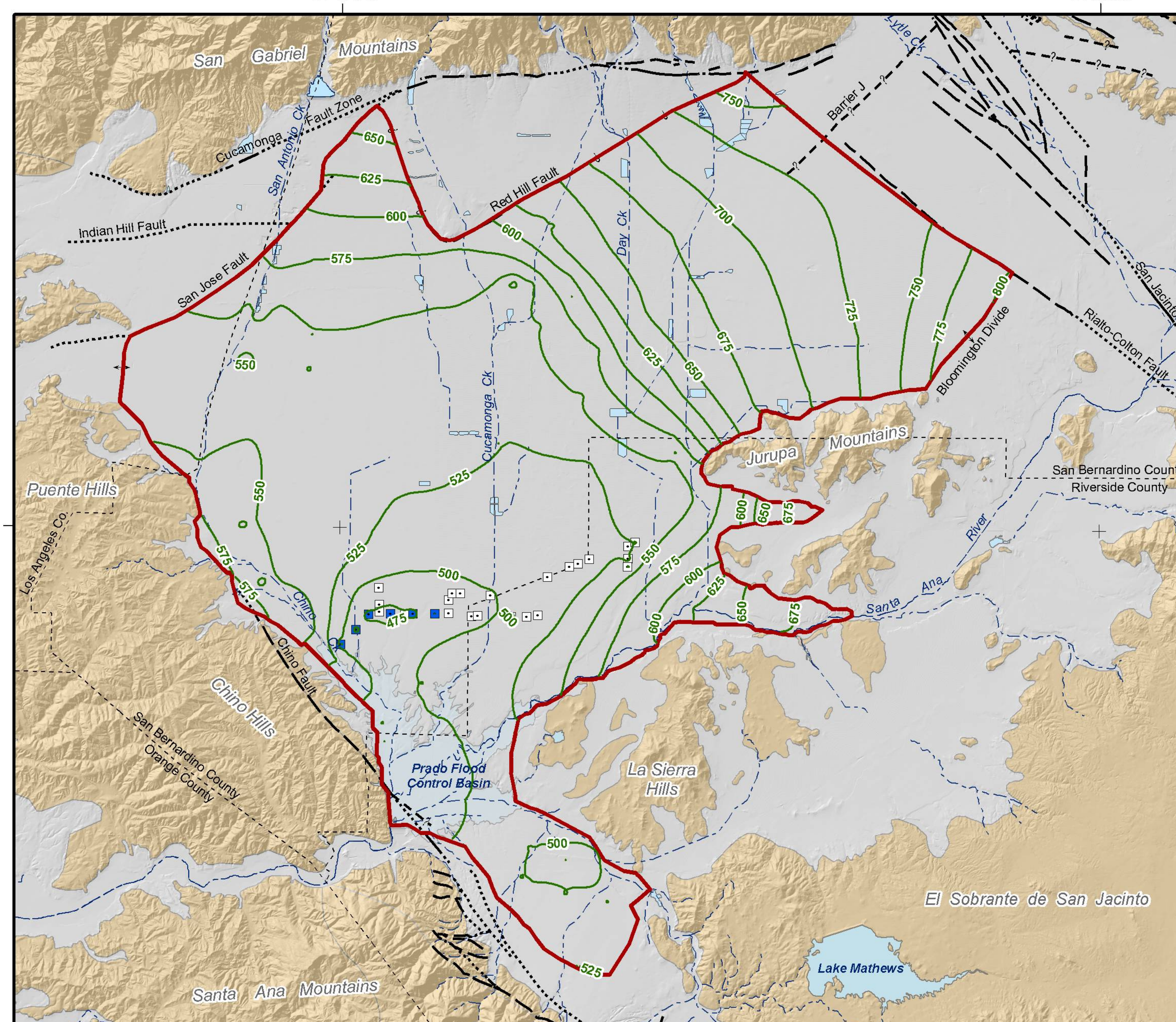
Three Valleys Municipal Water District
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 3

Alternative 1 in 2030

Figure 9c



Groundwater Elevation Contours *(feet above mean sea-level)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Uncertain

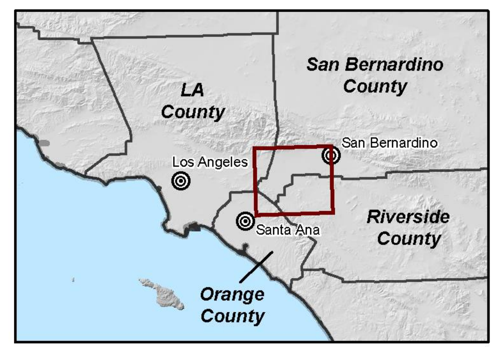
Location Concealed

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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File: Figure_10a.mxd

0 1 2 3 4 *Miles*

0 2 4 6 *KM*

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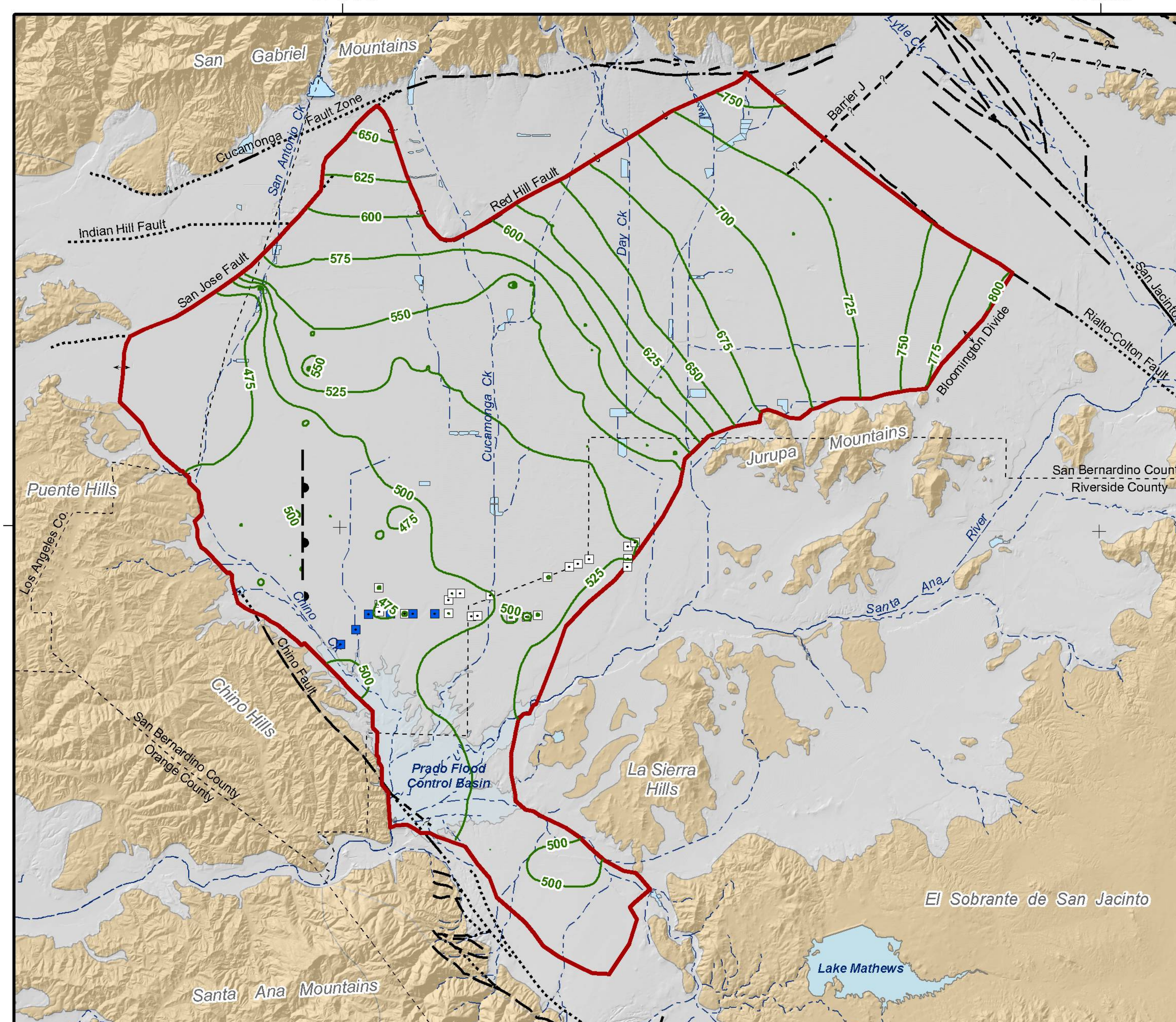
Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Projected Groundwater Elevations for Layer 1

Alternative 2 in 2021

Figure 10a



Groundwater Elevation Contours (feet above mean sea-level)

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Concealed

Location Uncertain

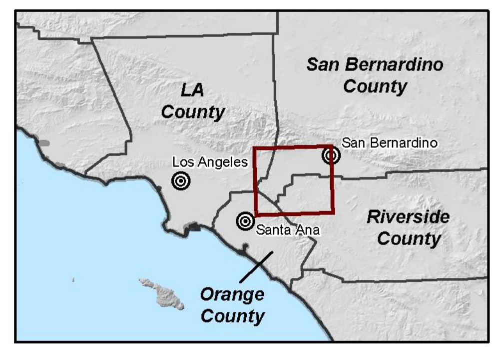
Approximate Location of Groundwater Barrier

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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Date: 20081024

