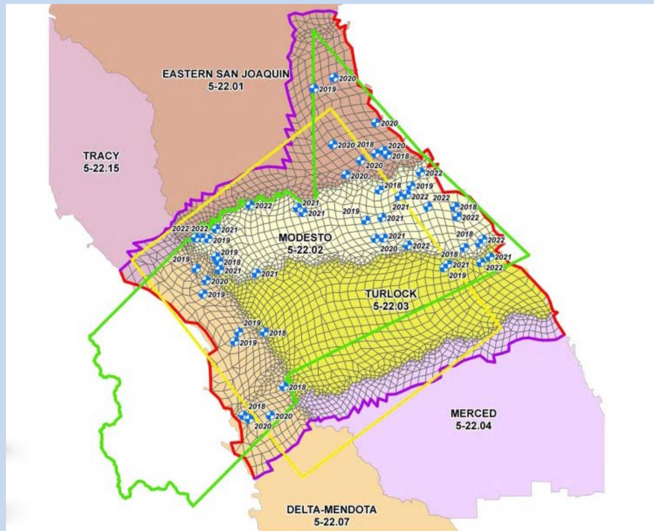

FINAL PROGRAM ENVIRONMENTAL IMPACT REPORT

SCH #2016102005

Discretionary Well Permitting and Management Program
Stanislaus County, California

June 2018

Prepared for:
Stanislaus County Department of Environmental Resources
3800 Cornucopia Way, Suite C, Modesto, California 95358

Prepared by:

JACOBSON | JAMES
& associates, inc

TETRA TECH

FINAL PROGRAM ENVIRONMENTAL IMPACT REPORT

for the

Stanislaus County Discretionary Well Permitting and Management Program

June 11, 2018

Prepared for:

Stanislaus County
Department of Environmental Resources
3800 Cornucopia Way, Suite C
Modesto, California 95358

Prepared by:

Jacobson James & Associates, Inc.
9083 Foothills Boulevard, Suite 370
Roseville, California 95747

and

Tetra Tech, Inc.
1999 Harrison Street, Suite 500
Oakland, California 94612

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1.0 INTRODUCTION

1.1 Background

This document comprises the Final Program Environmental Impact Report for the Stanislaus County Discretionary Well Permitting and Management Program (Final PEIR). The Stanislaus County Department of Environmental Resources (SCDER) is the Lead Agency for this project. A Draft Program Environmental Impact Report for the Discretionary Well Permitting and Management Program (Draft PEIR; SCH #2016102005) was released for public comment on March 23, 2018. The 45-day public review period for the Draft PEIR ended on May 7, 2018.

This Final PEIR document was prepared in accordance with the California Environmental Quality Act (CEQA), and together with the Draft PEIR and appendices reflects Stanislaus County's independent review and judgment, and constitutes the environmental basis for current and subsequent discretionary actions to be undertaken by SCDER for the implementation of the discretionary well permitting and management program.

1.2 Purpose

The Final PEIR was prepared pursuant to the requirements of CEQA and the CEQA Guidelines. CEQA Guidelines Section 15132 specifies the content of a Final EIR as:

- The Draft EIR or a revision of the Draft EIR;
- Comments and recommendations received on the Draft EIR, either verbatim or in summary;
- A list of persons, organizations, and the public agencies commenting on the Draft EIR;
- The responses of the Lead Agency to significant environmental points raised in the review and consultation process; and
- Any other information added by the Lead Agency.

1.3 PEIR Summary

The primary action evaluated in the PEIR is the future issuance of permits for wells that are not exempt from the Stanislaus County Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code), prior to adoption of Groundwater Sustainability Plans (GSPs) under the California Sustainable Groundwater Monitoring Act (SGMA). The initial terms for groundwater extraction under the permits will extend until GSPs are adopted. The permits will be renewed in five-year increments coinciding with the required update cycles for the GSPs, and the permit conditions will be updated as needed for consistency with the GSPs during each permit term.

The PEIR also addresses potential actions by the County after GSPs are adopted, pertaining to wells located in unincorporated areas found to be extracting groundwater unsustainably in violation of the Ordinance. Under SGMA, Groundwater Sustainability Agencies (GSAs) will be required to regulate groundwater extraction within their jurisdictions to assure that the sustainability goals adopted in their GSPs are being met, and if a GSA fails to fulfill this obligation, the State is expected to intervene. Therefore, it may be presumed that the need for action by the County to regulate wells after GSPs are adopted will be relatively rare, or never occur.

The Draft PEIR, provided as Attachment 1, is hereby incorporated into the Final PEIR by reference. This Final PEIR, when combined with the Draft PEIR, constitutes the complete environmental review document for the Project.

The remainder of the report sections are organized as follows:

Section 2.0 – Draft PEIR Comments

Section 3.0 – Public Participation, Review and Notifications

Section 4.0 – Mitigation Monitoring and Reporting Program

Section 5.0 – Findings of Fact

Attachment 1 – Draft PEIR

Attachment 2 – Copies of Public Comments

Attachment 3 – Documentation of Public Participation and Copies of Notifications

Attachment 4 – Mitigation Monitoring and Reporting Plan

2.0 COMMENTS ON DRAFT PEIR

A catalogue of all comments received on the Draft PEIR is provided in this report section. Copies of comment letters received are included in Attachment 2. Stanislaus County received two letters containing written comments on the Draft PEIR during the comment period that ended on May 7, 2018. Each letter was assigned a number, as listed below.

Letter #1 –Stanislaus County Environmental Review Committee (ERC), dated April 24, 2018

Lead Agency Response to Comment Letter 1: This letter states that the ERC reviewed the Draft PEIR and had no comments. No response is required.

Letter #2 - California Office of Planning and Research State Clearinghouse (SCH)

Lead Agency Response to Comment Letter 2: This comment letter acknowledges the closure of the public review period for state agencies, identifies the state agencies involved in the review, and states that no agencies submitted comments by the end of the review period. No response is required.

Public Meeting

A public meeting was held on April 12, 2018 at the Stanislaus County Farm Bureau, located 1201 L Street in Modesto, California. No oral comments were taken during the public meeting on April 12, 2018. No response is required.

3.0 PUBLIC PARTICIPATION, REVIEW AND NOTIFICATIONS

SCDER complied with all CEQA noticing and public review requirements. Specifically, SCDER notified all responsible and trustee agencies, and interested groups, organizations, and individuals that the Draft PEIR was available for review. A summary of public notification and outreach activities that took place during the preparation, distribution, and review of the DRAFT PEIR is provided below, and documentation of these activities is included in Attachment 3.

1. A Notice of Preparation (NOP) for the Draft PEIR was posted with the CEQA Initial Study on October 4, 2016. The Initial Study was available for review at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, Modesto, California 95358. In addition, the Initial Study was available for download at the following internet address: http://www.stancounty.com/er/groundwater/
2. The NOP initiated a 30-day comment period from October 4, 2016 to November 3, 2016. All comments received on or before 5:00 PM on November 3, 2016, were considered in preparation of the Draft PEIR.
3. Two public scoping meetings were held for the PEIR:

   Scoping Meeting #1 - October 6, 2017 from 1:30pm to 3:00pm during a meeting of the Stanislaus County Technical Advisory Committee at the Stanislaus County Farm Bureau, 1201 L Street in Modesto; and

   Scoping Meeting #2 - October 13, 2017 from 7:00 to 9:00 PM at Harvest Hall, 3800 Cornucopia Way #B in Modesto.

   Persons wishing to comment on the scope of the PEIR at these meetings were given the opportunity to fill out comment cards and/or to speak publicly.
4. A Notice of Completion (NOC) and copies of the Draft PEIR were filed with the State Clearinghouse on March 23, 2018. An official 45-day public review period for the Draft PEIR was established by the State Clearinghouse, ending on May 7, 2018.
5. A Notice of Availability (NOA) for the Draft PEIR was published in several local and regional newspapers throughout Stanislaus County. The Draft EIR was also published on the SCDEQ website: http://www.stancounty.com/er/groundwater/.
6. A public meeting to present the Draft PEIR to interested parties took place on April 12, 2018 from 1:30 to 3:00 PM at the Stanislaus County Farm Bureau, located at 1201 L Street in Modesto.

Copies of the Draft PEIR were made available for review at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, in Modesto and at the Stanislaus County Library, 1500 I Street, Modesto. The Draft PEIR and associated documents were also available to be downloaded from the County's groundwater resources web page at the following internet address:

http://www.stancounty.com/er/groundwater/

4.0 MITIGATION MONITORING AND REPORTING PROGRAM

This section contains the Mitigation Monitoring and Reporting Plan (MMRP) to aid SCDER with the implementation and monitoring of mitigation measures adopted in the Final PEIR, and to comply with the requirements of Public Resources Code Section 21081.6(a). The MMRP provides the mitigation measures, timing, implementing party, enforcement responsibility, and monitoring actions to verify implementation. The MMRP is presented as Attachment 4, and may also be downloaded from the County's groundwater resources web page at the following internet address:

http://www.stancounty.com/er/groundwater/.

5.0 FINDINGS OF FACT

Under the California Environmental Quality Act (CEQA), the Lead Agency is required to make specific findings regarding the potential environmental effects of a project if the Lead Agency decides to approve the project (California Public Resources Code Section 21081). Pursuant to the CEQA Guidelines (14 California Code Regulations Sections 15000, *et seq*.), these Findings of Fact (Findings) support adoption and certification of the "Discretionary Well Permitting and Groundwater Management Final Program Environmental Impact Report" (Final PEIR) and other supplemental documentation incorporated by reference, including the Project Mitigation and Monitoring Reporting Program (MMRP). The County of Stanislaus is the Lead Agency for the Project.

5.1 CEQA Finding Requirement

The California Environmental Quality Act ("CEQA") (Pub. Res. Code Sections 21000, et seq.) and the State CEQA Guidelines (the "CEQA Guidelines") require that the environmental impacts of a project be examined before a project is approved. Specifically, regarding findings, Public Resources Code Section 21081 provides that:

> *No public agency shall approve or carry out a project for which an EIR has been certified which identifies one or more significant effects on the environment that would occur if the project is approved or carried out unless both of the following occur:*
>
> *a) The public agency makes one or more of the following findings with respect to each significant effect:*
>
> *1) Changes or alterations have been required in, or incorporated into, the project which mitigate or avoid the significant effects on the environment.*
>
> *2) Those changes or alterations are within the responsibility and jurisdiction of another public agency and have been, or can and should be, adopted by that other agency.*
>
> *3) Specific economic, legal, social, technological, or other considerations, including considerations for the provision of employment opportunities for highly trained workers, make infeasible the mitigation measures or alternatives identified in the environmental impact report.*

In addition, CEQA requires a public agency to make a finding that the PEIR reflects the public agency's independent review and judgment. Having received, reviewed, and considered the Discretionary Well Permitting and Groundwater Management Final PEIR, State Clearinghouse No. 2016102005, as well as all other information in the record of proceedings on this matter, the Findings of Fact included herein are hereby adopted by the SCDER in its capacity as the CEQA Lead Agency. These Findings set forth the environmental basis for current and subsequent discretionary actions to be undertaken by the County of Stanislaus and responsible agencies for the implementation of the Project.

5.2 Incorporation by Reference

All CEQA project impacts and mitigation measures, including those discussed below, are analyzed in greater detail in the Draft PEIR which is incorporated herein by reference. The Draft PEIR is included as Attachment 1 and may be downloaded from the County's groundwater resources web page at the following internet address: http://www.stancounty.com/er/groundwater/.

CEQA Project mitigation measures and reporting responsibilities are also summarized in the Final PEIR MMRP as Attachment 4.

5.3 General Findings on Significant and Unavoidable Impacts that cannot be Avoided or Lessened to a Less than significant Level

No significant and unavoidable impacts which cannot be avoided or substantially lessened to a less than significant level are identified for the Project.

5.4 Cumulative Impacts

No cumulative impacts are identified with this Project.

5.5 Statement of Overriding Considerations

No statements of overriding consideration are necessary for this Project.

5.6 Significant Impacts that are Avoided or Substantially Lessened to a Less than significant Level

The Draft PEIR describes environmental impacts that may be potentially significant impacts to biological, cultural resources, hydrology and water quality, and noise. These potentially significant impacts are presented below, along with County of Stanislaus staff findings and rationale for those findings to support each Finding.

5.6.1 Biological Resources

Impact BIO-1. Substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

The study area contains sensitive natural communities that provide unique habitat for many endemic species, including special-status plants, birds, invertebrates, and amphibians: oak woodland, vernal pools (annual grassland/vernal pool complex), palustrine wetlands and riparian areas. These communities provide habitat for federal- and state-listed and special-status plant species. The specific effects on species and natural communities would depend on the size of the construction footprint and its location relative to sensitive natural communities, the extent of pumping-induced drawdown that could affect nearby groundwater-dependent ecosystems, whether water from a well is used to indirectly support the conversion of rangeland to irrigated agricultural production, the occurrence of species in potentially affected habitats, and species' use of and dependence on potentially affected habitats for foraging or breeding. The construction of wells and associated infrastructure could result in the loss or disturbance of habitat, injury or mortality to special status species, and disruption of normal behaviors that could reduce reproductive output and overall survivorship. The construction of wells and associated infrastructure could result in the loss or disturbance of habitat, injury or mortality to special status species, and disruption of normal behaviors that could reduce reproductive output and overall survivorship. Construction of new wells permitted under the Ordinance has the potential for significant impacts on special-status species or their habitats, if not mitigated.

Impact BIO-2. Substantial adverse effect on any riparian habitat, groundwater-dependent ecosystem, groundwater-connected stream or reservoir, or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

The construction of new wells and associated infrastructure could result in ground disturbance around the well site, or in areas of rangeland that are converted to cultivated agricultural land using irrigation water supplied by the wells, causing temporary or permanent damage, modification, or removal of sensitive, natural communities in and adjacent to the construction site. Potential impacts include construction of well pads, access roads and power service connections, operation of drilling and other construction equipment, alteration of localized drainage patterns, or discharge of soil or other construction wastes all could degrade or damage existing sensitive habitats. Drawdown induced by pumping of new wells could hydrologically influence wetlands, riparian habitat, and other groundwater-dependent ecosystems. The extent of adverse effects caused by such drawdown and hydrologic change depends on the extent of drawdown at the water table, the species present and their ability to effectively adapt to changes in groundwater levels, and the extent to which the habitats are dependent on surface water inflow as compared to groundwater. At this time, it is not known where new discretionary wells permitted under the Ordinance would be located, so the actual impacts of constructing and operating these wells, or of any associated rangeland conversion, on sensitive habitats cannot be adequately evaluated at the program level. At a program level, it is concluded that constructing new wells permitted under the Ordinance has the potential to cause significant impacts to sensitive habitats, if not mitigated.

> *Findings:* Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.
>
> *Rationale:* Several mitigation measures are included in the Final PEIR and will be used to minimize impacts to biological resources potentially associated with specific wells permitted under the Ordinance. These mitigation measures will be included as appropriate, as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.
>
> *Mitigation Measures Incorporated:* Mitigation Measure BIO-1a; Mitigation Measure BIO-1b.

***Impact BIO-3. Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) or waters of the State through direct removal, filling, hydrological interruption, or other means**.*

The construction of wells and associated infrastructure could result in the disturbance or loss of federal and state protected wetlands and waters in and adjacent to the construction site, or in areas of rangeland that are converted to cultivated agricultural land using irrigation water supplied by the wells, including creeks, rivers, streams, vernal pools, marshes, and other types of seasonal and perennial wetland communities. Wetlands and other waters of the U.S. could be affected through direct removal, filling, hydrological interruption, alteration of bed and bank, and other construction-related activities. Drawdown induced by pumping of new wells could also affect protected wetlands, causing hydrological interruption. Potential adverse effects include degradation of a sensitive plant community, fragmentation, or isolation of an important wildlife habitat, and disruption of natural wildlife movement corridors. The specific effects on protected wetlands and waters would depend on the size of the construction footprint and its location relative to the protected wetlands and waters, and the type of disturbance or loss. The extent and effect of hydrological interruption caused by such drawdown depends on the extent of drawdown at the water table, the species present and their ability to effectively adapt to changes in groundwater levels, and the extent to which the wetlands are dependent on surface water inflow as compared to groundwater. At this point, it is not known where new wells permitted under the program will be located, so this impact cannot be adequately evaluated at the program level, and could be significant, if not mitigated.

Impact BIO-4. Conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Potential conflicts with local policies or ordinances regarding biological resources would depend on the nature of the construction footprint or any rangeland converted to agricultural production that is made possible by the new wells, their location relative to the protected biological resource, and the type of disturbance or loss. Based on the lack of detailed, site-specific information, this impact cannot be adequately evaluated at the program level. New well applications will be assessed for impacts and conflicts with local policies or ordinances.

> *Findings*: Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.
>
> *Rationale*: Several mitigation measures are included in the Final PEIR and will be used to minimize impacts to biological resources potentially associated with specific wells permitted under the Ordinance. These mitigation measures will be included as appropriate, as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.
>
> *Mitigation Measures Incorporated*: Mitigation Measure BIO-1a.; Mitigation Measure BIO-1b.; Mitigation Measure BIO-4.

5.6.2 Cultural Resources

Impact CUL-1: A substantial adverse change in the significance of a historical resource as defined in § 15064.5

Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. In some cases, the new wells could make it possible for rangeland to be converted to irrigated farmland. This could cause a localized substantial adverse change in the significance of a historic resource if the resource is located on or adjacent to the site of the new well or converted rangeland area and depths of the construction project reach native soils. At this time, the locations at which new wells would be constructed are not known, so potential impacts to historical resources cannot be adequately assessed at the program level. These impacts could be significant, if not mitigated.

Impact CUL-2: A substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5

Archaeological resources are known to be present throughout Stanislaus County. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. In some cases, the new wells could make it possible for rangeland to be converted to irrigated farmland. This could cause a localized substantial adverse change in the significance of a prehistoric resource if the resource is located on or adjacent to the site of the new well or converted rangeland area, and depths of soil disturbance reach native soils. At this time, the locations at which new wells would be constructed are not known, so potential impacts to archaeological resources cannot be adequately assessed at the program level. These impacts could be significant, if not mitigated.

Impact CUL-3: Direct or indirect destruction of a unique paleontological resource or site or unique geologic feature

Most of the geologic units within the county are highly sensitive for paleontological resources because the valley is immediately underlain by the Modesto and Riverbank Formations of Late Pleistocene, which are typically considered highly sensitive for paleontological resources. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. In some cases, the new wells could make it possible for rangeland to be converted to irrigated farmland. This could cause destruction of a unique paleontological resource or site or unique geologic feature if the resource or feature is located on or adjacent to the site of the new well or converted rangeland area, and depths of soil disturbance reach native soils. Destruction of a unique paleontological resource would be a significant impact, if not mitigated.