File: Figure_10b.mxd

0 1 2 3 4 Miles

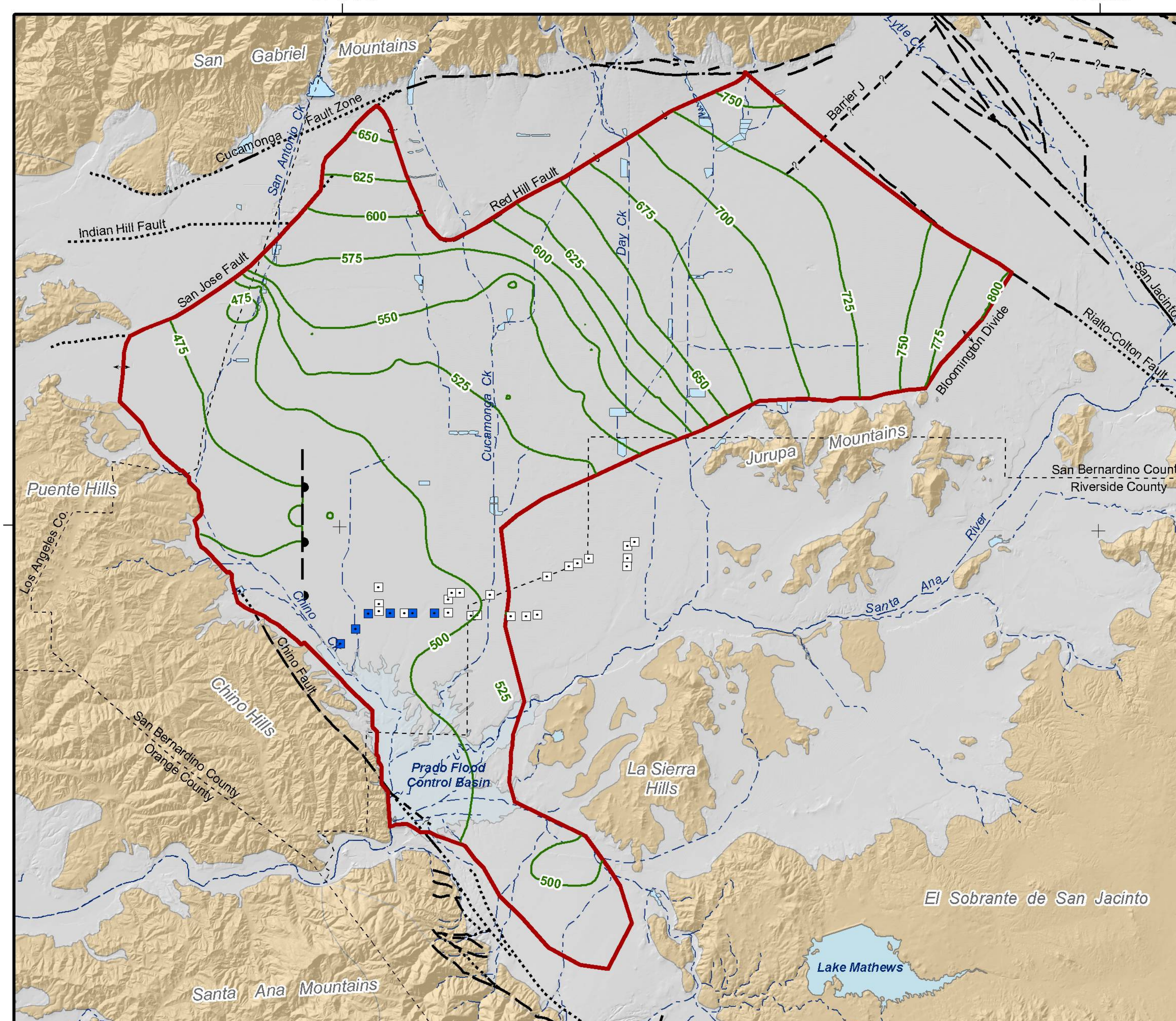
0 2 4 6 KM

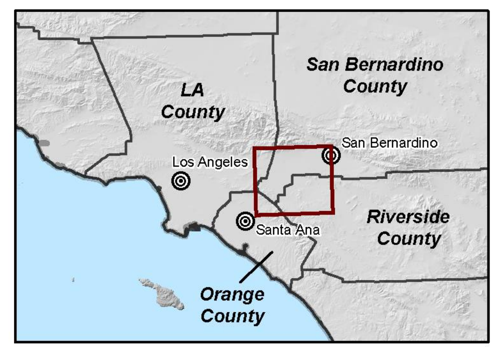
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

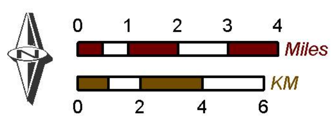
Projected Groundwater Elevations for Layer 2

Alternative 2 in 2021

Figure 10b







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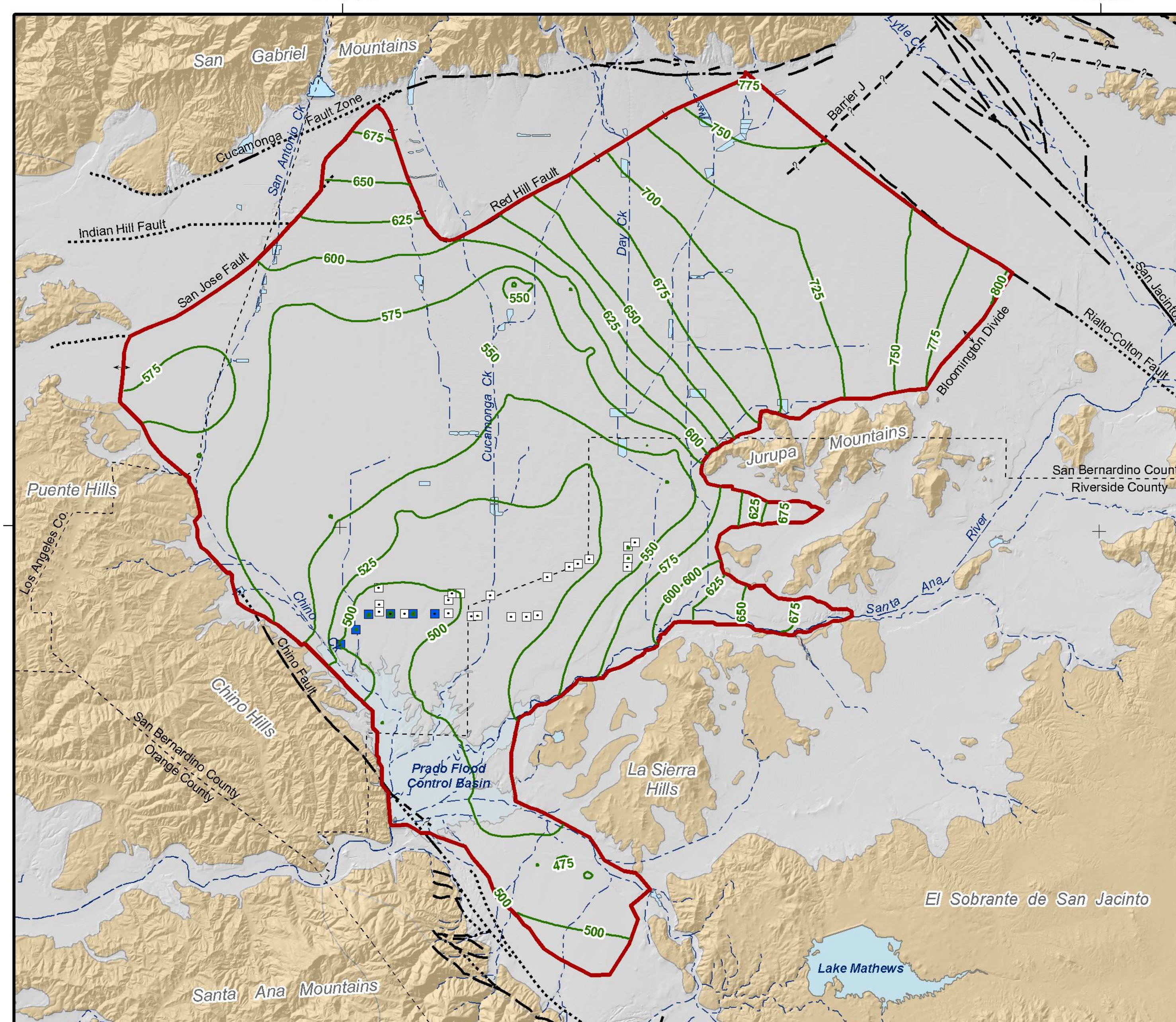
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 3

Alternative 2 in 2035

Figure 10c



~800~ Groundwater Elevation Contours *(feet above mean sea-level)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

? Location Uncertain

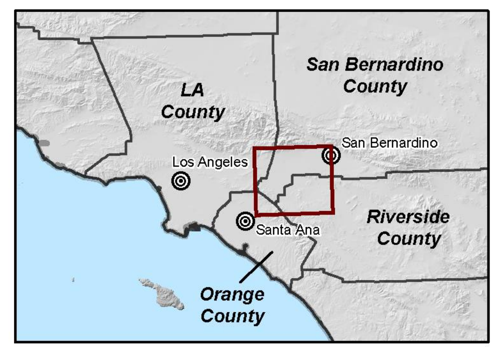
Location Concealed

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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0 1 2 3 4 Miles

0 2 4 6 KM

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Inland Empire Utilities Agency

Western Municipal Water District

Three Valleys Municipal Water District

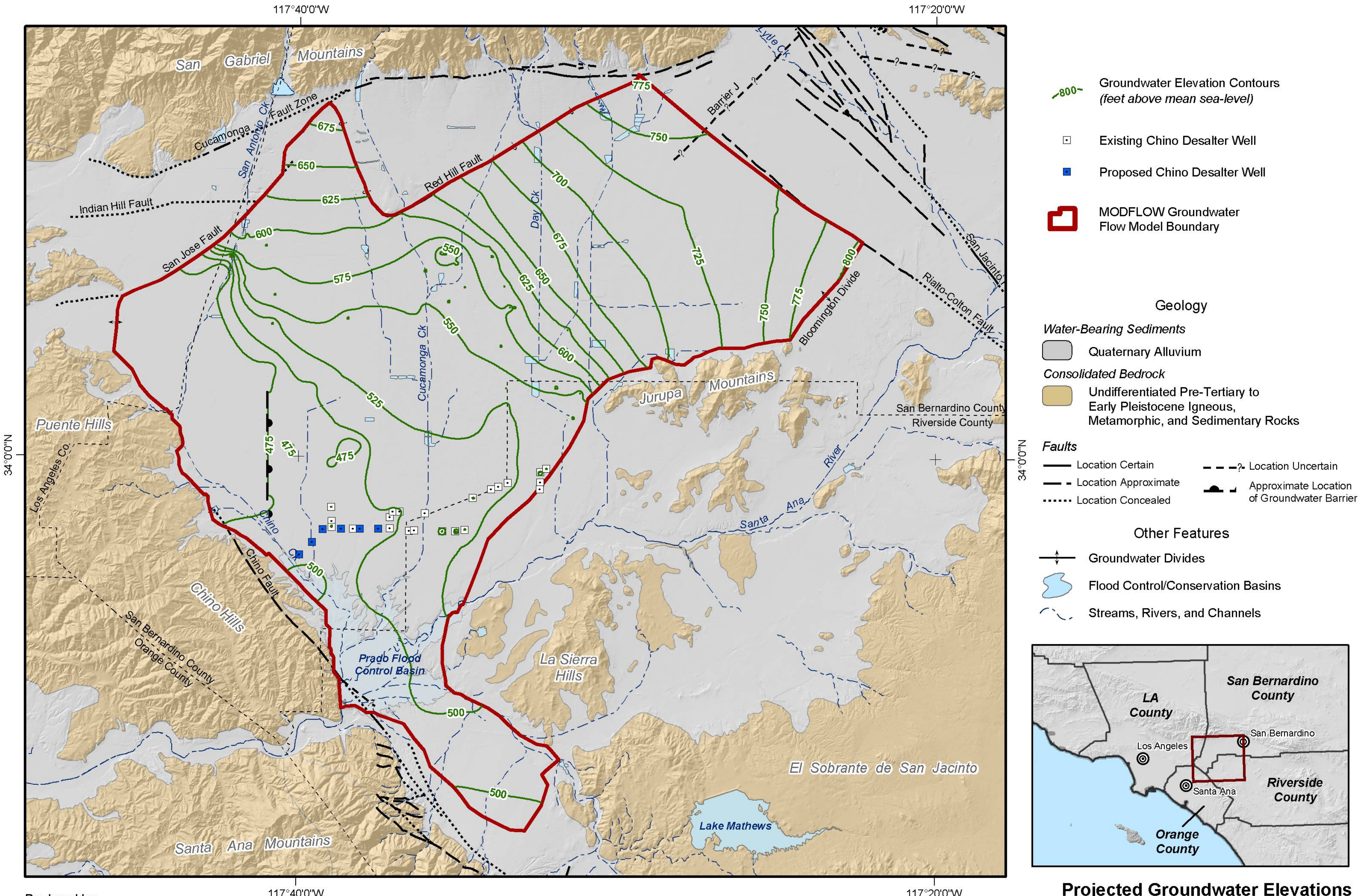
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 1

Alternative 3 in 2030

Figure 11a



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0 1 2 3 4 Miles
0 2 4 6 KM

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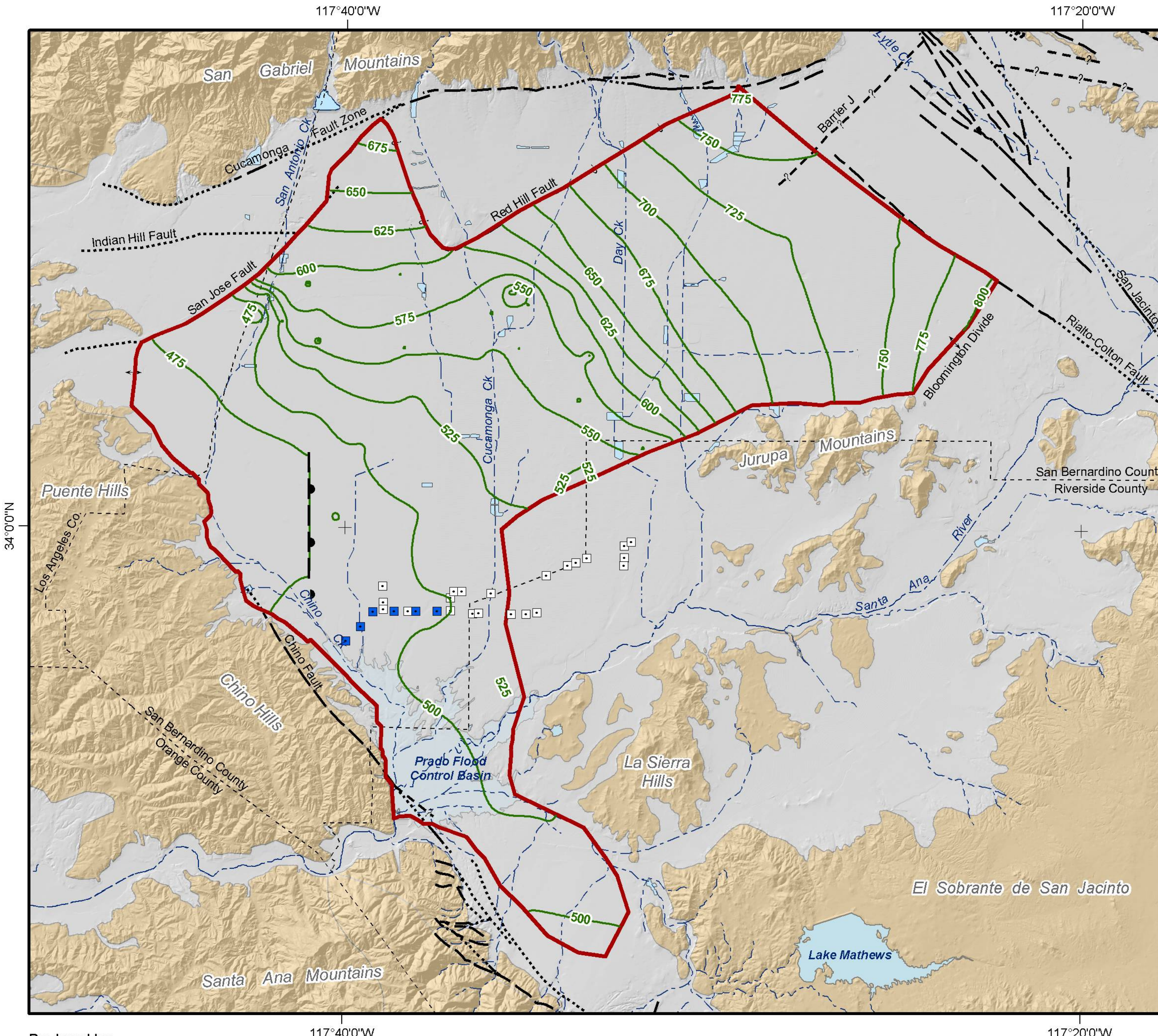
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 2

Alternative 3 in 2030

Figure 11b



800 Groundwater Elevation Contours *(feet above mean sea-level)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

Location Concealed

Location Uncertain

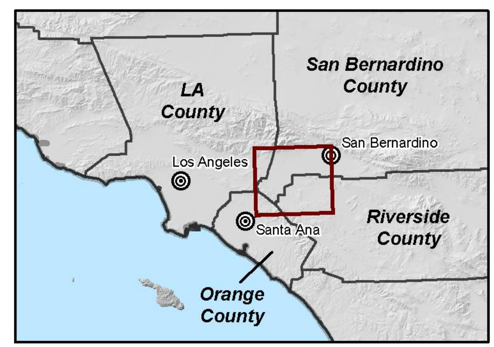
Approximate Location of Groundwater Barrier