> *Findings:* Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.

Rationale: Several mitigation measures are included in the Final PEIR and will be used to minimize potential impacts to prehistoric, historic, or paleontological resource associated with specific new wells permitted under the Ordinance. These mitigation measures will be included as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.

Mitigation Measures Incorporated: Mitigation Measure CUL-1a.; Mitigation Measure CUL-1b.; Mitigation Measure CUL-1c.

Impact CUL-4: Disturbance of human remains, including those interred outside of dedicated cemeteries

Human remains, including those interred outside of dedicated cemeteries may be found at numerous locations throughout the county. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. In some cases, the new wells could make it possible for rangeland to be converted to irrigated farmland. This could disturb human remains, if the remains are located on or adjacent to the site of the new well or converted rangeland area, and depths of soil disturbance reach native soils. Destruction or disturbance of human remains would be a significant impact, if not mitigated.

Findings: Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.

Rationale: Several mitigation measures are included in the Final PEIR and will be used to minimize potential impacts to human remains associated with specific wells permitted under the Ordinance. These mitigation measures will be included as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.

Mitigation Measures Incorporated: Mitigation Measure CUL-1a.; Mitigation Measure CUL-1b.; Mitigation Measure CUL-1c.

5.6.3 Hydrology and Water Quality

Impact WAT-2: Cause interference drawdown to existing wells that substantially interferes with their ability to support existing land uses, or land uses for which permits have been granted.

Pumping groundwater from a well causes groundwater levels to decrease around a well, forming a "cone of depression." If the cone of depression encompasses a neighboring well, the depth to groundwater in the vicinity of the neighboring well will increase. In some cases, this effect known as "interference drawdown" can lead to decreased productivity and increased pumping costs for a neighboring well. In severe cases, a nearby well could go dry. In addition, if groundwater levels drop below the top of a well's screen interval, the rate of bacterial growth and encrustation on the well screen can increase, leading to an increase in well maintenance requirements and costs. When a well is no longer able to support existing land uses or land uses for which permits have been granted, well interference impacts would be considered significant unless mitigated. To support the evaluation of these potential impacts in the PEIR, the Stanislaus

County Hydrologic Model (SCHM) was constructed. SCHM results indicate that significant interference drawdown impacts to domestic wells are possible, and the potential for significant interference drawdown impacts to municipal, industrial and irrigation wells cannot be ruled out without site-specific analyses. The County of Stanislaus' discretionary well permitting program requires that the potential for these impacts be evaluated on a case-by-case basis for each well application; nevertheless, impacts could be significant, if not mitigated.

> *Findings:* Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the potentially significant environmental effect as identified in the Final PEIR.
>
> *Rationale:* The County's discretionary well permitting program includes application requirements including the evaluating the potential for interference drawdown and specifies thresholds and response actions to help prevent such impacts. When potentially significant interference drawdown cannot be avoided or ruled out, an Interference Drawdown Monitoring and Mitigation Program is required to be implemented, and will be included as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.
>
> *Mitigation Measures Incorporated:* Mitigation Measure WAT-2.

Impact WAT-3: Cause groundwater drawdown or storage depletion that does not recover over a period of years that includes wet and dry periods, and that will interfere with the ability of other well operators to support existing or permitted land uses, or that will substantially increase the cost to pump groundwater in the area

The Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the County, have been designated as critically overdrafted by the DWR, and all four subbasins in the County experienced storage depletion and other stresses from recent, unprecedented, drought conditions between 2011 and 2015. The construction and operation of new groundwater wells for which discretionary permits are issued could further deplete groundwater supplies and storage or cause a chronic lowering of groundwater levels in some areas. The County's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts and includes the regulation of new well in areas where significant drawdown and storage depletion is already occurring. These are designated as Groundwater Level Management Zones. Groundwater modeling was done in support of this PEIR to assess the general impacts associated with pumping of new wells permitted under the County's Groundwater Ordinance, and indicates that drawdown and storage depletion impacts will be less than significant as long as measures specified in the County's discretionary well permitting program are implemented; however, portions of the County have not yet been evaluated to determine whether Groundwater Level Management Zones need to be established. As such, the pumping of new wells could contribute to a cumulatively considerable drawdown or storage depletion impact if the need for establishing additional Groundwater Level Management Zones is not evaluated, and any Groundwater Level Management Zones are identified and managed.

Findings: Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.

Rationale: The County's discretionary well permitting program includes application requirements including the evaluating the potential for drawdown and storage depletion and specifies thresholds and response actions to help prevent such impacts. A key measure in the program is the identification and management of Groundwater Level Management Zones, within which requirements and restrictions apply that prevent additional contribution to areas where significant drawdown or storage depletion may already be occurring. To date, only the Northern Triangle portion of the County has been evaluated to identify whether conditions warrant the establishment of Groundwater Level Management Zones. The County has adopted a mitigation measure to extend the evaluation completed in the Northern Triangle to the remaining portions of the County that are subject to the County's discretionary well permitting program, and prevent further drawdown and storage depletion as a result of permitting new wells in those areas. For wells located in Groundwater Level Management Zones, Conditions of Approval will be included in each new Groundwater Extraction Permit issued under the discretionary well permitting program.

Mitigation Measures Incorporated: Mitigation Measure WAT-3.

Impact WAT-4: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site.

The project involves construction of groundwater wells and appurtenant access routes and electrical service. The wells and their appurtenances will not be permitted to be in surface water bodies or drainages where they could alter the course of a stream or river and cause substantial erosion or siltation. Because it is currently not known where new discretionary wells will be located and it is possible that construction of well pads and access routes could encroach on surface water bodies or drainages, the actual construction impacts associated with these wells cannot be adequately evaluated at a program level. In addition, some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land may cause some alteration of drainage patterns. Deep ripping of slopes could make them more vulnerable to erosion. As with any agricultural operation, impacts to surface drainages that cause erosion or siltation would be minimized as part of standard soil conservation practices employed in farming operations. Because it is not currently known where new discretionary wells will be located that will make agricultural conversion of rangeland possible, and some alteration of drainages and streams cannot be ruled out, the actual indirect impacts associated with these new wells cannot be adequately evaluated. At a program level, it is therefore concluded that constructing new wells permitted under the Ordinance in undeveloped rangeland portions of the County has a significant potential to cause substantial erosion or sedimentation, if not mitigated.

Findings: Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.

Rationale: Several mitigation measures are included in the Final PEIR and will be used to minimize impacts to groundwater resources and water supplies underlying Stanislaus County. These mitigation measures will be included as Conditions of Approval in each new Groundwater Extraction Permit issued under the discretionary well permitting program.

Mitigation Measures Incorporated: Mitigation Measure WAT-4.

5.6.4 Noise

Impact NOI-1: Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Construction of wells for which discretionary permits are issued could increase noise levels through operation of construction vehicles and construction equipment, such as drilling rigs, portable generators, compressors, and power tools. These construction activities may occur 24 hours per day. Moreover, the Stanislaus County Noise Ordinance limits noise generated from construction equipment to 75 dBA between 7:00 p.m. and 7:00 a.m. at the property line; however, agricultural activities, including the drilling of wells on agriculturally-zoned land, are exempt from the Noise Ordinance. New wells would most likely be installed in agriculturally-zoned, rural areas at a sufficient distance from sensitive receptors. It is unlikely that a well would be drilled closer than 200 feet to a sensitive receptor that is located on a parcel not zoned for agricultural use. However, it is not known where new wells permitted under the program will be located, so this impact cannot be adequately evaluated at the program level, and significant impacts are possible, if not mitigated.

Impact NOI-2: Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Issuing permits for new wells under the County's discretionary well permitting program could increase ambient noise levels as a result of temporary construction-related noise, and long-term noise associated with pump operations and conversion of rangeland to irrigated agricultural use. Agricultural activity, including the drilling and operation of wells, is exempt under the Stanislaus County Noise Ordinance. Construction noise would be temporary, and the wells developed under the program would operate intermittently during the irrigation season, primarily during daytime hours when ambient noise levels are higher. New wells would most likely be located in agriculturally-zoned, rural areas at a sufficient distance from sensitive receptors. It is unlikely that a well would be located closer than 200 feet to a sensitive receptor that is located on a parcel not zoned for agricultural use. However, it is not known where wells permitted under the program will be located, so this impact cannot be adequately evaluated at the program level, and significant impacts are possible, if not mitigated.

Findings: Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Final PEIR.

Rationale: If future wells permitted under the Stanislaus County Groundwater Ordinance are located very close to sensitive receptors, Conditions of Approval will be incorporated into the

Groundwater Extraction permits issued for those wells under the County's discretionary well permitting program to lessen potential noise impacts to less than significant levels.

Mitigation Measures Incorporated: Mitigation Measure WAT-4

5.7 Mitigation Monitoring and Reporting Program

As mentioned in the discussion of potentially significant impacts above, SCDER has approved a MMRP to guide the monitoring and reporting of CEQA mitigation compliance. The MMRP will guide implementation of all CEQA project mitigation measures by assigning implementation and reporting responsibilities and specifying timelines. The MMRP lists all mitigation measures and reporting and is herewith incorporated by reference. The MMRP is provided as Attachment 4, and may be downloaded from the County's groundwater resources web page at the following internet address:
http://www.stancounty.com/er/groundwater/.

ATTACHMENT 1

DRAFT PEIR

Attachment 1

Draft

PROGRAM ENVIRONMENTAL IMPACT REPORT

Discretionary Well Permitting and Management Program
Stanislaus County, California

March 2018

Prepared for:

Stanislaus County
Department of Environmental Resources
3800 Cornucopia Road
Modesto, California 95358

Prepared by:

Jacobson James & Associates, Inc.
9083 Foothills Boulevard, Suite 370
Roseville, California 95747

and

Tetra Tech, Inc.
1999 Harrison Street, Suite 500
Oakland, California 94612

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LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

1,2,3-TCP	1,2,3-trichloropropane
AB	Assembly Bill
AFY	Acre-feet per year
amsl	Above mean sea level
AQMP	Air Quality Management Plan
APE	Area of potential effects
BAU	Business as usual
BMP	Best management practice
BPS	Best Performance Standard
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CASGEM	California Statewide Groundwater Elevation Monitoring
CCID	Central California Irrigation District
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CH_4	Methane
CMP	Conservation Management Practice
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CRHR	California Register of Historical Resources
dB	Decibel
dBA	A-weighted decibel
DBCP	Dibromo-chloro-propane
DER	Stanislaus County Department of Environmental Resources
DWR	Department of Water Resources
EPA	U.S. Environmental Protection Agency
EWD	Eastside Water District
FMMP	Farmland Mapping and Monitoring Program
FPMP	Fugitive PM_{10} Management Plan
GAP	Gap Analysis Program
GDE	Groundwater-dependent ecosystem
GHG	Greenhouse gas
GMP	Groundwater Management Plan
GPS	Global Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
H_2O	Water

H_2S	Hydrogen sulfide
HFC	Hydrofluorocarbon
ILRP	Irrigated Lands Regulatory Program
IPaC	Information for Planning and Consultation
LAFCO	Stanislaus County Local Agency Formation Commission
MBTA	Migratory Bird Treaty Act
MCL	Maximum contaminant level
MGD	Million gallons per day
MID	Modesto Irrigation District
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
N_2O	Nitrous oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxide
NOP	Notice of Preparation
NRHP	National Register of Historic Places
NSR	New source review
OID	Oakdale Irrigation District
Pb	Lead
PCE	Perchloroethylene
PEIR	Program Environmental Impact Report
PFC	Perfluorocarbon
$PM_{2.5}$	Fine particulate matter
PM_{10}	Inhalable particulate matter
PRC	Public Resources Code
PVC	Polyvinyl chloride
ROG	Reactive organic gas
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCHM	Stanislaus County Hydrologic Model
SF_6	Sulfur hexafluoride
SGMA	Sustainable Groundwater Management Act
SJGW	San Joaquin Groundwater
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SJVGB	San Joaquin Valley Groundwater Basin
SLDMWMA	San Luis and Delta-Mendota Water Management Authority
SLDMWUA	San Luis and Delta Mendota Water Use Authority
SO_2	Sulfur dioxide
STRGBA	Stanislaus and Tuolumne Rivers Groundwater Basin Association
SWRCB	State Water Resources Control Board
TAC	Stanislaus County Technical Advisory Committee
TGBA	Turlock Groundwater Basin Association
TID	Turlock Irrigation District
UCMP	University of California Museum of Paleontology
USACE	U.S. Army Corps of Engineers

USFWS	U.S. Fish and Wildlife Service
UWMP	Urban Water Management Plan
VdB	Vibration decibel
WAC	Stanislaus County Water Advisory Committee
WDR	Waste Discharge Requirement
WHR	Wildlife-Habitat Relationships

EXECUTIVE SUMMARY

ES.1 Purpose

Stanislaus County adopted a Groundwater Ordinance in November 2014 (Chapter 9.37 of the County Code, hereinafter, the "Ordinance") that codifies requirements, prohibitions, and exemptions intended to help promote sustainable groundwater extraction in unincorporated areas of the county. Actions by regulatory agencies to protect natural resources or the environment, such as adoption of the Ordinance by the County, are categorically exempt from environmental review under the California Environmental Quality Act (CEQA).[1] Subsequent to Ordinance adoption, Stanislaus County implemented a Discretionary Well Permitting and Management Program. Stanislaus County is voluntarily preparing this Program Environmental Impact Report (PEIR) for this program to evaluate the broad-scale environmental impacts of issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance.

There are several advantages to preparing a PEIR on a program of this type:

- A PEIR will allow for consideration of broader alternatives, giving the County greater flexibility to implement appropriate groundwater management strategies.
- A PEIR can accommodate development of program-wide mitigation strategies that might not be practical on an individual action (e.g., establishment of groundwater management zones);
- A PEIR facilitates consideration of cumulative impacts that can be under-evaluated in a case-by-case analysis of individual actions; and
- A PEIR can provide comprehensive consideration of certain issues so that they do not need to be revisited in subsequent environmental evaluation of individual actions undertaken under the Ordinance.

ES.2 Project Description

The primary action evaluated in this PEIR is the future issuance of permits for wells that are not exempt from the Ordinance, prior to adoption of Groundwater Sustainability Plans (GSPs) under the California Sustainable Groundwater Monitoring Act (SGMA). The initial terms for groundwater extraction under the permits will extend until GSPs are adopted. The permits will then be renewed in five-year increments coinciding with the required update cycles for the GSPs, and the permit conditions will be updated as needed to be consistent with the GSPs during each permit term. Under SGMA, GSPs are to be adopted by 2020 in the Eastern San Joaquin and Delta Mendota groundwater subbasins, and 2022 in the Modesto and Turlock subbasins.

The PEIR also addresses potential actions by the County after GSPs are adopted, pertaining to wells located in unincorporated areas found to be extracting groundwater unsustainably in violation of the Ordinance.[2]

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[1] State CEQA Guidelines §15307 and 15308.

[2] Section 9.37.045(B) of the Stanislaus County Code states as follows: "Effective upon adoption of an applicable groundwater sustainability plan, the prohibition set forth in subsection A of Section 9.37.040 shall be applicable to the extraction from any

Under SGMA, Groundwater Sustainability Agencies (GSAs) will be required to regulate groundwater extraction within their jurisdictions to assure that the sustainability goals adopted in their GSPs are being met, and if a GSA fails to fulfill this obligation, the State is expected to intervene. Therefore, it may be presumed that the need for action by the County to regulate wells after GSPs are adopted will be relatively rare, or never occur.

Adoption of the Ordinance itself was exempt from review under CEQA; therefore, the Ordinance itself is not being evaluated.

These clauses in the Ordinance form the basis of the "program" to be addressed in the PEIR:

- Stanislaus County Code §9.37.040
- Stanislaus County Code §9.37.045 A
- Stanislaus County Code §9.37.050 A
- Stanislaus County Code §9.37.045 B

Based on these clauses, the Ordinance divides the county into these areas for application of discretionary well permitting and management requirements:

- **Incorporated Areas.** The Ordinance does not apply to the incorporated areas of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford.
- **Exempt Areas.** Groundwater management in these areas occurs under the authority of a public water agency in compliance with a Groundwater Management Plan (GMP) or a GSP. Before GSPs are adopted under SGMA, the County's groundwater management authority in these areas is generally limited to issuing ministerial[3] well permits that are exempt from the prohibition against unsustainable extraction.[4] After GSPs are adopted, the Ordinance prohibition against unsustainable groundwater extraction will apply to any well (including new and existing wells) from which the county reasonably concludes that groundwater is being unsustainably withdrawn. Issuing permits for new wells after such a determination is made would also become discretionary.[5] The County would determine whether continued groundwater extraction from these existing wells is unsustainable, and therefore prohibited. As stated above, after GSPs are adopted, GSAs will be required to regulate groundwater extraction within their jurisdictions; therefore, although the County is authorized to take action to

groundwater well for which the county reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In the event of such determination by the county, the affected holder or holders of a well construction permit issued pursuant to Chapter 9.36 for such well shall be notified and shall be required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in subsection 6 of Section 9.37.030."

[3] A ministerial decision involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out (State CEQA Guidelines Section 15369). By themselves, ministerial actions are not subject to CEQA.

[4] Because the exemption applies to the water management actions of public water agencies and their rate payers, applications from non-rate payers for permits to construct new wells would still be subject to the prohibition in the Ordinance because such wells are not subject regulation under GMPs. Permits for such wells would be discretionary.

[5] "Discretionary project" means a project that requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular activity (State CEQA Guidelines Section 15357).

address unsustainable extraction of groundwater from wells after GSPs are adopted, this scenario is unlikely.

- **"White Areas."** These include unincorporated areas that are not in the jurisdictional boundaries of a public water agency covered by a GMP or GSP. The County has primary authority for groundwater management in these areas and is responsible for issuing discretionary permits for new wells subject to the Ordinance prohibition. SGMA requires the adoption of GSPs in all areas of the county by 2020 or 2022. After this time, applications for new well permits will be exempt from the Ordinance prohibition[6] and will be issued on a ministerial basis, unless the County reasonably concludes that groundwater extraction from the proposed well will be unsustainable. Existing wells for which the county reasonably concludes groundwater extraction is unsustainable would also be subject to the prohibition. However, as stated above, since the primary responsibility for regulating sustainable extraction will be vested with GSAs, enforcement of this provision in the Ordinance by the County is unlikely to be necessary.