Other Features

Groundwater Divides

Flood Control/Conservation Basins

Streams, Rivers, and Channels



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0 1 2 3 4 Miles
0 2 4 6 KM

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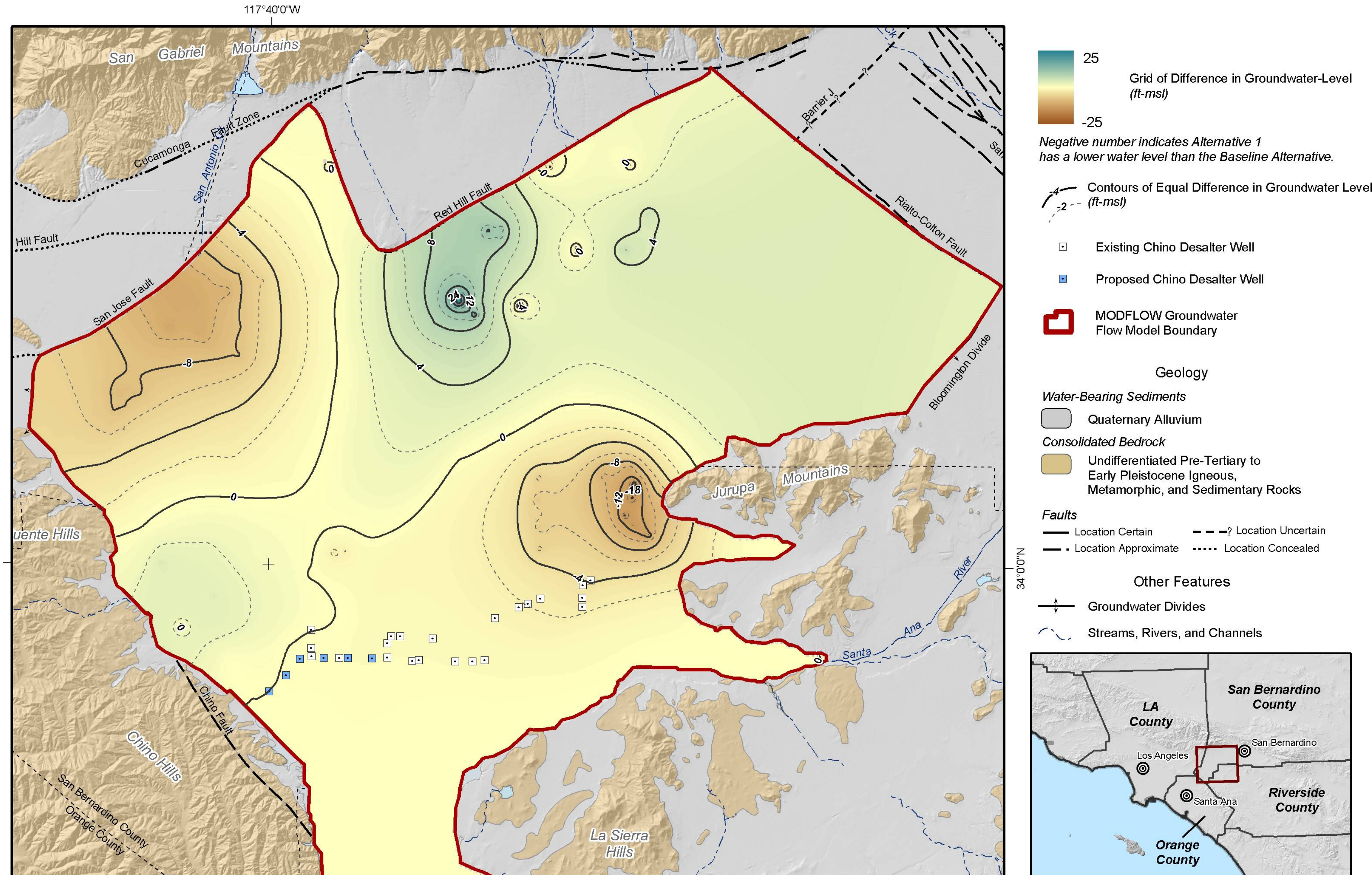
Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Projected Groundwater Elevations for Layer 3

Alternative 3 in 2030

Figure 11c



Difference in Groundwater Elevations for Layer 1

Baseline - Alternative 1 -- 2030

Figure 12a

Chino Basin Dry-Year Yield Program Expansion Impact Analysis

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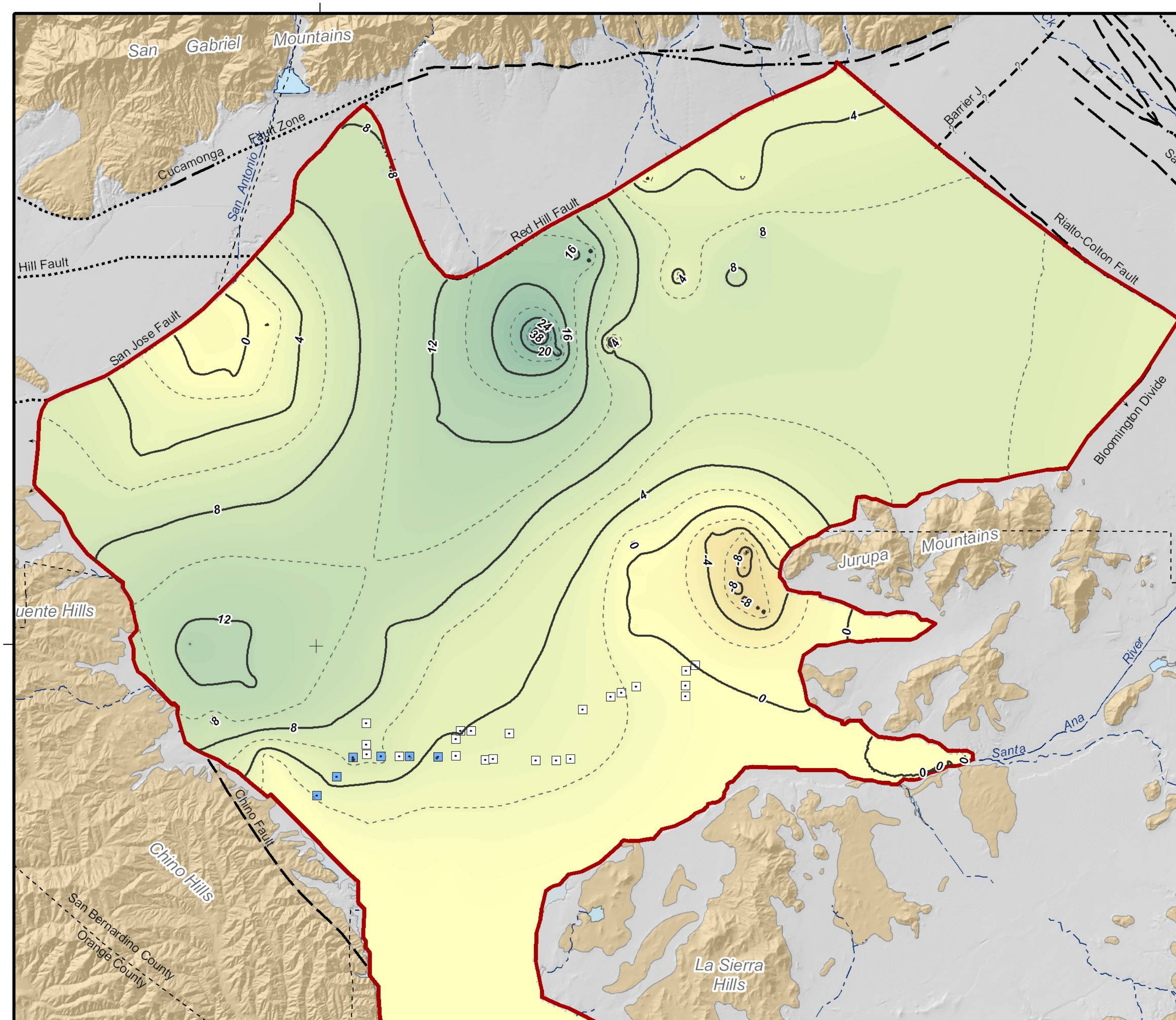
File: Figure_12a.mxd



40
-40
Grid of Difference in Groundwater-Level *(ft-msl)*

Negative number indicates Alternative 2 has a lower water level than the Baseline Alternative.

Contours of Equal Difference in Groundwater Level *(ft-msl)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain
Location Approximate
Location Uncertain
Location Concealed

Other Features

Groundwater Divides

Streams, Rivers, and Channels

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0 1 2 3 4 Miles
0 2 4 6 KM

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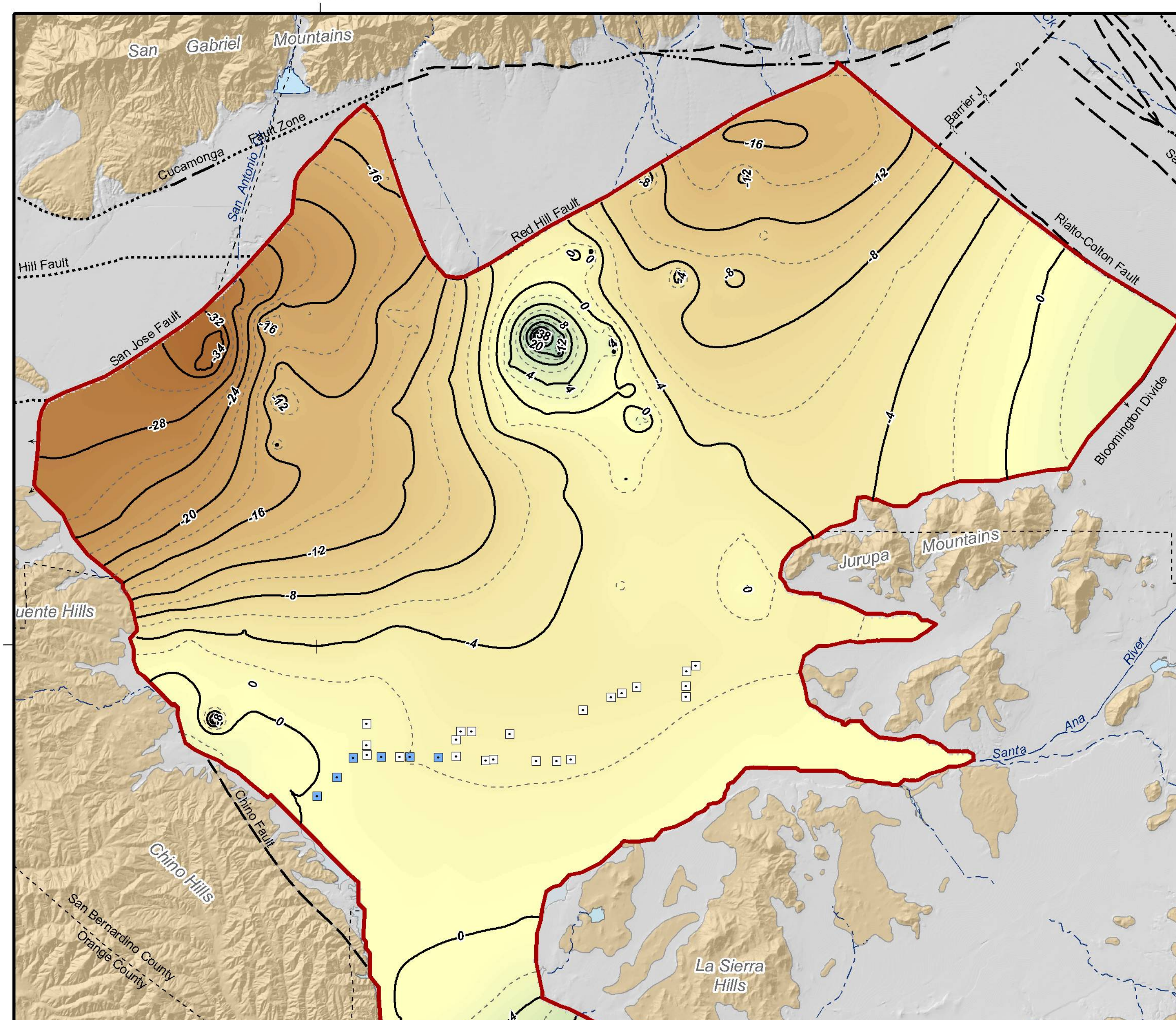
Western Municipal Water District
Three Valleys Municipal Water District
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Difference in Groundwater Elevations for Layer 1

Baseline - Alternative 3 -- 2030

Figure 12b



40

-40

Grid of Difference in Groundwater-Level *(ft-msl)*

Negative number indicates Alternative 2 in 2021 has a lower water level than the Baseline Alternative in 2030.

Contours of Equal Difference in Groundwater Level *(ft-msl)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

?Location Uncertain

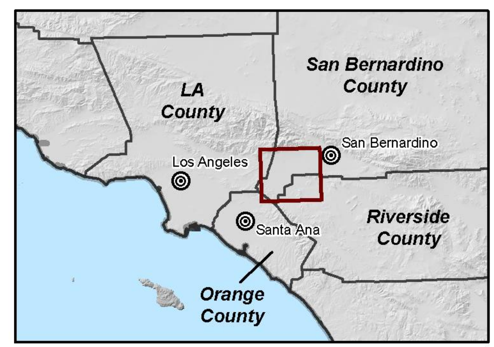
Location Approximate

Location Concealed

Other Features

Groundwater Divides

Streams, Rivers, and Channels



Difference in Groundwater Elevations for Layer 1

Baseline 2030 - Alternative 2 2021

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Date: 20081024

File: Figure_12c.mxd

0 1 2 3 4 Miles

0 2 4 6 KM

BLACK & VEATCH Corporation

Inland Empire Utilities Agency

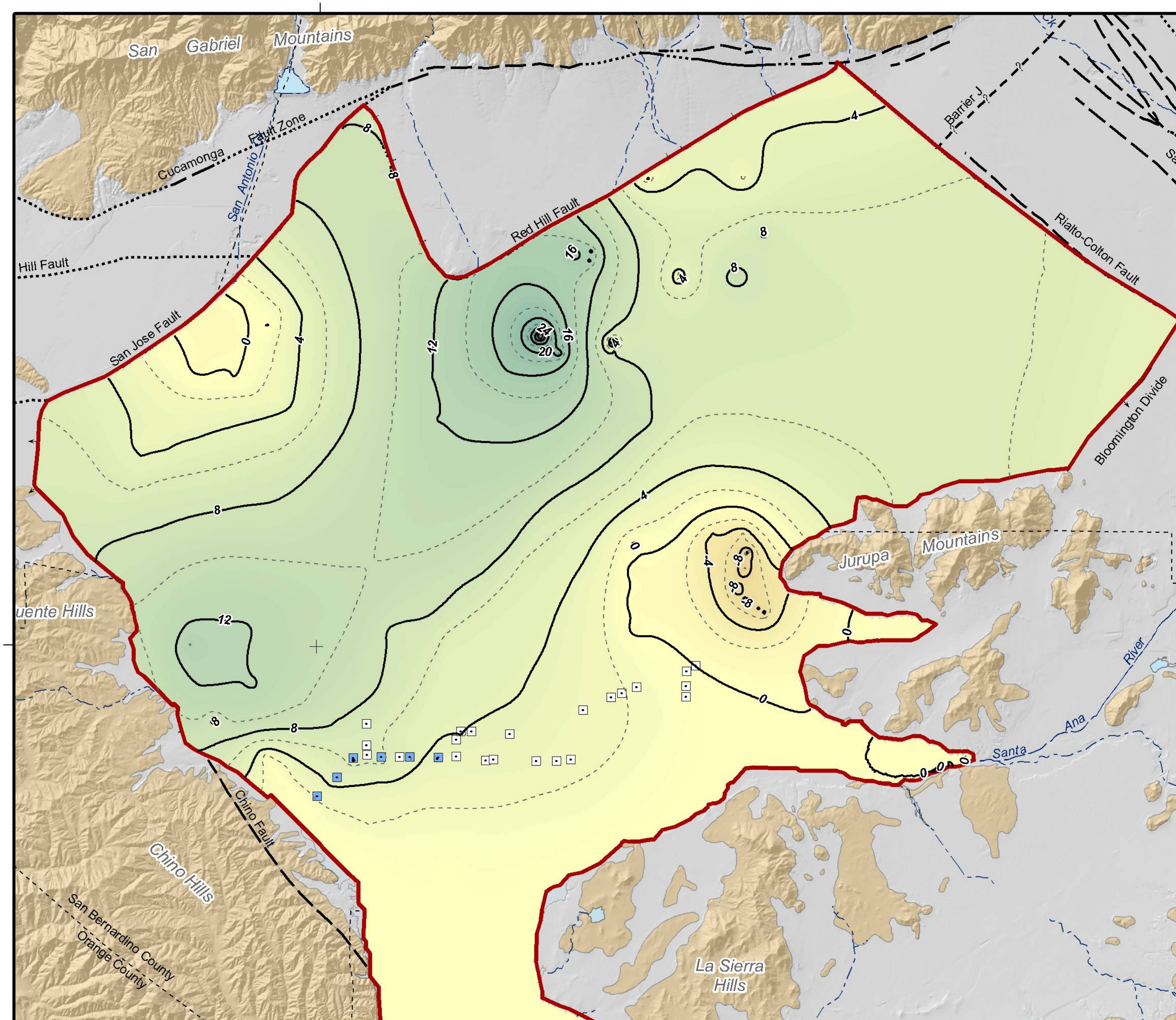
Western Municipal Water District

Three Valleys Municipal Water District

Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Figure 12c



25

-25

Grid of Difference in Groundwater-Level *(ft-msl)*

Negative number indicates Alternative 3 has a lower water level than the Baseline Alternative.

Contours of Equal Difference in Groundwater Level *(ft-msl)*

Existing Chino Desalter Well

Proposed Chino Desalter Well

MODFLOW Groundwater Flow Model Boundary

Geology

Water-Bearing Sediments

Quaternary Alluvium

Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Faults

Location Certain

Location Approximate

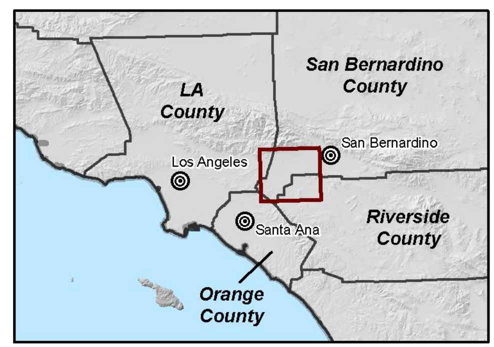
? Location Uncertain

Location Concealed

Other Features

Groundwater Divides

Streams, Rivers, and Channels



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File: Figure_12d.mxd

0 1 2 3 4 Miles

0 2 4 6 KM

BLACK & VEATCH Corporation

Inland Empire Utilities Agency

Western Municipal Water District

Three Valleys Municipal Water District

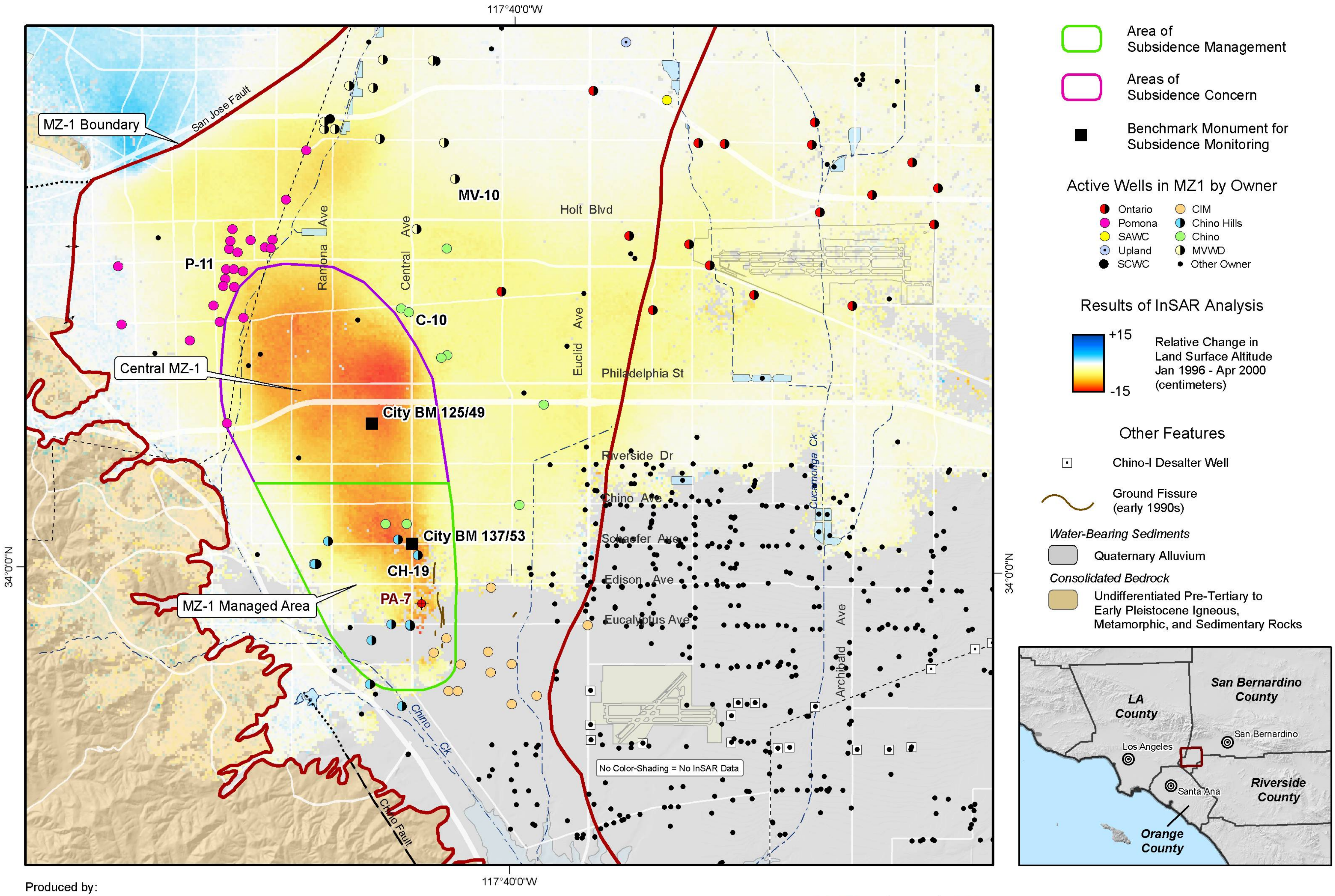
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Difference in Groundwater Elevations for Layer 1