The program to be evaluated in the PEIR consists of these actions implemented under the Ordinance in the unincorporated areas of the county:

- Issuing discretionary well permits before a GSP is adopted for proposed new wells subject to the Ordinance prohibition against unsustainable extraction
- Issuing discretionary well permits after adoption of GSPs for any new well that the county reasonably concludes is not in compliance with a GSP
- Regulating groundwater extraction after adoption of GSPs from any existing well that the county reasonably concludes is not in compliance with a GSP

ES.3 Summary of Environmental Impacts and Mitigation Measures

Table ES-1 presents the impacts, mitigation measures, and impact level of significance before and after mitigation for implementation of the proposed program.

ES.4 Significant and Unavoidable Impacts

No significant and unavoidable impacts were identified from implementation of the proposed program.

ES.5 Summary of Alternatives

The purpose of the alternatives analysis under CEQA is to consider potentially feasible alternatives to the proposed project that are capable of avoiding or substantially lessening the significant effects of the project and that will foster informed decision making and public participation. Because this Program EIR focuses on evaluating potential impacts associated with issuing discretionary well permits for theoretical projects that

[6] After GSP adoption, the primary groundwater management authority in these areas will be vested with GSAs that will manage and regulate groundwater resources in compliance with their GSP. Groundwater extractors (except *de minimis* extractors) will be required to pay rates to the GSAs for their extraction.

TABLE ES-1 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Impact Significance Before Mitigation	Mitigation Measures	Impact Significance After Mitigation
AGRICULTURE AND FORESTRY RESOURCES			
Impact AGR-1. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use	Less than Significant	None required	Less than Significant
Impact AGR-2. Involve other changes in the existing environment that, because of their location or nature, could result in the conversion of farmland to non-agricultural use	Less than Significant	None required	Less than Significant
AIR QUALITY			
Impact AQ-1. Conflict with or obstruct implementation of the applicable air quality plan	Less than Significant	None required	Less than Significant
Impact AQ-2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation	Less than Significant	None required	Less than Significant
Impact AQ-3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard	Less than Significant	None required	Less than Significant
BIOLOGICAL RESOURCES			
Impact BIO-1. Substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service	Potentially Significant	**Mitigation Measure BIO-1a.** A qualified biologist shall investigate the potential presence or absence of sensitive habitats and wetlands, and special-status plants or wildlife in areas that will be disturbed by well construction or conversion of rangelands to cultivated use that is made possible by the well, prior to well permit approval or project implementation. Documentation could involve any of these tasks: • Desktop review of existing site records through the county records and general plan, California Natural Diversity Database (CNDDB), California Native Plant Society (CNPS) inventory, environmental documents and surveys to determine likelihood of occurrence near (within ½ mile) the well site, any rangeland converted to cultivated agricultural use that is supplied by the well, and any related construction areas. • Conduct field reconnaissance. A field reconnaissance survey shall be conducted, including a habitat assessment to determine whether suitable conditions exist for special-status species. • Determine the need for additional species-specific surveys or wetland delineation. If warranted, coordinate with appropriate agencies (U.S. Fish and Wildlife Service [USFWS], California Department of Fish and Wildlife [CDFW], or U.S. Army Corps of Engineers [USACE]) as may be necessary to determine appropriate survey timing and effort. • Coordinate with appropriate agencies and the County as may be necessary based on the results of additional species-specific surveys or wetland delineation to identify and implement mitigation measures as necessary to avoid, minimize, or otherwise mitigate potential impacts to special-status species, wetlands or other habitat to a less-than-significant level. **Mitigation Measure BIO-1b.** The applicant shall endeavor to conduct any drilling, construction work and/or ground-disturbing activities associated with installation of the proposed well or the conversion of rangeland to cultivated agricultural use that will be irrigated using the well during the non-breeding season of any birds and raptors protected under the Migratory Bird Treaty Act (generally September 16 through January 31). If construction activities must be scheduled during the nesting season (generally February 1 to September 15), pre-construction surveys for raptors, migratory birds, and special-status bird species shall be done by a qualified biologist to identify active nests near the site. This shall include a buffer extending out from the construction or disturbance area to a distance of approximately ½ mile. If active nests are found, no drilling construction activities shall occur within 500 feet of the nest until the young have fledged and the nest is no longer active (as determined by the qualified biologist). Survey timing and frequency requirements differ among species; species-specific surveys should follow all timing and frequency requirements of CDFW and USFWS. Consultation with the CDFW and/or USFWS shall occur if required, and may result in additional requirements.	Less Than Significant
Impact BIO-2. Substantial adverse effect on any riparian habitat, groundwater-dependent ecosystem, groundwater-connected stream or reservoir, or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service	Potentially Significant	Mitigation Measure BIO-1a and BIO-1b.	Less than Significant

TABLE ES-1 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Impact Significance Before Mitigation	Mitigation Measures	Impact Significance After Mitigation
Impact BIO-3. Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) or waters of the State through direct removal, filling, hydrological interruption, or other means.	Potentially Significant	Mitigation Measure BIO-1a and BIO-1b.	Less than Significant
Impact BIO-4. Conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	Potentially Significant	**Mitigation Measure BIO-4.** Evaluate well construction permit applications to assess potential conflicts with local policies or ordinances that protect biological resources, and consider mitigation measures for significant effects on the environment on a project-specific basis.	Less than Significant
CULTURAL RESOURCES			
Impact CUL-1. A substantial adverse change in the significance of a historical resource as defined in § 15064.5	Potentially Significant	**Mitigation Measure CUL-1a.** For projects with anticipated ground disturbance that would extend beyond previously disturbed soils, a qualified cultural resources professional shall investigate the potential presence of archaeological or historical resources in the vicinity of the well, the well pad, any appurtenant access drives and electrical service lines, and any rangeland tracts converted to cultivated agricultural use that will be irrigated by the well, through a desktop review. The review shall include records at the Central California Information Center (CCIC), records at the University of California Berkeley Museum of Paleontology (UCMP), a Sacred Lands File search at the Native American Heritage Commission, Native American tribal consultation, California Register of Historical Resources (CRHR), and the National Register of Historic Places (NRHP). **Mitigation Measure CUL-1b.** If it is determined through implementation of Mitigation Measure CUL-1a that archaeological, historical or paleontological resources or human remains may be located on a site, or the area is judged to have a high degree of sensitivity relative to these resources, prior to any project-related ground disturbing or construction activities, a qualified archaeologist, historian or paleontologist (as applicable) shall conduct an archaeological/ historical/paleontological resources survey (as applicable). If it is determined that the proposed well is in an area adjacent to or in one of these resources, the well would be relocated and the project reconfigured to avoid substantial changes to the resource. **Mitigation Measure CUL-1c.** If the construction staff or others observe previously unidentified archaeological, historical or paleontological resources, or human remains during drilling or other ground-disturbing activities associated with well construction or conversion of rangeland to cultivated agricultural use, they will halt work within a 100-foot radius of the find(s), delineate the area of the find with flagging tape or rope (may also include dirt spoils from the find area), immediately notify the lead agency, and retain a qualified archaeologist, historian or paleontologist (as applicable) to review the observed resources. Construction will halt within the flagged or roped-off area. The archaeologist will assess the resource as soon as possible and determine appropriate next steps in coordination with the lead agency. Such finds will be formally recorded and evaluated. The resource will be protected from further disturbance or looting pending evaluation.	Less than Significant
Impact CUL-2. A substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5	Potentially Significant	Mitigation Measures CUL-1a, CUL-1b, and CUL-1c	Less than Significant
Impact CUL-3. Direct or indirect destruction of a unique paleontological resource or site or unique geologic feature	Potentially Significant	Mitigation Measures CUL-1a, CUL-1b, and CUL-1c	Less than Significant
Impact CUL-4. Disturbance of human remains, including those interred outside of dedicated cemeteries	Potentially Significant	Mitigation Measures CUL-1a, CUL-1b, and CUL-1c	Less than Significant
GEOLOGY AND SOILS			
Impact GEO-1. Be on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site inelastic subsidence that could substantially interfere with land surface infrastructure or uses	Less than Significant	None required.	Less than Significant
GREENHOUSE GAS EMISSIONS			
Impact GHG-1. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment	Less than Significant	None required	Less than Significant
Impact GHG-2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	Less than Significant	None required	Less than Significant

TABLE ES-1 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Impact Significance Before Mitigation	Mitigation Measures	Impact Significance After Mitigation
HAZARDS AND HAZARDOUS MATERIALS			
Impact HAZ-1. Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one quarter mile of an existing or proposed school	Less than Significant	None required	Less than Significant
HYDROLOGY AND WATER QUALITY			
Impact WAT-1. Violate any water quality standards or waste discharge requirements, or cause the degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the California Regional Water Quality Control Board's Water Quality Control Plan	Less than Significant	None required	Less than Significant
Impact WAT-2. Cause interference drawdown to existing wells that substantially interferes with their ability to support existing land uses, or land uses for which permits have been granted	Potentially Significant	**Mitigation Measure WAT-2.** Property owners and water agencies in the area where predicted drawdown exceeds 5 feet will be notified of the existence of the Interference Drawdown Monitoring and Mitigation Program, and will be invited to register any domestic wells in the predicted 5-foot drawdown area and any municipal, industrial, or irrigation wells in the predicted 20-foot drawdown area to participate in the program. To register for the program, well owners will be required to complete a Well Information Questionnaire regarding the construction, use, history and performance of their well, and to allow access for periodic measurement of water levels and assessment of well condition and performance by the County or a neutral third party. If well performance is found to be diminished by more than 20 percent or to be inadequate to meet pre-existing water demand due to interference drawdown, registered participants will be eligible to receive reimbursement for reasonable and customary costs for well replacement, deepening or rehabilitation, or pump lowering as needed to restore adequate well function. The cost of reimbursement shall be borne by the operator of the well causing the interference in proportion to the degree of their contribution to the drawdown that caused the diminished yield.	Less than Significant
Impact WAT-3. Cause groundwater drawdown or storage depletion that does not recover over a period of years that includes wet and dry periods, and that will interfere with the ability of other well operators to support existing or permitted land uses, or that will substantially increase the cost to pump groundwater in the area	Potentially Significant	**Mitigation Measure WAT-3.** The County will identify additional Groundwater Level Management Zones in the unincorporated, non-district portions of the County where existing groundwater level trends constitute "chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon" as defined in Section 9.37.030(9)(a) of the Ordinance. In such areas, an applicant proposing installation of a new discretionary well is required to submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be offset, resulting in no net additional groundwater demand to the pumped aquifer system. Alternatively, the applicant must do a Groundwater Resources Investigation and implement a Groundwater Level Monitoring Program that demonstrates the proposed extraction will not result in, or contribute to, Undesirable Results as defined in the Ordinance.	Less than Significant
Impact WAT-4. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site	Potentially Significant	**Mitigation Measure WAT-4.** Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in significant on- or off-site erosion or sedimentation. If the potential for significant erosion or sedimentation is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.	Less than Significant
Impact WAT-5. Substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site	Potentially Significant	**Mitigation Measure WAT-5.** Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in an increase in runoff and significant on- or off-site flooding. If the potential for significant flooding is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.	Less than Significant
Impact WAT-6. Otherwise substantially degrade water quality	Less than Significant	None required	Less than Significant
LAND USE AND PLANNING			
Impact LAN-1. Conflicts with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect	Potentially Significant	Mitigation Measures BIO-4, CUL-1a, CUL-1b, CUL-1c, WAT-2, WAT-3, and NOI-1.	Less than Significant

TABLE ES-1 SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Impact Significance Before Mitigation	Mitigation Measures	Impact Significance After Mitigation
NOISE			
Impact NOI-1. Expose persons to, or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies	Potentially Significant	**Mitigation Measure NOI-1.** If well construction activities will take place closer than 200-feet from nearby sensitive receptors on non-agriculturally zoned parcels, the project shall employ noise attenuating measures and/or work schedules such that the project would comply with the Stanislaus County Noise Ordinance and General Plan Noise Element. Noise mitigation shall include a combination of the measures to achieve construction noise at or below the maximum allowable noise level of 75 A-weighted decibels from 7:00 p.m. to 7:00 a.m. If a well is located closer than 70 feet to sensitive receptors on non-agriculturally zoned parcels, operating noise mitigation measures shall be implemented such that the project will comply with the Stanislaus County Noise Ordinance.	Less than Significant
Impact NOI-2. Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project	Potentially Significant	Mitigation Measure NOI-1	Less than Significant
UTILITIES AND SERVICE SYSTEMS			
Impact UTL-1. Sufficient water supplies available to serve the project from existing entitlements and resources or need for new or expanded entitlements	Less than Significant	None required	Less than Significant

have not yet been defined, the alternatives analysis focuses on key well permitting program alternatives that were considered.

During the process of identifying program alternatives, the essential goal of the program evaluated in the PEIR was considered: to prevent the unsustainable extraction of groundwater from new wells subject to the Stanislaus County Groundwater Ordinance. This goal is supported by these objectives:

- Avoid or minimize potential adverse environmental impacts from the unsustainable extraction of groundwater resources, including, but not limited to, increased groundwater overdraft, land subsidence, uncontrolled movement of inferior quality groundwater, the lowering of groundwater levels, and increased groundwater degradation (Stanislaus County Code § 9.37.020 (4)); and
- Avoid or minimize potential adverse economic impacts from the unsustainable extraction of groundwater resources, including, but not limited to, loss of arable land, a decline in property values, increased pumping costs due to the lowering of groundwater levels, increased groundwater quality treatment costs, and replacement of wells due to declining groundwater levels, replacement of damaged wells, conveyance infrastructure, roads, bridges and other appurtenances, structures, or facilities due to land subsidence (Stanislaus County Code § 9.37.020 (5)).

The potential alternatives also were subjected to these screening criteria:

- Does the alternative meet most or all of the project objectives?
- Is the alternative potentially feasible?
- Would the alternative substantially reduce one or more of the significant impacts associated with the project?

The alternative development and screening process identified these alternatives that were carried forward for detailed evaluation in this PEIR:

- **No Project Alternative.** Under this alternative, the County would not issue discretionary well permits. Development and land uses in the county would continue to be guided by the existing adopted plans and their policies; installation of new groundwater supply wells in the unincorporated, non-district areas of the County would not occur. There would be no site-specific changes in existing property uses that require additional groundwater (such as irrigated agriculture). Impacts to agricultural resources and utilities and service systems may occur.
- **Alternative 1.** This alternative would be similar to the proposed program (as described in Section ES.2), with adjustments to the measurement approach and management criteria that would increase the potential for greater local groundwater drawdown and well interference relative to the proposed program.
- **Alternative 2.** This alternative would be similar to the proposed program, with adjustments to the measurement approach and management criteria that would further increase the potential for greater local groundwater drawdown and well interference relative to Alternative 1.

ES.6 Areas of Known Controversy and Issues to be Resolved

A Notice of Preparation (NOP) and associated Initial Study for the Program EIR was distributed to the State Clearinghouse, responsible agencies, and other interested parties for a 30-day public review period from October 4, 2016, to November 3, 2016. Public scoping meetings were held in Modesto.

While a limited number of agencies, organizations, and individuals submitted comments on the NOP, commenters provided suggested areas of study and potential environmental impacts, including the following:

- Ripping of slope soils for planting of nut trees loosens soils that can be transported into stream beds reducing the capacity of those stream channels and increasing the flooding potential;
- The infiltration of river water into wells constructed within 1,000 feet of a river can affect downstream surface water rights holders;
- The document needs to address the long-term effects of climate change on the county's environment and surface and groundwater supplies;
- The County should follow the Department of Water Resources regulations in regard to GSPs, commencing with Section 350 of Title 23 of the California Code of Regulations, for its study of land subsidence impacts in the PEIR;
- The County should broadly define its studies of hydrology and water quality impacts to ensure that the data gather through the PEIR can be applied to all groundwater users in the county that must comply with SGMA;
- The County should consider the application of city noise ordinances to wells near their jurisdictions;
- The County's analysis of population and housing should take into account the impact of seasonal population growth and its potential for significant impacts on the environment, in particular those impacts on housing and businesses; and
- The County's analysis of public services should consider the contribution that seasonal workers make regarding the demand for housing and services.

ES.7 Public Review of the Draft Program EIR

The Draft PEIR will be available for public review for the statutory 45-day public review period, beginning March 23, 2018, and ending on May 7, 2018. During that time, agency representatives and members of the public can submit written comments on the Draft PEIR. Comments must be received before 5:00 PM on May 7, 2018. They may be e-mailed to wward@envres.org or mailed to:

Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

Following the end of the public review period, and as part of preparing the Final PEIR, the County will prepare written responses to all substantive environmental issues that are raised by commenters. The Final PEIR will consist of the Draft PEIR, the received comments, the written responses to those comments, and a list of commenters. It may also contain additional information necessary to respond to the comments. All public agencies that submit comments will be sent a copy of the County's response to their comment at least 10 days prior to the public hearing where the Final PEIR will be considered for approval by Board of Supervisors.

The Board of Supervisors will certify the Final PEIR and will adopt findings regarding the disposition of each significant effect identified in the Final PEIR, and a statement of overriding considerations describing the specific benefits that outweigh the project's significant and unavoidable impacts.

ES.8 Future Use of this Program EIR

The County will undertake further environmental review pursuant to CEQA when permit applications for non-exempt wells are received and a decision must be made whether to issue these permits, or when the County decides whether and how to regulate a well it finds is extracting groundwater unsustainably. At that time, this PEIR can be used to simplify the task of preparing environmental documents for these actions through tiering.[7] Tiering refers to *"... the analysis of general matters contained in a broader EIR [in this case, the PEIR] with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR or negative declaration solely on the issues specific to the later project."*[8]

To facilitate the use of the PEIR as a Tier 1 document that can be referenced by CEQA documents prepared for the issuance of subsequent discretionary well permits and regulatory actions regarding existing wells at the Tier 2 level,[9] it is written as a template or "handbook" to be used during future CEQA review. To achieve this, these features have been incorporated:

- A streamlined and focused set of impact assessment threshold questions was developed and used to facilitate the analysis of environmental impacts in Section 4. This refined questionnaire may be used as a departure point for future analysis of environmental impacts in Tier 2 documents.
- Focus has been given to providing a regional characterization of hydrogeologic and water resources conditions to facilitate future CEQA analysis and serve as a technical support for future groundwater management decisions.
- Programmatic mitigation measures were developed to help guide mitigation of potential impacts at the project level.
- By collecting and referencing relevant plans, studies and other information in a single document, the PEIR creates a technical basis for uniform assessment of well applications.

[7] CEQA Guidelines Sections 15168(d) and 15152(a)
[8] CEQA Guidelines, Section 15152
[9] State CEQA Guidelines Sections 15168(b) and (c)

1.0 INTRODUCTION

1.1 Project Background

Stanislaus County adopted a Groundwater Ordinance in November 2014 (Chapter 9.37 of the County Code, hereinafter, the "Ordinance") that codifies requirements, prohibitions, and exemptions intended to help promote sustainable groundwater extraction in unincorporated areas of the county. The Ordinance prohibits the unsustainable extraction of groundwater and makes issuing permits for new wells that are not exempt from this prohibition discretionary. Applications for non-exempt wells must include substantial evidence that they will not withdraw groundwater unsustainably, as defined in the Ordinance. After an unincorporated area adopts a GSP pursuant to SGMA, the county can require holders of permits for wells it reasonably concludes may be withdrawing groundwater unsustainably to provide substantial evidence that continued operation of such wells does not constitute unsustainable extraction. If operation of the well is found to be unsustainable, it would violate the Ordinance prohibition, and the County has the authority to regulate future groundwater extraction.[10]

Actions by regulatory agencies to protect natural resources or the environment, such as adoption of the Ordinance by the County, are categorically exempt from environmental review under CEQA;[11] however, discretionary actions under the Ordinance, such as issuing permits for non-exempt wells or exercising authority to regulate wells after GSPs are adopted, are subject to CEQA review. CEQA provides a lead agency with the flexibility to prepare different types of Environmental Impact Reports and to employ different procedural means to focus environmental analysis on the issues appropriate for decision at each level of environmental review (Public Resources Code § 21093[a]).[12] As the lead agency under CEQA, Stanislaus County is voluntarily preparing this PEIR for Discretionary Well Permitting and Management under the Stanislaus County Groundwater Ordinance, to evaluate the broad-scale environmental impacts of issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance. The purpose of a PEIR is to provide public agencies and the public with information about the effects and cumulative impacts that a series of proposed activities are likely to have on the environment. Beyond identifying environmental impacts, a PEIR may also identify ways to mitigate those impacts. The analysis and technical information in this PEIR will allow future evaluation of discretionary well permitting and regulation of unsustainable wells under the Ordinance to proceed in a more streamlined fashion. Specifically, this PEIR is a Tier 1 document that can be referenced by CEQA documents prepared for the issuance of subsequent discretionary well permits and regulatory actions regarding existing wells at the Tier 2 level.[13]

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[10] Since the sustainable management of groundwater will be a primary responsibility of GSAs after GSPs are adopted, it is unlikely that the County will ever need to enforce this aspect of the Ordinance. Nevertheless, it is included as a backstop to help assure compliance with the SGMA and prevent the potential for State intervention.

[11] State CEQA Guidelines §15307 and 15308.

[12] CEQA provides that the "degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity which is described in the EIR" (State CEQA Guidelines Section 15146).

[13] State CEQA Guidelines Sections 15168(b) and (c)

The Ordinance and SGMA are responses to recognized environmental problems (and economic threats) that can arise from aquifer depletion. Groundwater protection under the Ordinance is intended to provide benefits to existing economic investments, and to provide protection against significant and unreasonable effects on groundwater-dependent habitat, springs and other connected surface waters, existing wells, groundwater storage reserves, water quality and subsidence. The benefits of the program being evaluated in this PEIR should, and are intended and expected to, outweigh potential adverse effects. The Ordinance (and after GSP adoption, SGMA implementation) may significantly influence future property use and development decisions, limiting agricultural expansion and urban growth (initially in unincorporated areas, and eventually in all areas). The potential adverse effects of limiting groundwater extraction on existing and permitted uses are considered in the impact analysis. Well permitting or regulation under the Ordinance also has the potential to limit future proposed groundwater-reliant uses that are not yet planned or permitted; however, these effects are the results of regulatory actions to protect the environment and not considered an environmental impact under CEQA. Such effects are discussed in this PEIR, but are not considered in the impact analysis.

1.2 Lead Agency

The Stanislaus County Department of Environmental Resources is the Lead Agency for this project pursuant to CEQA and its implementing regulations.[14] The Lead Agency has the principal responsibility for implementing and approving a project that may have a significant effect on the environment.

1.3 CEQA Overview

1.3.1 Purpose of CEQA

All discretionary projects in California are required to undergo environmental review under CEQA. A project is defined in CEQA Guidelines § 15378 as the whole of the action having the potential to result in a direct physical change or a reasonably foreseeable indirect change to the environment and is either:

- An activity directly undertaken by any public agency, including, but not limited to, public works construction and related activities, clearing or grading land, improvements to existing public structures, enactment and amendment of zoning ordinances, and adoption and amendment of local General Plans or elements;
- An activity undertaken by a person that is supported in whole or in part through public agency contacts, grants, subsidies, loans, or other forms of assistance from one or more public agencies; or
- An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

CEQA Guidelines § 15002 lists the basic purposes of CEQA as:

- To inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities;

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[14] Public Resources Code § 21000 - 21177 and California Code of Regulations Title 14, Division 6, Chapter 3.

- To identify the ways that environmental damage can be avoided or significantly reduced;
- To prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; and
- To disclose to the public, the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

1.3.2 Authority to Mitigate

CEQA establishes a duty for public agencies to avoid or minimize environmental damage where feasible. Under CEQA Guidelines § 15041, a Lead Agency for a project has authority to require feasible changes in any or all activities involved in the project to substantially lessen or avoid significant effects on the environment, consistent with applicable constitutional requirements such as the "nexus"[15] and "rough proportionality"[16] standards.

CEQA allows a Lead Agency to approve a project even though the project would cause a significant effect on the environment if the agency makes a fully informed and publicly disclosed decision that there is no feasible way to lessen or avoid the significant effect. In such cases, the Lead Agency must specifically identify expected benefits and other overriding considerations from the project that outweigh the policy of reducing or avoiding significant environmental impacts of the project.

1.4 Purpose of the PEIR

1.4.1 Type of EIR

Although adoption of the Ordinance was categorically exempt from environmental review under CEQA,[17] Stanislaus County voluntarily elected to prepare this PEIR consistent with Section 15168 of the CEQA Guidelines to evaluate the potential broad-scale environmental impacts associated with future discretionary actions under the Ordinance, including issuing permits for non-exempt wells or exercising authority to regulate wells after GSPs are adopted. Section 15168 of the CEQA Guidelines specifies that a PEIR may be prepared on a series of actions that can be characterized as one large project, and are related either:

- Geographically;
- As logical parts of a chain of contemplated actions;
- In connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program; or
- As individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways.

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[16] The mitigation measure must be "roughly proportional" to the impacts of the project.
[17] State CEQA Guidelines §15307 and 15308.

The future issuance of permits for non-exempt wells and the regulation of unsustainable wells under the Ordinance meet these criteria. These future actions will be taken under the same regulatory program, will all occur in the county, and may be expected to have generally similar impacts that can be mitigated in similar ways.

There are several advantages to preparing a PEIR on a program of this type:

- A PEIR will allow for consideration of broader alternatives, giving the County greater flexibility to implement appropriate groundwater management strategies;
- A PEIR can accommodate development of program-wide mitigation strategies that might not be practical on an individual action (e.g., establishment of groundwater management zones);
- A PEIR facilitates consideration of cumulative impacts that can be slighted in a case-by-case analysis of individual actions; and
- A PEIR can provide comprehensive consideration of certain issues so that they do not need to be revisited in subsequent environmental evaluation of individual actions undertaken under the Ordinance.

1.4.2 Level of Detail and Approach

The specific locations, uses, and pumping rates of non-exempt wells for which well permits will be issued in the future cannot be ascertained at this time. The nature and location of property use and development changes that may be indirectly made possible by these wells is also unknown. Similarly, it is not known where, and even whether, the County may need to regulate unsustainably operated wells in the future, especially since under SGMA, local GSAs have the primary responsibility for regulating such wells, and are expected to exercise this authority in compliance with the regulation. While the actions being evaluated in the PEIR have not yet been proposed and cannot be known in detail, the general impacts of these actions can be evaluated at this time. Doing so will potentially streamline future CEQA evaluations once specific actions are proposed, and can help inform refinement of the well permitting implementation program. The CEQA Guidelines (Section 15146(a)) state that "the degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity which is described in the EIR." So, the PEIR focuses on developing an understanding of the regional conditions that will be affected by these future actions, and the foreseeable direct and indirect environmental effects common to well construction and operation. Consequently, the evaluations in the PEIR are not as detailed or specific as those in an EIR for specific construction project.

1.4.3 Use of the PEIR in Later Activities: Tiering

The County will undertake further environmental review pursuant to CEQA when permit applications for non-exempt wells are received and a decision must be made whether to issue these permits and what permit conditions should be applied, or when the County decides whether and how to regulate a well it finds is extracting groundwater unsustainably. At that time, this PEIR can be used to simplify the task of preparing environmental documents for these actions through tiering.[18] Tiering refers to *"… the analysis of general*

[18] CEQA Guidelines Sections 15168(d) and 15152(a)

matters contained in a broader EIR [in this case, the PEIR] with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR or negative declaration solely on the issues specific to the later project."[19] CEQA encourages agencies to tier environmental analyses as a means to eliminate repetitive discussions of the same issues, and focus later analysis on the issues most pertinent and unique to the proposed decision. As part of the tiering process, the County will use the PEIR, in conjunction with detailed information on the individual project, to determine whether impacts were adequately addressed in the PEIR or need to be further evaluated.

To facilitate the use of the PEIR as a Tier 1 document that can be referenced by CEQA documents prepared for the issuance of subsequent discretionary well permits and regulatory actions regarding existing wells at the Tier 2 level,[20] it is written as a template or "handbook" to be used during future CEQA review. To achieve this, these features have been incorporated:

- A streamlined and focused set of impact assessment threshold questions was developed and used to facilitate the analysis of environmental impacts in Section 4. This refined questionnaire may be used as a departure point for future analysis of environmental impacts in Tier 2 documents.
- Focus has been given to providing a regional characterization of hydrogeologic and water resources conditions to facilitate future CEQA analysis and serve as a technical support for future groundwater management decisions.
- Programmatic mitigation measures were developed to help guide mitigation of potential impacts at the project level and to inform changes to the discretionary well permitting program.
- By collecting and referencing relevant plans, studies and other information in a single document, the PEIR creates a technical basis for more uniform assessment of well applications.

1.5 Other Agencies

Other public agencies are provided the opportunity to review and comment on the PEIR. Each of these agency types is described briefly:

- A Responsible Agency (14 California Code of Regulations [CCR] § 15381) is a public agency, other than the Lead Agency, that has discretionary approval power over the project, such as permit issuance or plan approval authority.
- A Trustee Agency[21] (14 CCR § 15386) is a state agency having jurisdiction by law over natural resources affected by a project that are held in trust for the people of the State of California.
- Agencies with Jurisdiction by Law (14 CCR § 15366) are any public agencies that have authority (1) to grant a permit or other entitlement for use, (2) to provide funding for the project in question, or (3) to exercise authority over resources that may be affected by the project.

[19] CEQA Guidelines, Section 15152

[20] State CEQA Guidelines Sections 15168(b) and (c)

[21] The four Trustee Agencies in California listed in CEQA Guidelines § 15386 are California Department of Fish and Wildlife, State Lands Commission, State Department of Parks and Recreation, and University of California.

- A city or county will have jurisdiction by law with respect to a project when the city or county having primary jurisdiction over the area involved is: (1) the site of the project, (2) the area which the major environmental effects will occur, or (3) the area where those citizens most directly concerned by any such environmental effects reside.

1.6 Organization of PEIR

This PEIR is organized to satisfy CEQA Guidelines § 15168, and includes these sections:

- Chapter 1, Introduction – identifies the purpose and scope of the PEIR.
- Chapter 2, Project Description – provides an overview of the program being evaluated.
- Chapter 3, Environmental Setting – describes location, existing site conditions, land uses, zoning designations, topography, vegetation and other conditions associated with the program location and surrounding area.
- Chapter 4, Environmental Impacts – describes the approach to the analysis of the potential environmental impacts associated with the program, and an evaluation of these impacts and associated mitigation measures.
- Chapter 5, Alternatives – describes the alternatives considered in this PEIR and the rationale for selection of an environmentally superior alternative.
- Chapter 6, Other CEQA Considerations – describes any cumulative impacts, growth inducing impacts, and significant and unavoidable impacts, and any significant irreversible environmental changes or any effects found not to be significant.
- Chapter 7, References – includes a list of documents cited in the PEIR.
- Chapter 8, List of Preparers – identifies the persons who participated in preparing the PEIR and shows their technical specialties.

1.7 Incorporation by Reference

As permitted by CEQA Guidelines § 15150, this PEIR has referenced several technical studies, analyses, and previously certified environmental documentation in the Stanislaus County General Plan, adopted in August 2016. Information incorporated by reference has been briefly summarized in the appropriate sections. The relationship between the incorporated part of the referenced document and the PEIR has been described.

1.8 Scoping Comments Received and Considered

A Notice of Preparation (NOP) and associated Initial Study for the PEIR was distributed to the State Clearinghouse, responsible agencies, and other interested parties for a 30-day public review period from October 4, 2016, to November 3, 2016. Public scoping meetings were held in Modesto. A limited number of agencies, organizations, and individuals submitted comments on the NOP. Commenters provided suggested areas of study and potential environmental impacts that were considered in preparation of this PEIR, including the following:

- Ripping of slope soils for planting of nut trees loosens soils that can be transported into stream beds reducing the capacity of those stream channels and increasing the flooding potential;
- The infiltration of river water into wells constructed within 1,000 feet of a river can affect downstream surface water rights holders;
- The document needs to address the long-term effects of climate change on the county's environment and surface and groundwater supplies;
- The County should follow the Department of Water Resources regulations in regard to GSPs, commencing with Section 350 of Title 23 of the California Code of Regulations, for its study of land subsidence impacts in the PEIR;
- The County should broadly define its studies of hydrology and water quality impacts to ensure that the data gather through the PEIR can be applied to all groundwater users in the county that must comply with SGMA;
- The County should consider the application of city noise ordinances to wells near their jurisdictions;
- The County's analysis of population and housing should take into account the impact of seasonal population growth and its potential for significant impacts on the environment, in particular those impacts on housing and businesses; and
- The County's analysis of public services should consider the contribution that seasonal workers make regarding the demand for housing and services.

2.0 PROJECT DESCRIPTION

2.1 Background and Overview

Stanislaus County is underlain by the Delta-Mendota, Eastern San Joaquin, Modesto, and Turlock groundwater subbasins of the San Joaquin Valley Groundwater Basin. Groundwater in most of the county has been sustainably managed for many years through conjunctive use with surface water under groundwater management plans implemented by the San Luis and Delta-Mendota Water Management Authority (SLDMWMA), the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), and the Turlock Groundwater Basin Association (TGBA). Nevertheless, all four subbasins have experienced storage depletion and other stresses, especially during drought conditions. Particular concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to the drought and changing surface water allocations. The Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the county, have been designated as critically overdrafted[22] by the Department of Water Resources (DWR) from overdraft conditions outside the county.

To address these evolving water supply challenges, Stanislaus County prepared and adopted the Ordinance to be deliberately aligned with sustainable groundwater management concepts defined in SGMA. Implementation guidelines for well permitting under the new Ordinance were adopted in August 2015. The Ordinance and implementation guidelines are incorporated by reference into this project description and are in Appendix A and Appendix B, respectively.

2.2 Program Requirements Being Evaluated

The action evaluated in this PEIR is future issuance of permits for wells that are subject to the Ordinance prohibition against unsustainable extraction, and potential future regulation of wells found to be extracting groundwater unsustainably, in violation of the Ordinance. Future well permitting is the primary focus of the PEIR, since the regulation of unsustainable groundwater extraction under SGMA is primarily the responsibility of GSAs, and it is unclear whether the County will ever need to exercise this authority under the Ordinance. The permitting of non-exempt wells under the Ordinance is limited in time to subsequent adoption of GSPs under SGMA. After that time (2020 in the Eastern San Joaquin and Delta Mendota groundwater subbasins, and 2022 in the Modesto and Turlock subbasins), it is expected that the Ordinance will play a relatively minor role. In the PEIR, the permitting of new wells that are subject to the Ordinance is the primary action that is being evaluated; however, it is important to note that the Ordinance itself is not the action that is being evaluated.

These clauses in the Ordinance form the basis of the "program" to be addressed in the PEIR:

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[22] SGMA references the following definition of critical overdraft from California Department of Water Resources (DWR) Bulletin 118-80: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."

- ***Stanislaus County Code §9.37.040.*** *Except as otherwise provided in this Chapter, the following actions are prohibited:*
  A. The unsustainable extraction of groundwater within the unincorporated areas of the County.
- ***Stanislaus County Code §9.37.045 A.*** *The prohibition set forth in Paragraph A of Section 9.37.040 is applicable to the extraction from any groundwater well for which an application for a new Well Construction Permit pursuant to Chapter 9.36 is filed after November 25, 2014. Applications for a Well Construction Permit submitted after that date shall demonstrate, based on substantial evidence, that either (1) one or more of the exemptions set forth in Section 9.37.050 apply, or (2) that extraction of groundwater from the proposed well will not constitute unsustainable extraction of groundwater. This paragraph shall not apply to a well designed to replace an existing well that has been permitted under Chapter 9.36 prior to November 25, 2014 if the replacement well has no greater capacity than the well it is replacing.*
- ***Stanislaus County Code §9.37.050 A.*** *The following water management practices are exempt from the prohibitions in Section 9.37.040:*
  1. *Water resources management practices of public water agencies that have jurisdictional authority within the County, and their water rate payers, that are in compliance with and included in groundwater management plans and policies adopted by that agency in accordance with applicable state law and regulations, as may be amended, including but not limited to the California Groundwater Management Act (Water Code Sections 10750 et seq.), or that are in compliance with an approved Groundwater Sustainability Plan.*
  2. *De minimis extractions as set forth in Section 9.37.030 (10) of this Chapter.*
- ***Stanislaus County Code §9.37.045 B.*** *Effective upon adoption of an applicable groundwater sustainability plan, the prohibition set forth in Paragraph A of Section 9.37.040 shall be applicable to the extraction from any groundwater well for which the County reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In the event of such determination by the County, the affected holder or holders of a Well Construction Permit issued pursuant to Chapter 9.36 for such well shall be notified and shall be required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in Paragraph 6 of Section 9.37.030.*

Based on these clauses, the Ordinance divides the county into the areas for application of discretionary well permitting and management requirements shown on Figure 2-1.