Baseline - Alternative 2 -- 2030

Figure 12d



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File: Figure_13.mxd

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Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Subsidence Area in MZ1

Figure 13

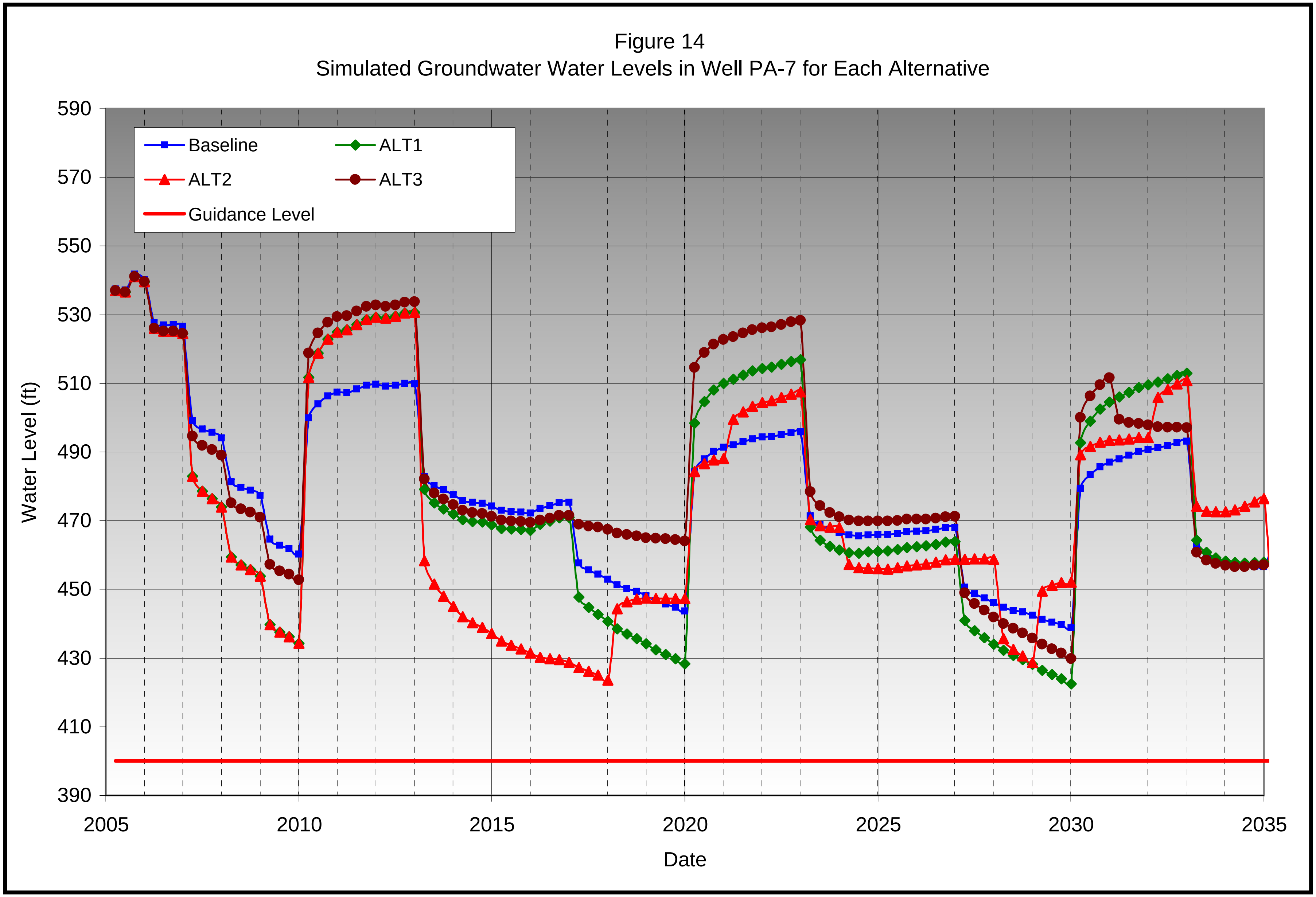

Figure 6 and Figure 14.xls

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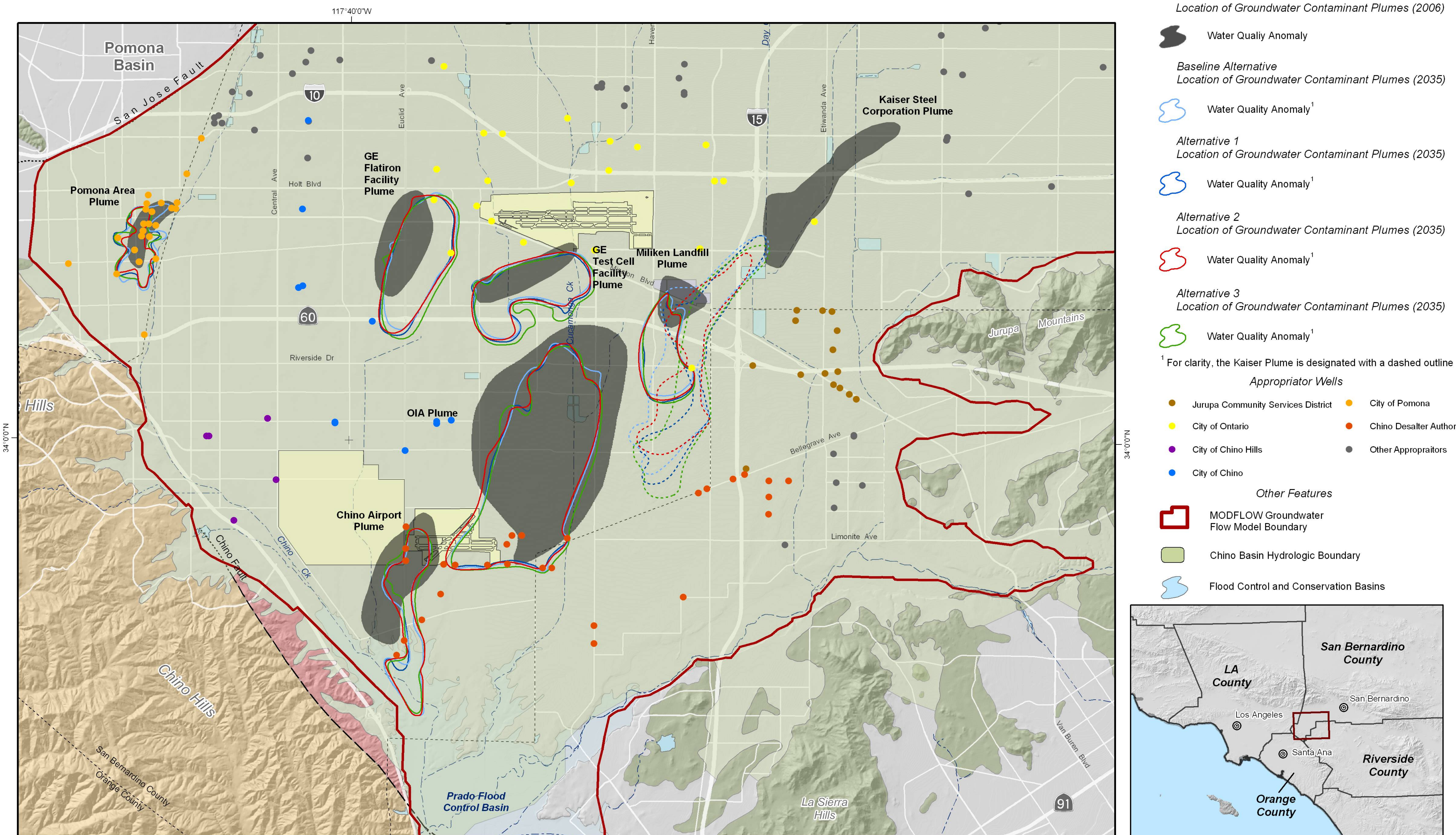

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Date: 20081211
File: Figure_15