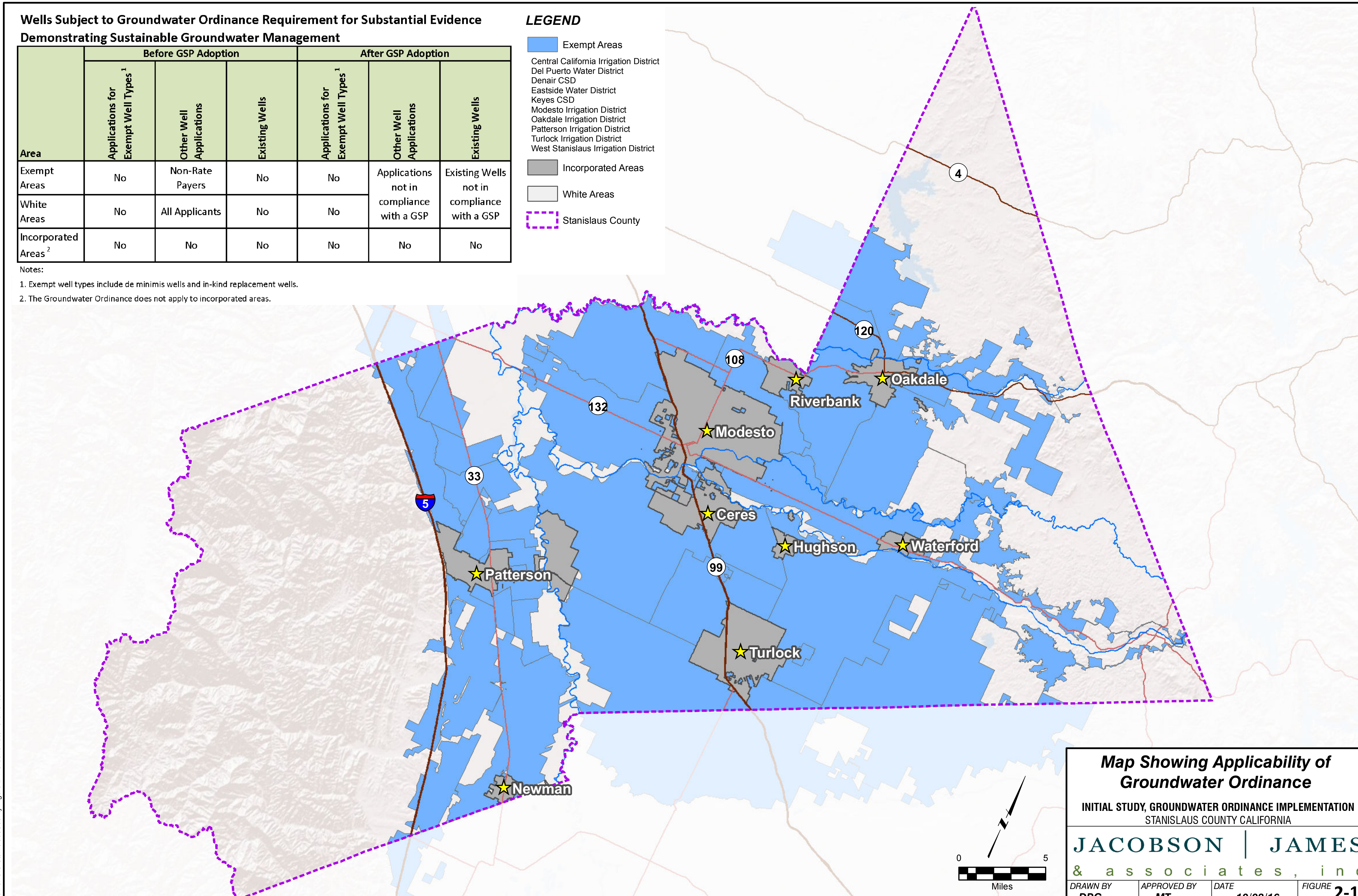
- **Incorporated Areas**. The Ordinance does not apply to the incorporated areas of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford.
- **Exempt Areas.** Groundwater management in these areas occurs under the authority of a public water agency in compliance with a GMP or a GSP. The majority of these areas receive surface water and use groundwater only as a supplemental supply. Before GSPs are adopted under SGMA, the county's

Wells Subject to Groundwater Ordinance Requirement for Substantial Evidence Demonstrating Sustainable Groundwater Management

<table>
<tr><th rowspan="2">Area</th><th colspan="3">Before GSP Adoption</th><th colspan="3">After GSP Adoption</th></tr>
<tr><th>Applications for Exempt Well Types [1]</th><th>Other Well Applications</th><th>Existing Wells</th><th>Applications for Exempt Well Types [1]</th><th>Other Well Applications</th><th>Existing Wells</th></tr>
<tr><td>Exempt Areas</td><td>No</td><td>Non-Rate Payers</td><td>No</td><td>No</td><td rowspan="2">Applications not in compliance with a GSP</td><td rowspan="2">Existing Wells not in compliance with a GSP</td></tr>
<tr><td>White Areas</td><td>No</td><td>All Applicants</td><td>No</td><td>No</td></tr>
<tr><td>Incorporated Areas [2]</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
</table>

Notes:

1. Exempt well types include de minimis wells and in-kind replacement wells.
2. The Groundwater Ordinance does not apply to incorporated areas.



Map Showing Applicability of Groundwater Ordinance

INITIAL STUDY, GROUNDWATER ORDINANCE IMPLEMENTATION

STANISLAUS COUNTY CALIFORNIA

JACOBSON | JAMES & associates, inc

DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	MT	10/03/16	2-1

Path: J:\GIS\StanislausCounty\Figure 2-1 Groundwater Ordinance.mxd groundwater management authority in these areas is generally limited to issuing ministerial[23] well permits that are exempt from the prohibition against unsustainable extraction.[24] After GSPs are adopted, the Ordinance prohibition against unsustainable groundwater extraction will apply to any well (including new and existing wells) from which the county reasonably concludes that groundwater is being unsustainably withdrawn. Issuing permits for new wells after such a determination is made would become discretionary.[25] The county may also determine whether continued groundwater extraction from existing wells is unsustainable, and therefore prohibited. However, under SGMA, GSAs will be required to regulate groundwater extraction within their jurisdictions to assure that sustainability goals established in their GSPs are being met, and if a GSA fails to fulfill this obligation, the State is expected to intervene. Therefore, it is unlikely that the County will ever need to regulate wells in this way after GSPs are adopted.

- **"White Areas."** These include unincorporated areas that are not in the jurisdictional boundaries of a public water agency covered by a GMP or GSP. The county has primary authority for groundwater management in these areas and is responsible for issuing discretionary permits for new wells that subject to the Ordinance prohibition, and ministerial permits for exempt wells. SGMA requires the adoption of GSPs for the county's subbasins by 2020 or 2022. After this time, applications for new well permits will be exempt from the Ordinance prohibition[26] and will be issued on a ministerial basis, unless the county reasonably concludes that groundwater extraction from a proposed well will be unsustainable. In addition, existing wells for which the county reasonably concludes groundwater extraction is unsustainable would be subject to the prohibition. (As stated above, it is unlikely that the County will ever need to enforce this prohibition after GSPs are adopted; however, the authority to do so is included in the Ordinance to provide a backstop to protect against the need for potential State intervention.)

The program to be evaluated in the PEIR consists of the following actions implemented under the ordinance in the unincorporated areas of the county:

- **Issuing discretionary well permits before a GSP is adopted for proposed new wells subject to the Ordinance prohibition against unsustainable extraction.** The county is responsible to implement a discretionary well permitting program for new wells subject to the Ordinance prohibition against unsustainable extraction. The applicant must provide substantial evidence that the proposed groundwater extraction will be sustainable, as defined under the Ordinance, in order to receive a well

[23] A ministerial decision involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out (State CEQA Guidelines Section 15369). By themselves, ministerial actions are not subject to CEQA.

[24] Because the exemption applies to the water management actions of public water agencies and their rate payers, applications from non-rate payers for permits to construct new wells would still be subject to the prohibition in the Ordinance because such wells are not subject regulation under GMPs. Permits for such wells would be discretionary.

[25] "Discretionary project" means a project that requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular activity (State CEQA Guidelines Section 15357).

[26] After GSP adoption, the primary groundwater management authority in these areas will be vested with GSAs that will manage and regulate groundwater resources in compliance with their GSP. Groundwater extractors (except *de minimis* extractors) will be required to pay rates to the GSAs for their extraction.

construction permit for a new well in the White Areas before the GSP is adopted or in the exempt areas if the applicant is not a rate payer. The well permitting guidelines developed under the Ordinance (Appendix B) outline the requirements for substantial evidence that must accompany non-exempt well permit applications and the criteria for their evaluation and prescribe well permit conditions for new wells as needed to assure they are operated sustainably as defined under the Ordinance. The terms for groundwater extraction in all discretionary permits that are issued will be limited to the time that GSPs are adopted in 2020 or 2022, at which time they be reauthorized for additional five-year terms with permit conditions updated with each renewal cycle to be consistent with the GSPs in force at that time.

- **Issuing discretionary well permits after adoption of GSPs for any new well that the county reasonably concludes is not in compliance with a GSP.** After GSPs have been adopted, the prohibition against unsustainable extraction will no longer presumptively apply to all new wells that are not exempt, but will apply only to any new well in the unincorporated areas of the county from which the County reasonably concludes groundwater would be unsustainably withdrawn. In essence, these are proposed wells that do not appear to be in compliance with a GSP.[27] If the County were required to step in, well permitting would then proceed under the County's discretionary program developed for non-exempt wells. It should be noted that since GSPs will define sustainable groundwater extraction at a more detailed and reliable level than is currently possible, it is not expected that many well permit applications found to be potentially unsustainable would move forward. Groundwater extraction under such permits would be issued for terms that coincide with the five-year GSP update cycles under SGMA, at which time they be reauthorized for additional five-year terms with permit conditions that are consistent with the GSPs in force at that time.
- **Regulating groundwater extraction after adoption of GSPs from any existing well that the county reasonably concludes is not in compliance with a GSP.** After GSPs have been adopted, the prohibition against unsustainable extraction will apply to any existing well in the unincorporated areas of the county from which the County reasonably concludes groundwater is being unsustainably withdrawn. These are existing wells that do not appear to be operated in compliance with a GSP. Because SGMA requires that such wells be regulated by the GSAs in the jurisdiction they are located, and under SGMA the state will regulate sustainable groundwater extraction if a GSA fails to fulfill this obligation, it may be presumed that the need for such an action by the County will be relatively rare and likely will never occur. Nevertheless, if such a determination is made, the affected holder of a Well Construction Permit for the well will be notified and required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in the Ordinance.[28] If the county determines that continued

[27] GSAs will be required to regulate groundwater extraction within their jurisdictions in accordance with their GSPs to assure that sustainability goals are being met, and the State is expected to intervene when a GSA does not uphold its responsibility. Therefore, although the County will be authorized to regulate wells after GSPs are adopted, it is unlikely that the County would need to exercise this authority.

[28] This "Look Back Provision" is intended to be a continuing safeguard against unsustainable extraction from new and existing wells in the exempt and non-exempt areas of the county after GSPs are adopted.

groundwater extraction from such a well is not sustainable, it will be subject to the prohibition in the Ordinance.

For perspective, from the time that the Ordinance was adopted on November 25, 2014 and December 13, 2017, 419 ministerial well permits have been issued for wells found to be exempt from the Ordinance, but only two discretionary well permits have been processed for a non-exempt well. During this time, the number of ministerial well permits issued decreased steadily from 241 during 2015 to 63 in 2017. It is anticipated that as the discretionary well permitting program matures, the number of discretionary permits issued will increase; however, based on experience to date, it is reasonable to assume that the rate at which discretionary permits are issued will not exceed approximately 10 permits per year. This is based on the general decrease in well permits issued over time, the growing recognition within the county that groundwater resources in the white areas are limited, and the expense associated with developing the substantial evidence required under the Ordinance and completing environmental analysis under CEQA. The period when most of these permits would be issued extends only until 2022. After that, most well permitting is expected to be in compliance with adopted GSPs, and to consist of issuing ministerial permits.

The county will issue discretionary well permits under the Implementation Guidelines developed per the requirements of the Ordinance. These implementation guidelines include thresholds that trigger requirements for implementation of certain investigations, monitoring, well design standards, or mitigation measures intended to assure the new wells will comply with the prohibition in the Ordinance against unsustainable groundwater extraction. The implementation guidelines are embodied in several documents included in Appendix B. The guidelines include these requirements:

Groundwater Levels and Storage:

- Groundwater level monitoring is required if the amount of groundwater volume proposed to be extracted from a well exceeds 10 percent of the total available aquifer storage space beneath the property that will be served.
- Storage depletion induced by new non-exempt wells may not exceed 10 percent of the pumped aquifer storage.
- If predicted interference drawdown exceeds 5 feet at an existing domestic well, or 20 feet at an existing irrigation, municipal, or industrial well, the applicant must implement a Well Interference Drawdown Monitoring and Mitigation Program to identify and ameliorate any significant adverse impacts to these wells.
- If the proposed well is in an area designated by the county as a Groundwater Level Management Zone, the applicant must: (1) provide and implement a Groundwater Extraction Offset plan that demonstrates the well will not result in a net increase in groundwater demand, or (2) complete a Groundwater Resources Investigation that demonstrates the proposed groundwater extraction will not result in adverse critical overdraft conditions as defined by DWR; and (3) provide and implement a groundwater level monitoring program.

Water Quality:

- The County has designated a Groundwater Quality Protection Zone in the area underlain by the Corcoran Clay. For new discretionary wells in this area, well construction standards must be implemented that prevent potential water quality degradation caused by cross connecting the confined and unconfined aquifer systems.
- The County has defined the area the area within 1 mile of a well that produces water with solute concentrations that exceed primary or secondary maximum contaminant levels [MCL] or other applicable Water Quality Objectives), or within 1 mile of a reported contamination incident, as a Groundwater Quality Protection Zone. For new discretionary wells in such areas, the applicant must submit a Groundwater Quality Investigation that demonstrates the proposed groundwater extraction will not result in the capture or migration of contaminated or poor quality groundwater.

Subsidence:

- The County has established a Subsidence Study Zone within 2 miles of the area underlain by the Corcoran Clay. For new discretionary wells proposed in this zone, the applicant must evaluate whether the proposed pumping will contribute to draw down of groundwater levels to an elevation below historical low levels, and assess whether the aquifer in which the well is completed may contain significant potentially compressible clay strata. (The confined aquifer system is presumed to contain significant amounts of clay deposits that are potentially compressible unless proven otherwise; whereas, the unconfined aquifer system is assumed to contain significant clay deposits that are potentially compressible if the thickness of clay strata in the completion interval of the well exceeds 50 feet)If the applicant's evaluation indicates that drawdown may decrease groundwater levels below historical low levels and the aquifer that is being pumped may contain significant compressible deposits, the applicant must submit a Geotechnical Subsidence Investigation that quantitatively assesses the amount of subsidence that may be induced by the proposed groundwater extraction, and provides recommendations for monitoring and mitigation, as appropriate.

Surface Water Depletion:

- The County has established Surface Water Protection Zones within 1 mile of groundwater-connected streams, tributaries, or reservoirs associated with the Calaveras, San Joaquin, Stanislaus, or Tuolumne Rivers for wells completed within the upper 200 feet of the aquifer system, and within 2,500 feet for wells completed below 200 feet. If a proposed discretionary well is located in a Surface Water Protection Zone, the applicant must do a Surface-Groundwater Interaction Study that demonstrates the proposed groundwater extraction will not cause depletion of surface water that unreasonably affects beneficial surface water uses.

Groundwater-Dependent Ecosystems:

- If predicted drawdown induced by a new well by the time that GSPs are adopted (2020 or 2022) exceeds ½ foot in the shallow pumped aquifer beneath any groundwater-dependent ecosystem (GDE) that is hydraulically connected to the aquifer, a GDE Impact Assessment must be done, including identification and mitigation of any potentially significant adverse impacts to GDEs.

2.3 Direct Actions

Direct actions under the program consist of the construction and operation of wells.

2.3.1 Permanent Facilities

Wells will be completed into the regional aquifer system and will consist of casing, wells screen, filter packs and sanitary grout seal intervals. The wells will be fitted with turbine submersible pumps, and completed at the surface in a small concrete well pad. The wells and appurtenant wellhead equipment may be enclosed within a small shelter and fenced compound, typically measuring approximately 10 by 20 feet.

In most cases, a power service line will be extended to a well from an existing power service line. Wooden power poles may be needed to facilitate the extension of power service to a well. In some cases, where power service is not available service extension is not practical, a diesel engine and fuel tank may be installed to power the well pump. Access to a well may be provided by existing or new access drives.

2.3.2 Typical Construction Activities and Schedules

Area of Disturbance. Well construction activities typically take place in an area measuring approximately 150 feet by approximately 200 feet. Access to the drilling site is sometimes provided from existing roads or access paths, or can be provided using a new unimproved dirt access drive which is usually approximately 10 feet wide.

Construction Schedule. Construction of a well is typically completed over an approximately 30-day period. Work during drilling and well construction is typically conducted in shifts for 24 hours/day, seven days/week until the well is constructed, which typically takes about two weeks. The remaining work, including well development, pump installation, extension of a power service line, and construction of a pump shed (if desired), is typically conducted during daytime working hours between approximately 7:00 AM and 7:00 PM and occurs over a one to two-week period.

Construction Equipment. Most production wells in the Stanislaus County region are drilled using the mud rotary or reverse rotary method with a conventional, truck-mounted drilling rig. Support equipment typically includes a flatbed pipe truck, water truck, skip loader, crew truck, generator, and light stand. Equipment used during well development and pump installation typically includes a pump truck, crew truck, generator, and pump. Finally, a fenced enclosure and shelter may be constructed around the well using standard construction equipment for small structures.

Construction Materials. Non-toxic and biodegradable National Sanitation Foundation Baroid-type products are typically used to condition the drilling mud to the proper weight and viscosity for site specific conditions. No toxic or non-degradable additives are typically used during water well drilling operations. The drilling mud is circulated through an excavated or portable mud pit. After completion of the work, the drill cuttings (soil from the boring) are typically removed from the pit, dried, and spread on the site surface in an area that does not drain to local waterways. In some cases, drilling mud is containerized and removed from a site for off-site disposal at a licensed facility. Supply wells are generally constructed using steel or polyvinyl chloride (PVC) casing and screen, and the well annular space is filled with a sand filter pack and cement grout seal in conformance with state and local well standards.

Construction Methods. Most supply wells in this region are drilled using the reverse circulation mud rotary method. Regulations for the protection of underground utilities require that the upper 5 feet of well borings be carefully hand excavated to probe for utilities. After drilling a well boring to the desired depth, electric logs are obtained and the boring is reamed to accommodate installation of the well casing and screen. The well annular space is filled with a sand filter pack and grout seal using the Tremie method. After completion of well construction, the well is developed to remove any remaining drilling fluids. The well is then tested and an appropriate pump is selected and installed.

Preparation of the fields for planting may begin concurrently with well installation or may be delayed. This work will include trenching and irrigation system installation to convey water from the well area to the orchard, followed by preparation of the field for planting by ripping, backhoeing, and/or slip plowing using tractors, and finally by planting of the trees. After planting, the orchard will be maintained and operated over an expected life of 20 years using standard agronomic methods. Ground disturbing activities will be limited to the program area and area of potential effects (APE) shown on Figure 2-1.

2.4 Required Permits and Approvals

Following Lead Agency approval of a project-specific CEQA evaluation, a Well Construction Permit and Consumptive Use Permit are issued by the Stanislaus County Department of Environmental Resources (DER). In addition to Typical permit conditions include the items below, but may include other conditions on a project-specific basis:

- **Special Well Construction Requirements.** The permit will specify any special well construction requirements, such as logging, seal depths and maximum well depths or other requirements. Non-exempt wells are required to have grout seals that extend to a depth of at least 100 feet below the ground surface in order to reduce the potential for interaction with surface water and GDEs.
- **Well Testing.** The permit will specify any special well testing requirements, such as specific capacity or aquifer testing.
- **Water Use Accounting.** The maximum average annual volume of groundwater that may be extracted will be specified in the permit based on information provided by the applicant and the results of the application review. The well owner shall install and maintain a metering device as part of the water supply and distribution system to document groundwater extraction from the well in gallons per month. Proof that the device is installed and operational (a manual and photos) shall be submitted to the DER prior to beginning extraction, and the device shall be maintained for the life of the well. The metering device shall consist of a propeller type (turbine meter) suitable for the range of extraction flows expected, and shall be installed in a straight piping run at least 10 pipe diameters from any valves, bends or fittings, and shall register total gallons and instantaneous flow rate in gallons per minute. By January 31 of each year, the well owner shall submit an annual groundwater

extraction report for the prior year to the DER that details the volume of groundwater extracted each month from the well for the prior year in gallons and acre-feet per month.

- **Groundwater Level Monitoring.** Within 30 days after receiving the well construction permit, the applicant shall submit, for DER review and approval, a brief monitoring plan that outlines the procedures to be used to obtain monthly groundwater level measurements at the site. A table presenting the date of each monthly measurement, the depth to groundwater measured to the nearest 0.1 foot below ground surface, and the length of time in days since the well was last operated, shall be submitted to the DER for each year by January 31 of the following year.[29]
- **Additional General Requirements.** This section specifies any additional requirements, such as adherence to general well construction permit conditions, state and county well construction standards, and Mitigation Monitoring and Reporting requirements resulting from the CEQA review projects.
- **Permit Terms.** A Consumptive Use Permit would be issued that would specify the term under which groundwater may be withdrawn from the well prior to renewal. The permits would be issued for terms that coincide with the adoption of GSPs, and every five-year update cycle thereafter. With each renewal, the permit conditions would be updated as needed to be consistent with the requirements of the GSP in-force at that time.

2.5 Indirect Actions

CEQA requires that an environmental analysis include the whole of an action and its potential consequences. This includes off-site and on-site, cumulative and project-level, indirect and direct, and construction and operational impacts, as long as they are reasonably foreseeable.[30] The primary impacts evaluated in the PEIR are the direct and indirect impacts associated with the primary action – construction and operation of groundwater extraction wells. Indirect actions that will be considered include the secondary actions from operation of the wells in question, such as the property uses or property use and development changes supported by the extracted groundwater. This is especially important for wells that will be used to supply water for cultivation in areas previously occupied by undeveloped rangeland (i.e., for agricultural conversion), where such an indirect action would not be possible "but for" construction of the well.[31] It is also important for regulation of wells that are currently supplying agricultural land uses because such regulation could result in a change in the type of agricultural use or even the general land use.

During conversion of rangeland to irrigated cultivation, preparation of the fields for planting may begin concurrently with well installation or may be delayed. This work typically begins with trenching and irrigation

[29] The Groundwater Ordinance identifies the acquisition of county-wide groundwater monitoring data as a key objective for effective groundwater management. Although the Ordinance allows the County to require collection of monitoring data for both exempt and non-exempt wells, this PEIR evaluates only the requirements associated with non-exempt wells for which the issuance of permits is discretionary. It should be noted, however, that the County is currently evaluating requiring the collection of monitoring data from exempt wells also.

[30] CEQA Guidelines § 15378.

[31] If a well is used to continue irrigation of a parcel that is already used for irrigated agriculture, no change in the use of the property occurs. There are no indirect impacts associated with such a well.

system installation to convey water from the well area to the area to be irrigated, followed by preparation of the field for planting. In previously uncultivated areas, this is typically done by ripping, backhoeing, and/or slip plowing using tractors, and finally by planting. After planting, the field is maintained and operated over an expected life of 20 years using standard agronomic methods.

The potential for well permitting or regulation under the Ordinance to limit future groundwater-reliant uses that have not yet been planned or permitted also exists. These effects are a potential outcome of regulatory requirements to protect the environment, and are not considered to be an environmental impact under CEQA. Specifically, denying discretionary permits or limiting the amount of groundwater that can be withdrawn from new wells is considered a regulatory action under the Ordinance that is intended to prevent significant and unreasonable societal and environmental impacts, and as such, is not evaluated as an impact under CEQA.

Tertiary and higher-tier actions, such as shifts in population growth or employment patterns in response to changes in how agricultural properties are used, and their associated environmental effects, are considered too speculative for analysis in the PEIR. This is because the number, locations and distribution of new wells evaluated under the program are not known, and higher-tier indirect effects are often driven by influences that are not reasonably foreseeable, such as future implementation of GSPs, or adoption of state standards and policies that affect surface water flow requirements and water supply deliveries.

3.0 ENVIRONMENTAL SETTING

3.1 General Setting

The program evaluated in this PEIR is applicable to unincorporated areas of Stanislaus County in central California that are not served by a public water agency operating under a GMP or GSP. The county covers 1,515 square miles in the northern San Joaquin Valley and surrounding coast range to the west and Sierra Nevada foothills to the east. Stanislaus County had a population of 531,997 in 2014 and is projected to grow to 611,376 by 2025.[32] The county is noted for its agriculture and food processing; agricultural sales and related industry accounted for $13 billion in economic activity in 2013. Other major segments of the economy include manufacturing and a range of service industries (healthcare, retail, and others). The largest manufacturing companies in the county are associated with the production of food and wine. Water supply is a major concern and is considered key to future economic prosperity, particularly in light of projected population increases. These facts are noted in the Ordinance, a copy of which is included in Appendix A.

This evaluation focuses on unincorporated portions of the county because the Ordinance does not apply to the incorporated areas. The portion of the county in the Coast Range west of the San Joaquin Valley is largely open rangeland, underlain by relatively impermeable bedrock of the Diablo Range. Groundwater supplies are very limited in this area, and groundwater demand consists of relatively few domestic and stock wells that would be considered *de minimis* and exempt from the Ordinance. The APE considered in this PEIR does not include this area, and focuses on the portion of the county in the San Joaquin Valley and the eastern foothills. These areas are underlain by regional aquifers in the San Joaquin Groundwater Basin and associated subbasins.

Conditions that may be of specific concern to this PEIR include new groundwater demand to supply the conversion of rangeland to agricultural production in the eastern portion of the county, and increased reliance on groundwater in the western portion of the San Joaquin Valley, where surface water deliveries have become less reliable as a result of drought conditions and increased allocation of surface water to environmental uses. These trends were partially responsible for the adoption of the Ordinance in 2014. Conjunctive use of groundwater and surface water is of critical importance to the reliability of agricultural and municipal water supplies in the county. Throughout most of the county, and especially in the boundaries of public water agencies, this has been effectively accomplished as evidenced by the long-term stability of groundwater levels. Increased reliance on groundwater in some areas, exclusive long-term reliance on groundwater in other areas, and the effects of drought conditions have stressed groundwater resources. Some of these stresses were alleviated by the end of the recent drought in 2016 and a return of more normal climatic conditions; however, they highlight a continuing vulnerability. Trends toward agricultural land conversion and increased allocation of surface water for environmental purposes will continue to pose challenges.

[32] Stanislaus County, 2016. Stanislaus County Comprehensive Economic Development Strategy, 2016-2021.

3.2 Land Use and Planning

Land use in Stanislaus County consists primarily of agricultural development. The incorporated cities of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford are in this area, as are the unincorporated communities of Crows Landing, Grayson, Keyes, Monterey Park, and Westley. The low foothills that comprise the eastern portion of the county are occupied primarily by open rangeland, some cultivated land, and several unincorporated communities. Three reservoirs important to the management of local water supplies are in this area, including Modesto and Woodward Reservoirs, and Turlock Lake.

The Stanislaus County General Plan includes elements, goals, policies, and implementation measures intended to protect environmental resources and avoid adverse environmental effects, examples of which include the Conservation/Open Space Element and the Noise Element. The Conservation/Open Space Element includes:

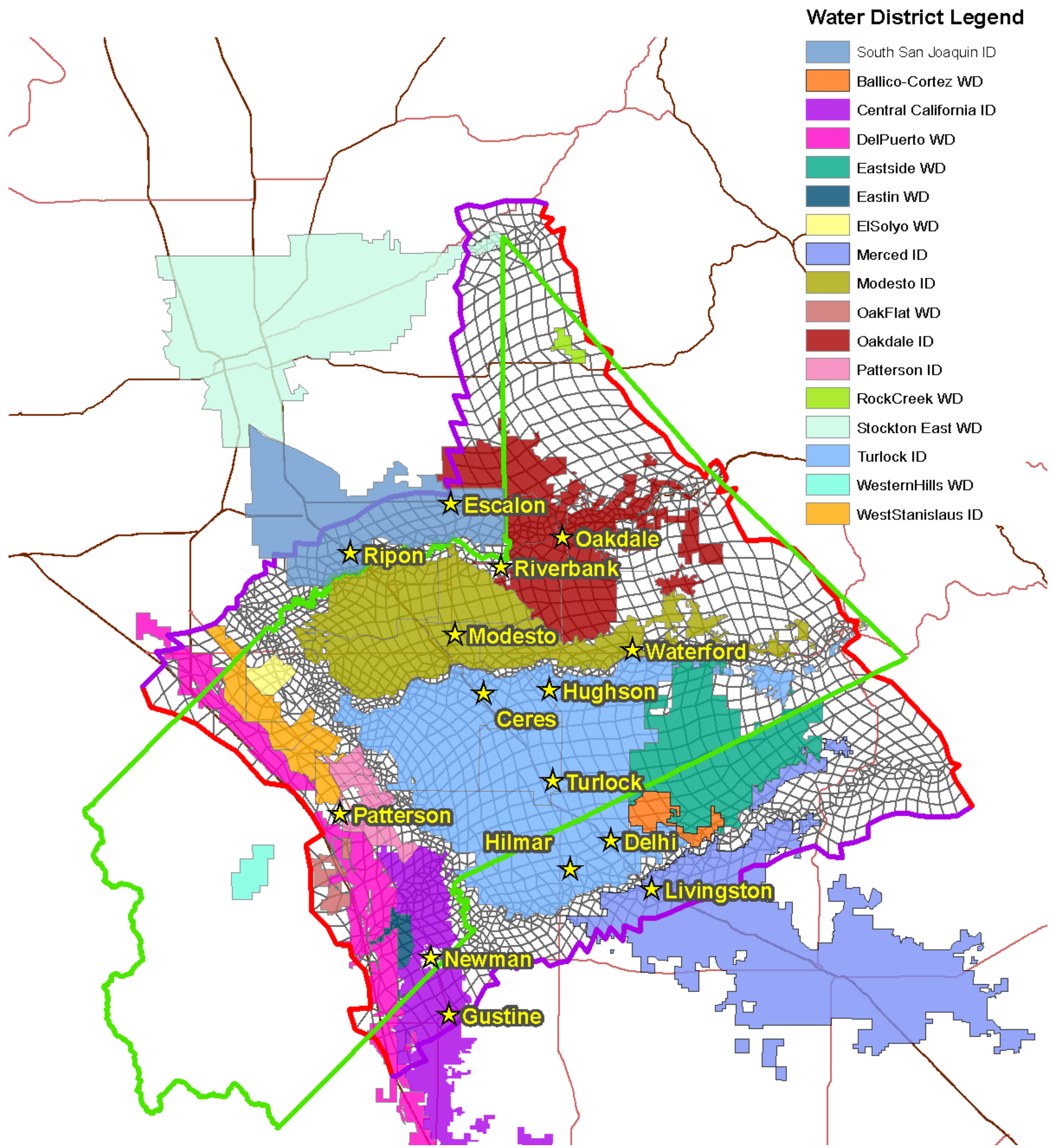
- Goal One, Encourage the protection and preservation of natural and scenic areas throughout the County;
- Goal Two, Conserve water resources and protect water quality in the County;
- Goal Six, Improve air quality;
- Goal Eight, Preserve areas of national, state, regional, and local historical importance;
- Goal Nine, Manage extractive mineral resources to endure [sic] an adequate supply without degradation of the environment; and
- Goal Ten, Protect fish and wildlife species of the County.

The applicable goal of the Noise Element is:

- Goal Two, Protect the citizens of Stanislaus County from the harmful effects of exposure to excessive noise).

3.3 Water Supply and Groundwater Management

Stanislaus County relies on the conjunctive use of surface water and groundwater. Locations of water districts and cities in the county are shown on Figure 3-1. Summaries regarding the agricultural and municipal water agencies in the County are in Tables 3-1 and 3-2, respectively. The Stanislaus and Tuolumne Rivers are important agricultural and municipal water supply sources to the county through diversions under senior water rights held by Modesto Irrigation District, Oakdale Irrigation District and Turlock Irrigation District. These districts deliver water to their agricultural and municipal customers through locally developed and financed water projects. Several public water agencies, including El Solyo Water District, Patterson Irrigation District and Westside Irrigation District, divert at least a portion of the water they deliver from the San Joaquin River. Additional riparian and appropriative water rights holders near these rivers divert water for local use. The California Aqueduct and Delta Mendota Canal skirt the western edge of the San Joaquin Valley and provide water to several public water agencies, including Central California Irrigation District, Del Puerto Water District, Oak Flat Water District, Patterson Irrigation District and Westside Irrigation District.



Notes:
ID = irrigation district
WD = water district

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& associates, inc

Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	11/17/17	JH	MT

FIGURE 3-1

Locations of Irrigation and Water Districts and Cities in the Stanislaus County Area

TABLE 3-1 MUNICIPAL WATER SUPPLY AGENCIES IN STANISLAUS COUNTY

Jurisdiction	Groundwater Subbasin	Water Supply Source	Description
City of Ceres	Turlock	Groundwater	15 Potable and 11 non-potable wells serve a population of approximately 48,000 via 11,300 connections.
Crows Landing CSD	Delta-Mendota	Groundwater	Two wells serve a population of approximately 500 via 140 connections.
City of Hughson	Turlock	Groundwater	Three active and two standby wells serving a population of approximately 6,100 with 2,000 connections.
Industrial Pumping	All	Groundwater	Some food processing and other industrial facilities in the area utilize their own water supply wells.
Keyes CSD	Turlock	Groundwater	Four wells serve a population of approximately 4,800 via 1,500 connections.
Knights Ferry CSD	Modesto	Surface Water	Surface water delivered by an OID diversion from the Stanislaus River.
City of Modesto	Modesto Turlock	60% Groundwater 40% Surface Water	88 wells plus surface water serve a population of approximately 260,000 via 75,000 connections (2015), including several "service island" systems (Grayson, Turlock, Del Rio, Empire, Hickman).
Monterey Park CSD	Modesto	Groundwater	Two wells serve a population of approximately 200 via 50 connections.
City of Newman	Delta-Mendota	Groundwater	Three active and 1 standby wells serving a population of approx. 11,000 with approx. 3,300 connections.
City of Oakdale	Modesto; Eastern San Joaquin	Groundwater	Nine wells serve a population of approximately 22,000 Via 7,700 connections.
City of Patterson	Delta-Mendota	Groundwater	Seven wells and two non-potable wells serving a population of approx. 22,600 with approx. 6,300 service connections.
City of Riverbank	Modesto	Groundwater	10 wells serve a population of 23,000 via 6,800 connections.
Riverdale Park CSD	Modesto	Groundwater	One well serves a population of approximately 300 via 180 connections.
Turlock	Turlock	TID Surface Water and Groundwater	20 active, one standby and four non-potable wells plus surface water serve a population of approximately 70,000 via 18,500 connections.
Waterford	Modesto	Groundwater	Three systems serve a population of approximately 10,000: Two adjacent systems (Waterford and River Pointe) with 8 wells serve 2,400 connections; Hickman with 2 wells serves 180 connections.
Westley CSD	Delta-Mendota	Groundwater	Two wells serve a population of approximately 80 via 23 residential and 15 commercial connections.