0 1 2 3 Miles
0 2 4 KM

BLACK & VEATCH Corporation

Inland Empire Utilities Agency

Western Municipal Water District

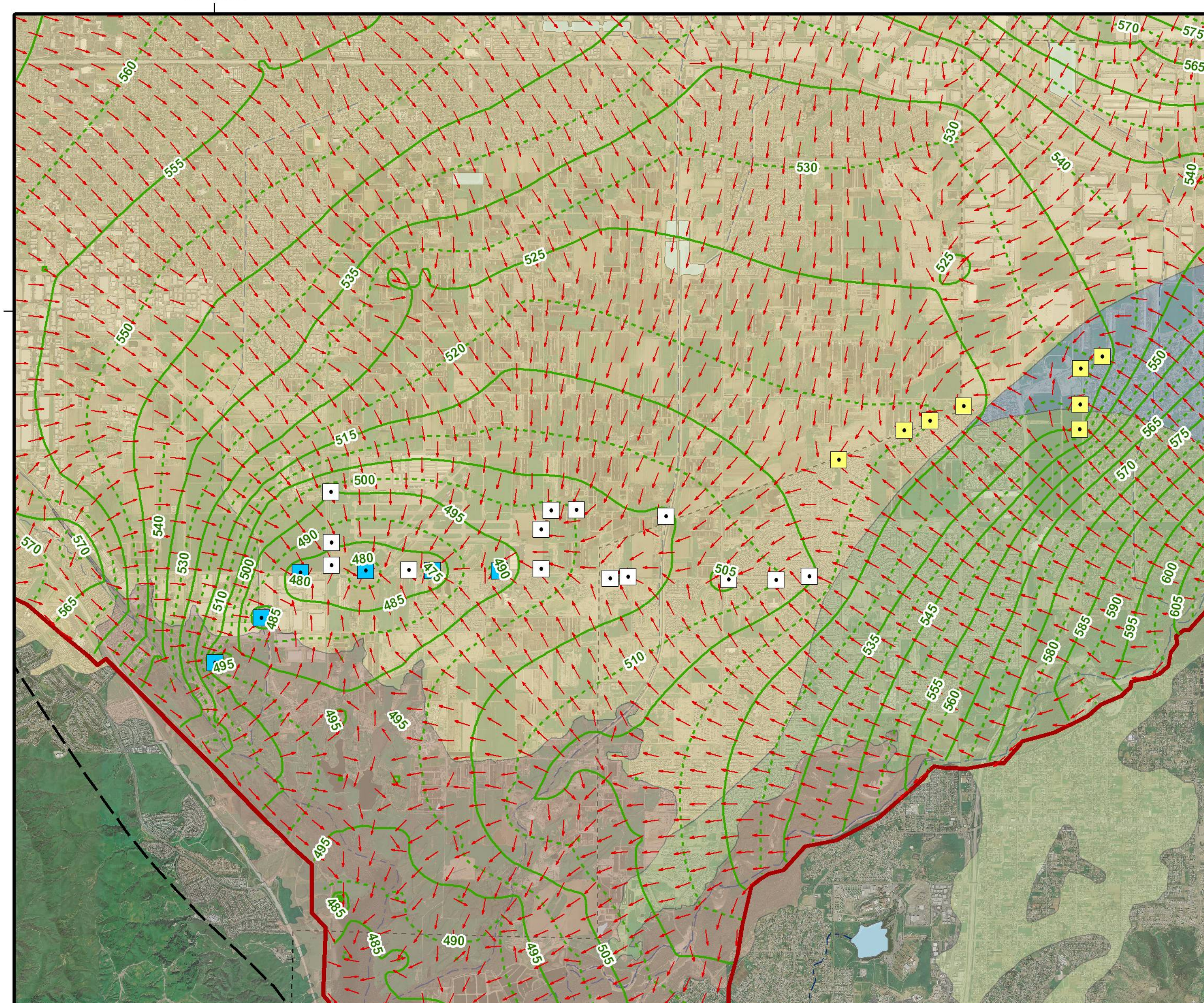
Three Valleys Municipal Water District

Chino Basin Watermaster — Partners in Basin Management

Estimated Location of Water Quality Anomalies in 2006 and their Projected Locations in 2035

Figure 15

Chino Basin Dry-Year Yield Program Expansion
Impact Analysis



Groundwater Elevation Contours (feet above mean sea-level)

Existing Chino 1 Desalter Well

Existing Chino 2 Desalter Well

Proposed Chino Creek Well

Groundwater Flow Direction

Other Features

Groundwater Management Zone

Chino-East

Chino-North

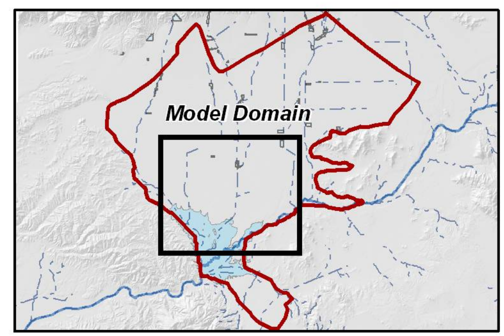
Chino-South

Prado Basin

MODFLOW Groundwater Flow Model Boundary

Flood Control and Conservation Basins

Streams, Rivers, and Flood Control Channels



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Date: 20081024

File: Figure_16a.mxd

0 1 2 Miles

0 1 2 3 KM

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Inland Empire Utilities Agency

Western Municipal Water District

Three Valleys Municipal Water District

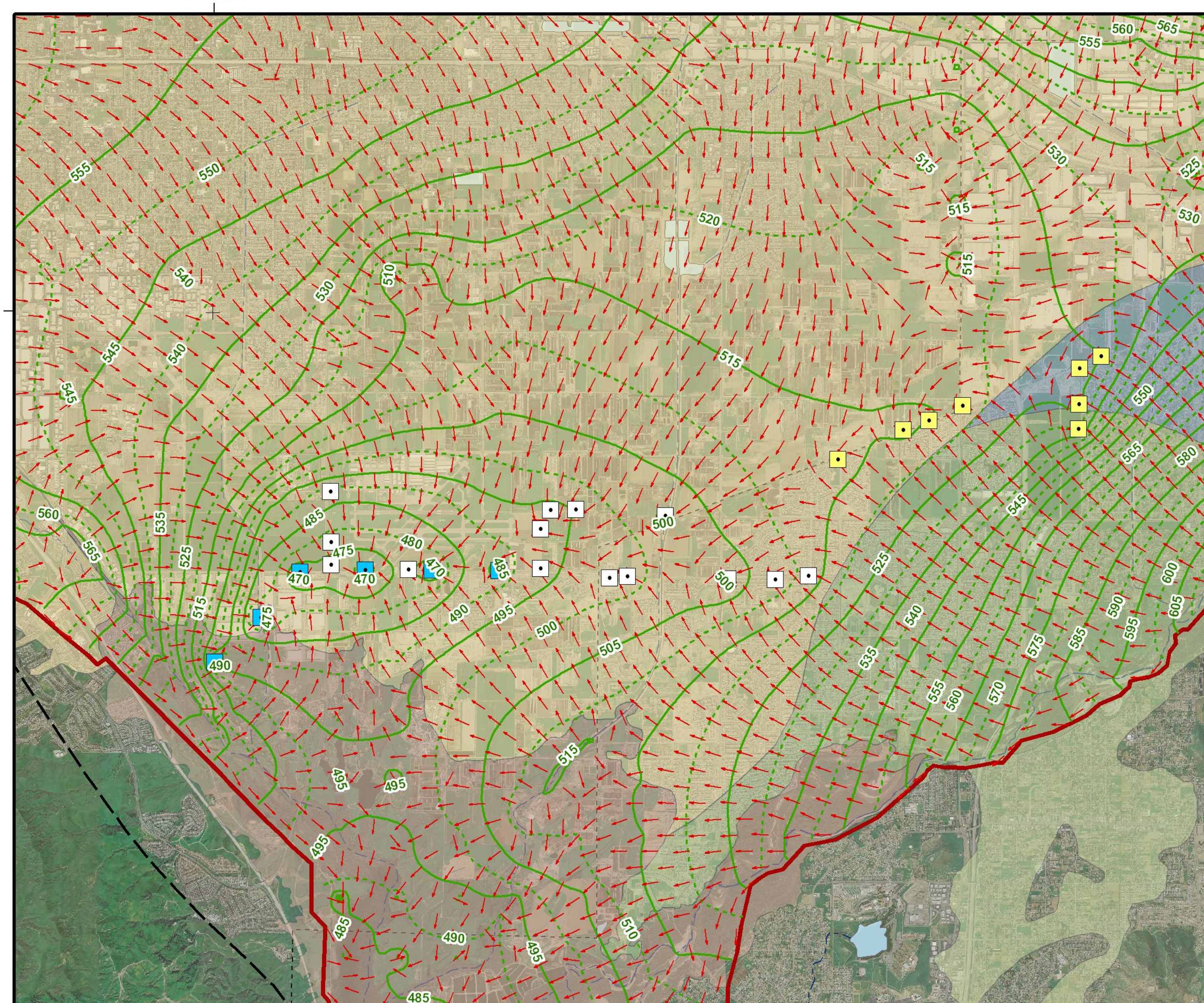
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Groundwater Elevation Contours and Flow Direction in the Vicinity of the Desalters

Baseline Alternative in Layer 1 -- 2023

Figure 16a



Groundwater Elevation Contours (feet above mean sea-level)

800
775

Existing Chino 1 Desalter Well

Existing Chino 2 Desalter Well

Proposed Chino Creek Well

Groundwater Flow Direction

Other Features

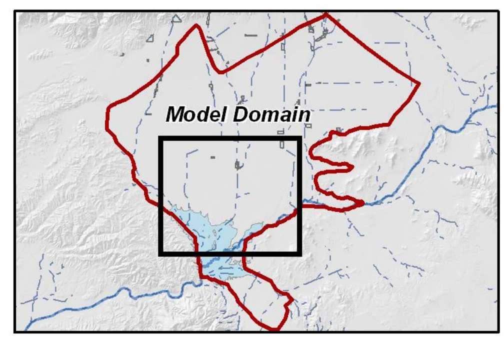
Groundwater Management Zone

Chino-East
Chino-South
Chino-North
Prado Basin

MODFLOW Groundwater Flow Model Boundary

Flood Control and Conservation Basins

Streams, Rivers, and Flood Control Channels



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Author: MJC
Date: 20081024
File: Figure_16b.mxd