Notes:
CSD = Community Services District
OID = Oakdale Irrigation District

TABLE 3-2 AGRICULTURAL WATER SUPPLY AGENCIES IN STANISLAUS COUNTY

Jurisdiction	Groundwater Subbasin	Water Source	Description
Central California Irrigation District	Delta-Mendota	Delivers CVP water (as a San Joaquin River Exchange Contractor) and groundwater, which is augmented by private groundwater pumping	Serves approximately 560 customers in a service territory of 143,400 acres, of which 20,000 acres are in western Stanislaus County, via a system of ditches and canals. CVP allocations average 510,000 AFY, but can be significantly less during drought years.
Del Puerto Water District	Delta-Mendota	Delivers CVP water, which is augmented by private groundwater pumping	Contracted to deliver up to 140,210 AFY to 147 retail customers with 44,000 irrigable acres in a 53,000-acre service area, mostly in Stanislaus County, via a system of ditches and canals.
Eastin Water District	Delta-Mendota	Groundwater	At this time, water within the 3,520-acre district is provided entirely by private groundwater pumping.
Eastside Water District	Turlock	Groundwater	At this time, water within the approximately 54,000-acre district is provided primarily by private groundwater pumping, with minor deliveries of TID surface water in years when surplus water is available
El Solyo Water District	Delta-Mendota	San Joaquin River water, augmented by private groundwater	Delivers water to agricultural customers in a 4,060-acre service area through a system of canals and ditches.
Modesto Irrigation District	Modesto	Delivers Tuolumne River water and groundwater, which is augmented to some extent by private groundwater pumping	Serves approximately 3,100 retail agricultural irrigation customers on 60,000 acres of irrigable land in a service territory of approximately 101,700 acres via a system of ditches and canals. In addition, the district delivers wholesale domestic water to the City of Modesto.
Oak Flat Water District	Delta-Mendota	Delivers SWP water, which is augmented by private groundwater pumping	Contracted to deliver up to 5,700 AFY to 2,158 irrigable acres in a 4,537-acre service area via a system of ditches and canals
Oakdale Irrigation District	Modesto; Eastern San Joaquin	Delivers Stanislaus River water, drainage water and groundwater, which is augmented to some extent by private groundwater pumping	Serves approximately 2,900 retail agricultural irrigation customers and nine domestic water systems in a service territory of approximately 73,660 acres via a system of ditches and canals

TABLE 3-2 AGRICULTURAL WATER SUPPLY AGENCIES IN STANISLAUS COUNTY

Jurisdiction	Groundwater Subbasin	Water Source	Description
Patterson Irrigation District	Delta-Mendota	Delivers CVP, reclaimed drainage, groundwater and San Joaquin River Water, which is augmented by private groundwater pumping	Serves approximately 725 retail customers in a 13,150-acre service area via a system of ditches and canals
Rock Creek Water District	Eastern San Joaquin	Delivers surface water from the Salt Spring Reservoir in Calaveras County, which is augmented by private groundwater pumping	Serves four retail customers in a service territory of 1,844 acres via a canal from Salt Springs Reservoir
Turlock Irrigation District	Turlock	Delivers Tuolumne River water and groundwater, which is augmented to some extent by private groundwater pumping	Serves approximately 5,800 retail agricultural irrigation customers on 150,000 acres of irrigable land in a service territory of approximately 196,500 acres via system of ditches and canals. In addition, the district delivers domestic water to the community of La Grange.
West Stanislaus Irrigation District	Delta-Mendota	Delivers water from the San Joaquin River, CVP and groundwater, which is augmented by private groundwater pumping	Serves 83 retail customers in a 21,774-acre service territory via a system of ditches and canals. Also sells water to the 2,203 acres in the White Lake area, north of Grayson.
Ballico-Cortez Water District	Turlock	Groundwater	At this time, water within the approximately 6,700-acre district is provided primarily by private groundwater pumping, with minor deliveries of Truckee Irrigation District surface water in years when surplus water is available.
Notes: AFY = acre-feet per year CVP = Central Valley Project			

Groundwater is the predominant source of municipal supply in the county, although surface water makes up a growing percentage of the municipal water supply, and additional projects to provide surface water for municipal use are being planned. For example, the Stanislaus Regional Water Authority plans to deliver up to 5,600 acre-feet per year (AFY) of Tuolumne River water to Ceres and up to 11,100 AFY to Turlock by 2020.[33]

[33] West Yost, 2017. *Surface Water Supply Project, Initial Project Capacity, Estimated Cost and Rate Impacts. Presentation to Stanislaus Regional Water Authority.* August 3.

Throughout most of the county, groundwater is used conjunctively with surface water as an irrigation water supply. Generally, in areas that receive surface water deliveries, groundwater is used as a supplemental irrigation supply during times of surface water shortage. This conjunctive use pattern, combined with deep percolation[34] of applied water to recharge groundwater supplies, has resulted in generally stable groundwater levels over the long term. A few areas rely primarily on groundwater as an irrigation water supply, including Eastin Water District, Eastside Water District, Ballico-Cortez Water District and the unincorporated areas of the county outside the boundaries of existing public water agencies (the "White Areas" discussed in Section 2.2). Groundwater resources in these areas are more vulnerable to long term stress and depletion and more important to local supply. Enhanced groundwater recharge and other means of relieving stress on groundwater resources are being investigated in these areas.

Due to regulatory restrictions associated with conveying water through the Sacramento-San Joaquin Delta and recent drought conditions, surface water deliveries from the state and federal water projects to water agencies west of the San Joaquin River have been significantly less than contract allocations. For example, during the recent years, Del Puerto Water District received these percentages of their contract allocation: 10% in 2009, 80% in 2010, 45% in 2011, 40% in 2012, 20% in 2013, 0% in 2014, and 0% in 2015.[35] Irrigation districts east of the San Joaquin River were not able to deliver their full allocations during the drought. The affected water districts have actively engaged in local, regional, and statewide efforts to secure additional water supplies to help meet customer demand. In some cases, landowners relied on the fallowing of productive lands or turned to groundwater for irrigation supplies.

Significant regulatory changes that will have a profound effect on both surface water and groundwater supplies in the county are expected to be implemented in the coming years. To comply with the SGMA, GSPs are required to be developed and implemented by GSAs for the Delta-Mendota and Eastern San Joaquin Subbasins by 2020, and for the Modesto and Turlock subbasins by 2022. These plans will define the sustainable yield of the subbasins, identify any special management areas, define management objectives, criteria and thresholds, and establish monitoring networks. With respect to this PEIR, the key implication of these requirements is that the groundwater resources impacts of all extraction in the county will be much more closely evaluated in the near future, with measures required to mitigate the adverse environmental economic and societal impacts associated with ongoing and potential future groundwater extraction. The SGMA regulations require GSAs to achieve set milestones every five years, and sustainability within 20 years. Failure to achieve these goals triggers state intervention by the State Water Resources Control Board (SWRCB).

The second anticipated regulatory change is the ongoing process by the SWRCB to amend the Bay-Delta Water Quality Control Plan. As currently proposed, this plan includes requirements to meet minimum, unimpaired flow requirements on the Stanislaus and Tuolumne Rivers. The Draft Substitute Environmental

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[34] Deep percolation is the term used to describe infiltration of water from the land surface past the root zone and the reach of near surface processes, where it will ultimately recharge the underlying groundwater aquifer.

[35] Stanislaus Local Agency Formation Commission, 2016. Municipal Service Review and Sphere of Influence Update for: Del Puerto, Eastin, El Solyo and Oak Flat Water Districts, Patterson and West Stanislaus Irrigation Districts.

Document prepared by the SWRCB is currently under review, and concludes that the impacts on groundwater resources will be significant and unavoidable; however, this document does not quantify the locations of these impacts or evaluate where they will occur.[36] The proposal presents an undefined challenge to sustainable groundwater management in the county.

Groundwater Management in the county was until recently performed under Groundwater Management Plans prepared and administered in the Modesto Subbasin by STRGBA, in the Turlock Subbasin by TGBA, and in the Delta-Mendota Subbasin by the SLDMWMA and Central California Irrigation District (CCID). With the implementation of SGMA, the following changes have been recently implemented:

- In 2015, the County registered with the DWR to be the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for that portion of the Eastern San Joaquin Groundwater (SJGW) Subbasin that lies within the County's boundaries, and submitted a monitoring plan that was accepted by DWR. Stanislaus County is coordinating monitoring activities in this area with Oakdale Irrigation District, Rock Creek Water District, and private land owners. The public agencies involved in groundwater management within the eastern portion of the Eastern San Joaquin Groundwater Subbasin, including the northern triangle area, have formed the Eastside San Joaquin Groundwater Sustainability Agency to address compliance with the SGMA. The locations of water agencies in this effort are shown in Figure 3-1.

- STRGBA is registered with the DWR to be the CASGEM monitoring entity for the Modesto Subbasin. This group, consisting of the Cities of Modesto, Riverbank, Waterford and Oakdale, as well as Oakdale Irrigation District (OID), Modesto Irrigation District (MID) and Stanislaus County, has recently organized to form the STRGBA GSA to address compliance with the SGMA. The locations of water agencies in this effort are shown in Figure 3-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and shares information with them through direct communication and via the Stanislaus County Water Advisory Committee (WAC) and Technical Advisory Committee (TAC), and as a member of the GSA.

- TGBA is registered with the DWR to be the CASGEM monitoring entity for the Turlock Subbasin. The western members of this group, consisting of the Cities of Turlock, Modesto, Ceres, Hughson and Waterford, as well as Turlock Irrigation District (TID), Delhi County Water District, Hilmar County Water District, Stevinson Water District, Merced Irrigation District, Merced County, Stanislaus County, Keyes Community Services District and Denair Community Services District have recently organized to form the West Turlock Subbasin GSA to address compliance with the SGMA. The eastern members of TGBA, including Eastside Water District (EWD), Ballico Cortez Water District, Merced Irrigation District, Merced County, Stanislaus County and the City of Turlock have formed the East Turlock Subbasin GSA. The locations of water agencies in this effort are shown in Figure 3-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and

[36] SWRCB, 2016. *Draft Revised Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the Bay-Delta: San Joaquin River Flows and Southern Delta Water Quality.* September 15.

shares information with them through direct communication and via the WAC and TAC, and as a member of the GSAs in the subbasin.

- Groundwater monitoring and management in the Delta Mendota Subbasin have been implemented through the San Luis and Delta Mendota Water Use Authority (SLDMWUA), of which Del Puerto Water District, West Stanislaus Irrigation District, Patterson Irrigation District, and Central California Irrigation District are members. Water management entities within the portion of the Delta-Mendota Subbasin that lies in the Stanislaus County Hydrologic Model (SCHM) have formed five separate GSAs to implement compliance with the SGMA. These include the City of Patterson, Patterson Irrigation District, Del Puerto Water District, West Stanislaus Irrigation District, and the Northwestern Delta-Mendota GSA (which consists of Merced and Stanislaus Counties, as well as several other cooperating entities and private landowners). The locations of water agencies in these efforts are shown in Figure 3-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and shares information with them through direct communication and via the WAC and TAC.

3.4 Physiographic Setting

The APE considered in this Initial Study includes the portions of Stanislaus County occupied by the San Joaquin Valley and the low Sierra Nevada foothills to the east. The San Joaquin Valley comprises the southern two thirds of California's Central Valley, a long asymmetrical trough, approximately 40 to 60 miles wide, extending north-northwest for approximately 400 miles between the Coast Ranges on the west and the Sierra Nevada and Cascade Mountains to the east. In Stanislaus County, the valley floor ranges in elevation from approximately 70 to 150 feet above mean sea level (amsl) near the southern county boundary to 30 to 100 feet amsl near the northern boundary. It is bounded by abruptly rising hills and mountains of the Diablo Range to the west that rise to elevations as high as 3,000 to 4,000 feet amsl. To the east are gently rising rolling foothills of the Sierra Nevada with elevations of approximately 400 to 700 feet amsl near the eastern county boundary. The foothills comprise a rolling upland that is dissected by the major rivers draining the western slope of the Sierra Nevada, including the Calaveras, Stanislaus and Tuolumne Rivers, which are deeply incised into canyons prior to emerging out onto the valley floor.

3.5 Climate

The area has a "Mediterranean" climate characterized by hot, dry summers and short, wet winters, averaging more than 260 sunny days per year. As summarized in Table 3-3, average annual precipitation at the Modesto meteorological station is just over 13 inches per year, with 88 percent occurring between November and April.[37,38, 39]

[37] Turlock Irrigation District, 2012. 2012 Agricultural Water Management Plan.

[38] Sperling's Best Places, 2016. http://www.bestplaces.net/climate/county/california/stanislaus. Accessed April 25.

[39] US Climate Data, 2017. Climate Modesto – California: https://www.usclimatedata.com/climate/modesto/california/united-states/usca0714

TABLE 3-3 AVERAGE CLIMATE, MODESTO, CALIFORNIA

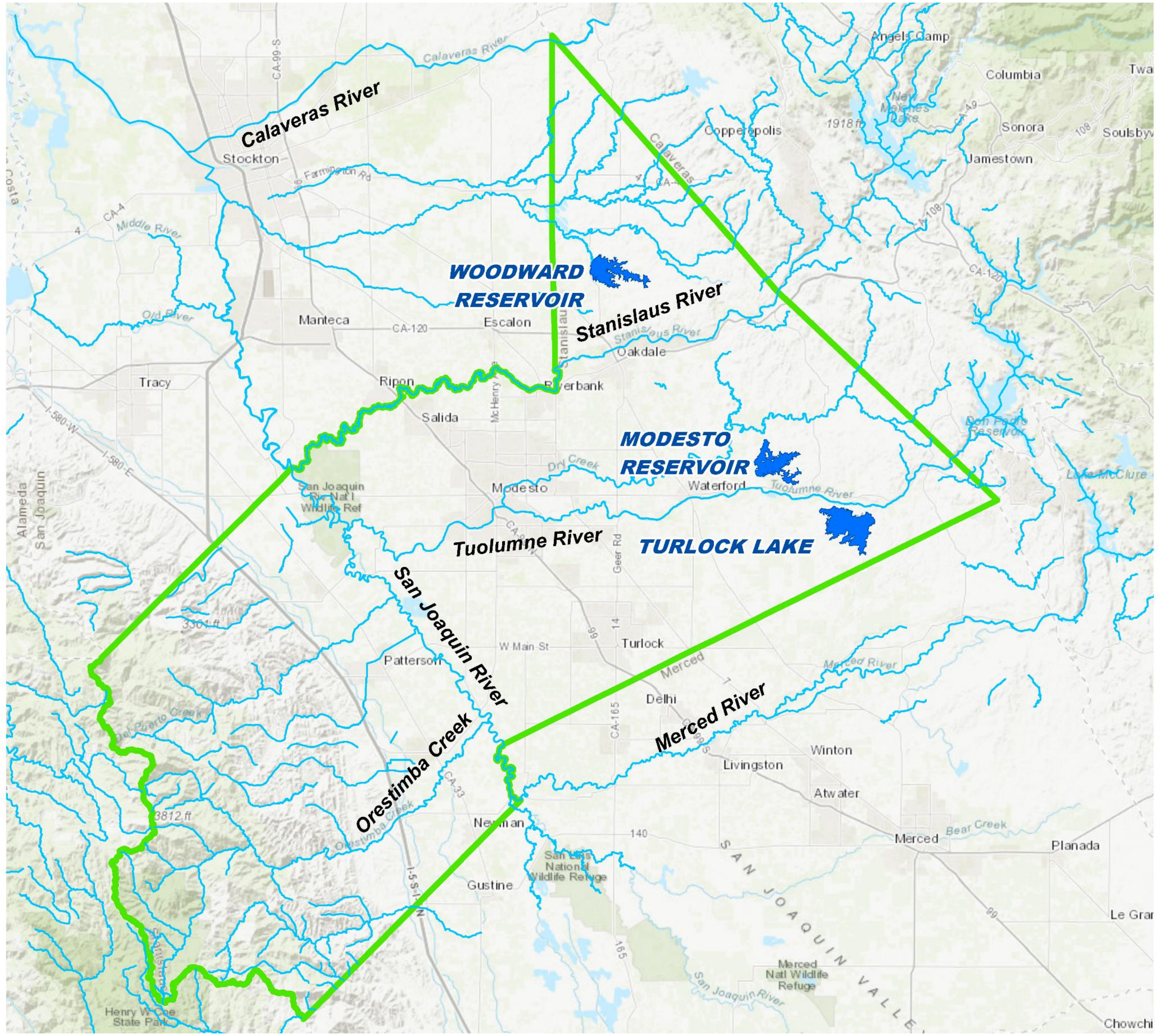
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	55	63	69	75	83	90	94	94	89	79	65	56
Average low in °F:	40	43	46	49	55	60	62	62	59	53	45	40
Average precipitation in inches:	2.6	2.36	2.05	0.98	0.63	0.12	0.04	0.04	0.28	0.67	1.38	2.05

Much of California, including the Central Valley, experienced unprecedented drought conditions from 2011 to 2015. As a result, water conservation measures were mandated, delivery of surface water from the state and federal water systems was curtailed, and reliance on groundwater resources for agricultural uses increased. Annual precipitation in most parts of California, including the northern San Joaquin Valley, is highly variable, and future droughts may be expected, including droughts similar in extremes and duration as the recent drought.

3.6 Hydrology

Stanislaus County is in the northern portion of the San Joaquin River Hydrologic Region. Major drainages entering the county from the east include the Stanislaus and Tuolumne Rivers. They are fed by storm runoff and snowmelt from the Sierra Nevada and constitute an important water supply for the county (Figure 3-2). These rivers are tributary to the San Joaquin River that enters the county from the south and flows north-northwestward through the low point of the San Joaquin Valley. Smaller tributaries of the Stanislaus and Tuolumne Rivers drain local upland areas (the downslope extensions of interfluvial ridges) between the more deeply incised river drainages. Dry Creek is a major local tributary of the Tuolumne River. The Calaveras River crosses the northern tip of the County and flows into the San Joaquin Delta, as does Littlejohn Creek and its tributaries that drain the northern triangle area of the county. Flow in the Calaveras, Stanislaus, San Joaquin and Tuolumne Rivers is regulated by releases from major storage reservoirs in the Sierra Nevada east of the county. Reservoir operations are controlled to provide water supply to downstream water right holders, attenuate peak flood flows, and meet mandated ecological flow requirements. Woodward Reservoir, Modesto Reservoir, and Turlock Lake are in the low foothills in the eastern portion of the county, and are used for off-stream storage of diverted water prior to delivery to agricultural and municipal water customers. Farmington Flood Control Basin on the Rock Creek, Duck Creek and Littlejohn Creek drainages in the northern triangle area of the county is currently used during wet years for flood control purposes, but Stockton East Water District is proposing to use Farmington Basin as a reservoir for conjunctive use of surface water to supply groundwater recharge in San Joaquin County.

Streams entering Stanislaus County from the Diablo Range to the west are smaller. With the exception of Orestimba Creek and Del Puerto Creek, these streams are typically ephemeral, at least on the valley floor, reaching the San Joaquin River for only part of the year.