0 1 2 Miles
0 1 2 3 KM

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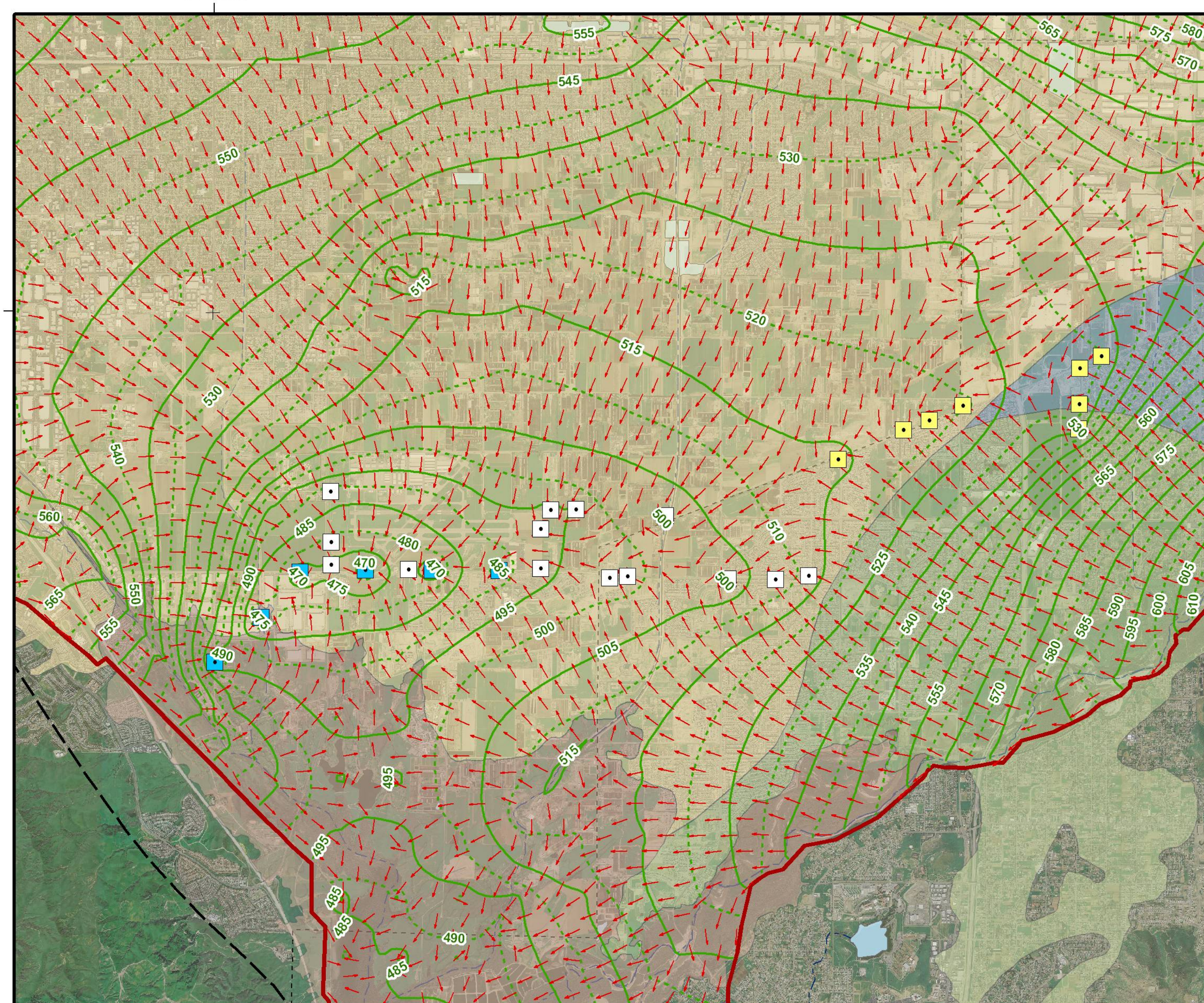
Inland Empire Utilities Agency
Western Municipal Water District
Three Valleys Municipal Water District
Chino Basin Watermaster

Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Groundwater Elevation Contours and Flow Direction in the Vicinity of the Desalters

Alternative 1 in Layer 1 -- 2030

Figure 16b



Groundwater Elevation Contours (feet above mean sea-level)

Existing Chino 1 Desalter Well

Existing Chino 2 Desalter Well

Proposed Chino Creek Well

Groundwater Flow Direction

Other Features

Groundwater Management Zone

Chino-East

Chino-South

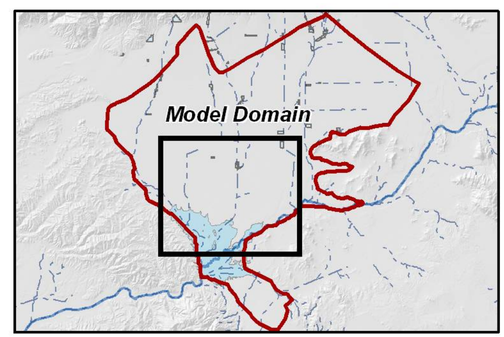
Chino-North

Prado Basin

MODFLOW Groundwater Flow Model Boundary

Flood Control and Conservation Basins

Streams, Rivers, and Flood Control Channels



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File: Figure_16c.mxd

0 1 2 Miles

0 1 2 3 KM

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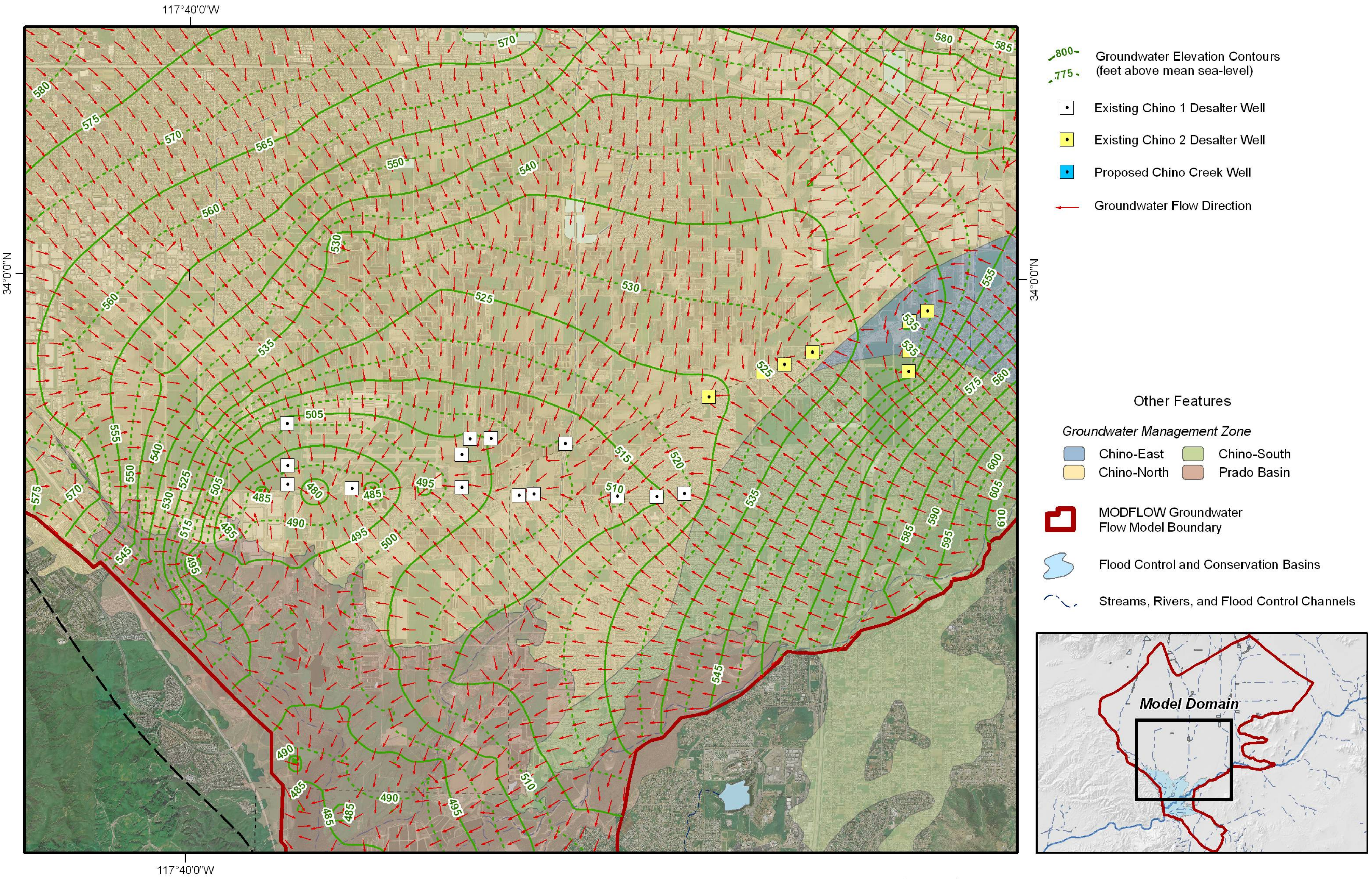
Chino Basin Dry-Year Yield Program Expansion Impact Analysis

Groundwater Elevation Contours and Flow Direction in the Vicinity of the Desalters

Alternative 2 in Layer 1 -- 2035

Figure 16c



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File: Figure_16d.mxd

0 1 2 Miles
0 1 2 3 KM

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Chino Basin Dry-Year Yield Program Expansion
Impact Analysis

Groundwater Elevation Contours and Flow Direction in the Vicinity of the Desalters

Alternative 3 in Layer 1 -- 2025

Figure 16d