Stanislaus County Boundary

Map Source: Esri, HERE, DeLorme, Tom Tom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, OpenStreetMap contributors, and the GIS User Community

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Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	12/19/17	JH/NA	MT

FIGURE 3-2

Hydrologic Features within Stanislaus County

3.7 Geology

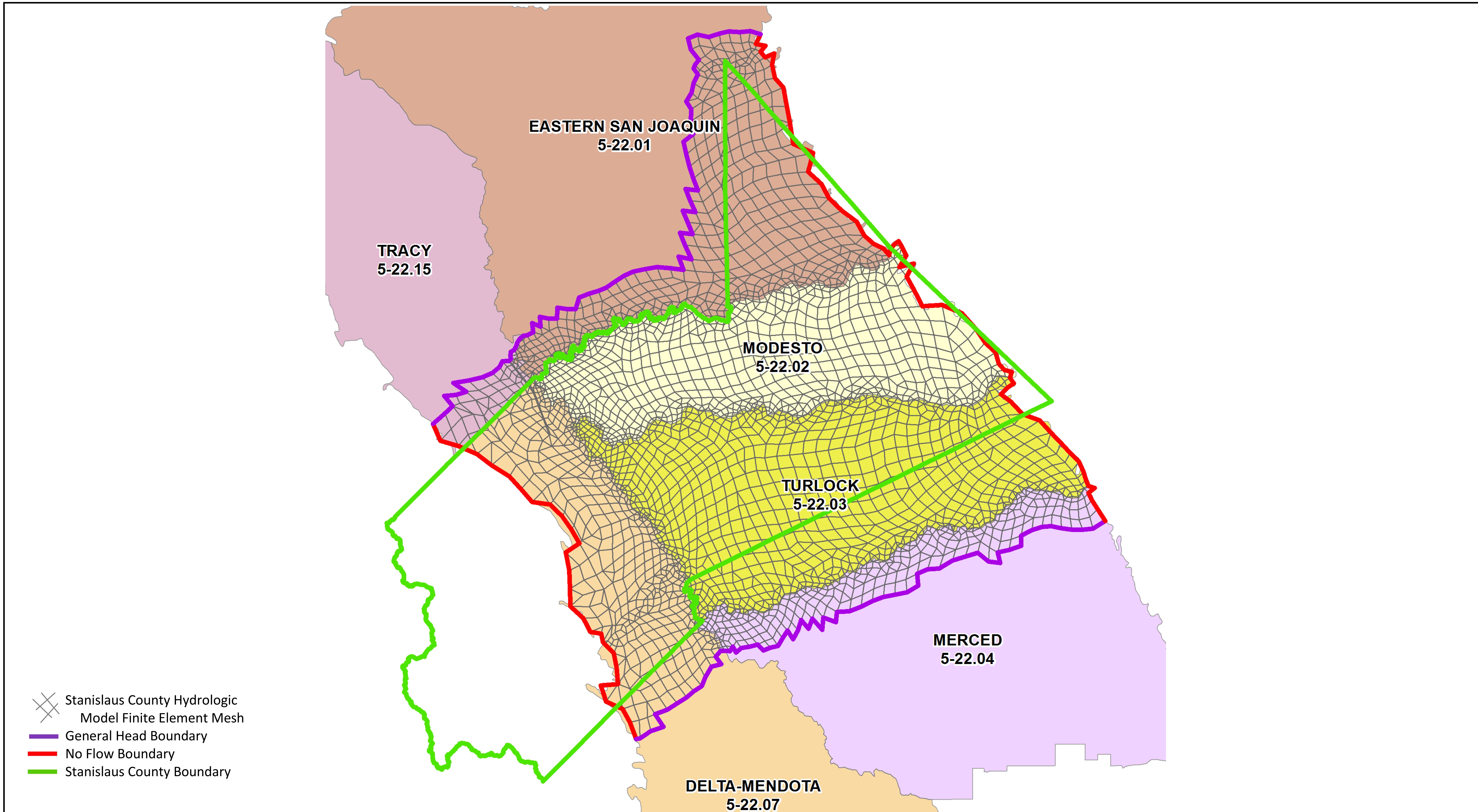
The San Joaquin Valley is a deep, north-northwest trending alluvial basin filled with a succession of Recent to upper Tertiary alluvial sediments derived from the Coast Range to the west and the Sierra Nevada to the east. These alluvial sediments are underlain by a succession of Tertiary and Mesozoic marine sedimentary formations. On the western side of the San Joaquin Valley, Quaternary alluvial deposits are underlain by the Plio-Pleistocene Tulare Formation that increases in thickness eastward away from the Diablo Range to a maximum of approximately 1,400 feet near the valley axis.[40] Similarly, east of the San Joaquin River, Quaternary alluvium is underlain by the Pleistocene Modesto and Riverbank Formations, and the Plio-Pleistocene Turlock Lake Formations. These formations are coeval and interfinger with the Tulare Formation near the valley axis. The Tulare, Modesto, Riverbank and Turlock Lake Formations all consist largely of alluvial fan deposits derived from the Diablo range and Sierra Nevada, and are separated by a series of fine-grained, lacustrine deposits that increase in frequency and thickness toward the valley center. The most regionally extensive lacustrine deposit is the Corcoran Clay member of the Tulare and Turlock Lake Formations that is thickest near the axis of the basin and thins or is absent near the basin edges.

On the east side of the county, the volcano-fluvial Pliocene-Miocene Mehrten Formation underlies the Turlock Lake Formation and crops out in the foothills, where it forms a dissected upland. The Mehrten Formation consists of semi-consolidated to well consolidated sandstones, conglomerates, volcanic mudflows and siltstones, often with interspersed paleosols, and capped in many places by well-developed duripan soils. The Mehrten Formation, is underlain by lower Tertiary volcanic and volcano-fluvial formations including the Valley Springs Formation in the foothills, and marine sedimentary formations including the Domengine Formation beneath the valley.

3.8 Hydrogeology

Stanislaus County is underlain by the Delta-Mendota, Eastern San Joaquin, Modesto, and Turlock groundwater subbasins of the San Joaquin Valley Groundwater Basin, as shown on Figure 3-3. Data regarding the groundwater subbasins in Stanislaus County is summarized in Table 3-4.

[40] San Luis and Delta-Mendota Water Users Authority, 2011. Groundwater Management Plan for the Northern Agencies in the Delta Mendota Canal Service Area.



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Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	11/10/17	JH	MT

FIGURE 3-3

Groundwater Subbasins in Stanislaus County

TABLE 3-4 SUMMARY OF STANISLAUS COUNTY GROUNDWATER SUBBASINS

Groundwater Subbasin (DWR Basin Number)	Approximate Area	CASGEM Priority	Critical Overdraft Listing
Eastern San Joaquin Subbasin (5-22.01)	1,105 mi^2 (707,000 acres, including areas outside the county)	High	Listed
Modesto Subbasin (5-22.02)	385 mi^2 (247,00 acres, entirely within the county)	High	No
Turlock Subbasin (5-22.03)	542 mi^2 (347,000 acres, including areas outside the county)	High	No
Delta-Mendota Subbasin (5-22.07)	1,170 mi^2 (747,000 acres, including areas outside county)	High	Listed

Sources:
California Department of Water Resources (DWR), 2003. *California's Groundwater, Bulletin 118.* Last update for Eastern San Joaquin, Turlock, and Delta-Mendota Subbasins: 2006; Modesto Subbasin: 2004.
DWR. 2016. *Water Management Planning Tool.* Website: http://water.ca.gov/groundwater/boundaries.cfm. Accessed July 12, 2017.

Groundwater in most of the county has been sustainably managed for many years through conjunctive use with surface water under groundwater management plans that are being implemented by the SLDMWMA, the STRGBA, and the TGBA. Nevertheless, all four subbasins have experienced storage depletion and other stresses resulting from conditions of drought. Particular current concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to the drought and changing surface water allocations. In addition, the Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the county, are designated as critically overdrafted[41] by the DWR as a result of overdraft conditions and subsidence outside the county.

Aquifer systems in the San Joaquin Valley Groundwater Basin (SJVGB) consist mostly of continental sediments derived from erosion of the Sierra Nevada to the east and the Coast Ranges to the west, and deposited in the valley. The alluvial aquifer system, much of which occurs as fan deposits, consists of a complex set of interbedded aquifers and aquitards that function regionally as a single water-yielding system. The aquifers are relatively thick, with the upper 800 feet providing the primary source of groundwater supply in the area. Aquifer materials consist of gravel and sand, which become increasingly interbedded with fine-grained silt, clay, and lakebed deposits toward the center of the valley. Regionally, the aquifer system of the SJVGB can be divided into an upper unconfined to semi-confined aquifer system, a series of geographically extensive confining clay layers, and a deep confined aquifer system that occupies the central portions of the basin. Toward the center of the valley, the distal, finer-grained facies of the alluvial deposits are interfingered and

[41] The DWR has adopted the following definition of critical overdraft: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (DWR Bulletin 118-80).

interbedded with flood plain and basin deposits. Buried river-channel deposits occur in the alluvial fan deposits at the margins of the valley and along Pleistocene and modern river courses.[42]

The principal water-bearing formations on the east side of SJVGB include the semi-consolidated to consolidated Mehrten Formation (Miocene-Pliocene), the semi-consolidated to unconsolidated Turlock Lake Formation (Plio-Pleistocene),[43] the unconsolidated Riverbank and Modesto Formations (Pleistocene), and the overlying unconsolidated Holocene Alluvium and Basin Deposits. These sedimentary deposits dip gently westward and increase in thickness with distance from the Sierra Nevada foothills and from north to south along the valley axis. Aquifers in these deposits tend to be unconfined to semi-confined near the valley margin, grading to semi-confined and confined near the valley axis.[44,45]

The principal water-bearing formation on the west side of the SJVGB is the Plio-Pleistocene Tulare Formation, which increases in thickness eastward away from the Coast Range to a maximum thickness of approximately 1,400 feet near the valley axis.[46] The Tulare Formation consists of alluvial deposits separated by a series of fine-grained lacustrine deposits that interfinger with coeval deposits of the Turlock Lake Formation to the east. It is broadly separated into an upper unconfined to semi-confined aquifer and a lower confined aquifer. The unconfined and confined aquifer systems are separated by a regionally extensive lacustrine unit in the upper Tulare and Turlock Lake Formations known as the Corcoran Clay, which occurs throughout the SJVGB.[47,48,49]

3.8.1 Eastern San Joaquin Groundwater Subbasin

The Eastern SJGW Subbasin underlies the "northern triangle" of Stanislaus County. Topographically, this area is characterized by low, rolling hills on the eastern flank of the San Joaquin Valley. It is bounded to the south by the Stanislaus River and to the east by low-permeability bedrock formations of the Sierra Nevada. To the north and west it extends outside the county boundaries into San Joaquin County. A small portion of the Eastern SJGW Subbasin also extends into Calaveras County to the east. Woodward Reservoir is located in the south-central portion of the northern triangle, and the Calaveras River is located near its northern apex.

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[42] DWR, 2013. California's Groundwater Update 2013, A Compilation of Enhanced Content for California Water Plan Update 2013, Chapter 8 – San Joaquin River Hydrologic Region. April.

[43] Some workers have mapped the Turlock Lake Formation as transitioning to the Plio-Pleistocene Laguna Formation north of Oakdale.

[44] USGS, 2004. *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California.* Scientific Investigations Report 2004-5232.

[45] DWR, 2013. California's Groundwater Update 2013, A Compilation of Enhanced Content for California Water Plan Update 2013, Chapter 8 – San Joaquin River Hydrologic Region. April.

[46] SLDMWUA, 2011. Groundwater Management Plan for the Northern Agencies in the Delta Mendota Canal Service Area. November.

[47] USGS, 2004. *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California.* Scientific Investigations Report 2004-5232.

[48] DWR, 2013. California's Groundwater Update 2013, A Compilation of Enhanced Content for California Water Plan Update 2013, Chapter 8 – San Joaquin River Hydrologic Region. April.

[49] The Corcoran Clay is also reported as a member of the Turlock Lake Formation that is coeval and interfingered with the Tulare Formation near the center of the SJVGB (USGS, 2004).

Groundwater in this portion of the subbasin occurs primarily in the Mehrten Formation under unconfined to semi-confined conditions. The southeastern portion of this area is also underlain by the Turlock Lake, Laguna, and Riverbank Formations, and by valley-fill alluvium near the Stanislaus River. These units supply more limited quantities of groundwater. The Stanislaus River in this area is groundwater-connected and includes both gaining and losing reaches.[50,51]

A portion of the area southwest of Woodward Reservoir is served by surface water from the Oakdale Irrigation District; however, groundwater is the primary water source for most of the remaining portion of the Eastern SJGW Subbasin that underlies the County. Most high-capacity irrigation wells in the area are completed in the Mehrten Formation; whereas the Turlock Lake Formation, Riverbank Formation, and valley-fill alluvium primarily serve as the water supply for lower-capacity and domestic wells.

The lack of current surface-water supply options in the eastern portions of the County, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, have placed significant stress on groundwater resources in the portion of the Eastern SJGW Subbasin underlying the County. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, these groundwater stresses may be expected to continue. Groundwater monitoring data are limited in this area; however, information compiled by the County suggests that groundwater levels have fallen in some areas by tens of feet in recent years.[52] At this time, available data are insufficient to assess long-term trends in large portions of this area.

3.8.2 Modesto Groundwater Subbasin

The Modesto Subbasin is bounded to the south by the Tuolumne River, to the north by the Stanislaus River, to the west by the San Joaquin River, and to the east by low-permeability bedrock formations of the Sierra Nevada. The subbasin lies entirely within the County. Topography ranges from gently rolling hills in the eastern portion of the subbasin to alluvial plains in the central and western portions. Modesto Reservoir is located in the rolling topography in the eastern portion of the subbasin, near the contact between the Mehrten Formation and the younger alluvial formations.

Groundwater in the eastern portion of the subbasin occurs primarily in the Mehrten, Turlock Lake, Riverbank, and Modesto formations under unconfined to semi-confined conditions. In the central and western portions of the subbasin, an unconfined to semi-confined aquifer system occurs above the Corcoran Clay in the Modesto and Riverbank Formations and Holocene alluvial deposits. Confined aquifers occur in the Turlock Lake Formation and Mehrten Formation below the Corcoran Clay. Groundwater production wells are

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[50] USGS, 2004. *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California.* Scientific Investigations Report 2004-5232.

[51] SWRCB, 2012. Draft Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the Bay-Delta: San Joaquin River Flows and Southern Delta Water Quality. December.

[52] Jacobson James & Associates, Inc., 2017. Technical Memorandum, Stanislaus County Hydrologic Model: Development and Forecast Modeling, Stanislaus County. Draft: December 20.

completed in both the confined and unconfined aquifer systems. The Stanislaus and Tuolumne Rivers are groundwater-connected, and include both gaining and losing reaches.[53,54]

Agricultural water demand in the central and western portions of the subbasin are primarily served by surface-water deliveries from Modesto Irrigation District and Oakdale Irrigation District, and to a lesser extent by groundwater extraction. Municipal water demand is met with a combination of surface water and groundwater supplied by the Cities of Modesto, Oakdale, Riverbank, and Waterford. The central and western portions of the Modesto Subbasin have a history of successful conjunctive use of groundwater and surface water that spans several decades, as evidenced by long-term well hydrographs indicating groundwater levels have generally recovered after periods of drought. The eastern portion of the subbasin is served almost exclusively by groundwater derived from the Mehrten Formation. Recent groundwater-level declines in portions of the basin that have been monitored under the CASGEM program.

As discussed above, the lack of current surface-water supply options in the eastern portions of the subbasin, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, have placed significant stress on groundwater resources in the Modesto Subbasin. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, these groundwater stresses may be expected to continue. Groundwater monitoring data are limited in the eastern portion of the County. At this time, available data are insufficient to assess long-term trends in much of this area.

Additional stress on the entire subbasin may occur if, as is currently proposed, the state mandates minimum unimpaired flow requirements for the Stanislaus and Tuolumne Rivers as part of the Bay-Delta Water Quality Control Plan Amendment process. Under these conditions, it is anticipated that less water will be available for diversion to meet existing agricultural and municipal water demands. The shortfall in demand is expected to be met through additional groundwater pumping. This scenario will potentially result in significant additional stress throughout the subbasin.

3.8.3 Turlock Groundwater Subbasin

Turlock Subbasin is bounded to the south by Merced River, to the north by Tuolumne River, to the west by San Joaquin River, and to the east by low-permeability bedrock formations of the Sierra Nevada; the subbasin extends southward from Stanislaus County into Merced County (Figure 2-1). Topography ranges from gently rolling hills in the eastern subbasin to alluvial plains in the central and western portions. Turlock Lake is located in the rolling topography in the eastern portion of the subbasin.

Similar to the Modesto Subbasin, groundwater in the eastern portion of the Turlock Subbasin occurs mainly in the Mehrten, Turlock Lake, Riverbank, and Modesto formations under unconfined to semi-confined conditions. An unconfined to semi-confined aquifer system occurs in the central and western portions of the subbasin in the Modesto and Riverbank Formations and Holocene alluvial deposits overlying the Corcoran

[53] USGS, 2015. *Hydrologic Model of the Modesto Region, California, 1960-2004.* Scientific Investigations Report 2015-5045.
[54] TGBA, 2008. Turlock Groundwater Basin Groundwater Management Plan. March.

Clay, and confined aquifers occur in the Turlock Lake Formation and Mehrten Formation below the Corcoran Clay. Groundwater production wells are completed in both the confined and unconfined aquifer systems. The Tuolumne River is groundwater-connected and includes both gaining and losing reaches.[55,56]

Agricultural water demand in the western and central portions of the subbasin is served primarily by surface-water deliveries from Turlock Irrigation District and to a lesser extent by groundwater extraction. Within Eastside Irrigation District, irrigation water demand is met entirely by groundwater pumping. Municipal water demand is met via groundwater supplied by the Cities of Turlock, Ceres, Delano, Denair, and Hughson. New projects are proposed that would increase reliance on conjunctive use of groundwater and surface water. The central and western portions of the basin have a history of successful agricultural conjunctive use of groundwater and surface water that spans several decades, as evidenced by long-term well hydrographs indicating groundwater levels have recovered after periods of drought. The eastern portion of the subbasin is served almost exclusively by groundwater from the Mehrten Formation and overlying alluvial aquifers. Recent groundwater-level declines in portions of the basin that have been monitored under the CASGEM program.

As discussed above, the lack of current surface-water supply options in the eastern portions of the subbasin, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, has placed significant stress on groundwater resources in the Turlock Subbasin. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, this groundwater stress may be expected to continue. Groundwater monitoring data in the vicinity of Eastside Irrigation District indicate groundwater-level declines of over 40 feet within the last 10 years with a resulting groundwater gradient reversal near the Tuolumne River.[57] Data are limited further east, and at this time, available data are insufficient to assess long-term trends.

Additional stress on the entire subbasin may occur if, as is currently proposed, the state mandates minimum unimpaired flow requirements for the Stanislaus and Tuolumne Rivers as part of the Bay-Delta Water Quality Control Plan Amendment process. Under these conditions, it is anticipated that less water will be available for diversion to meet existing agricultural and municipal water demands. The shortfall in demand is expected to be met through additional groundwater pumping. This scenario will potentially result in significant additional groundwater stress throughout the subbasin.

3.8.4 Delta Mendota Groundwater Subbasin

Within Stanislaus County, the Delta Mendota Subbasin is bounded to the east by the San Joaquin River and to the west by low-permeability bedrock formations of the Coast Ranges. The subbasin extends southward from the northern boundary of Stanislaus County along the west side of San Joaquin Valley for approximately 80 miles, and crosses a total of five counties. The western margin of the subbasin consists of low hills and dissected alluvial fans at the foot of the Coast Range. A short distance to the east, elevations drop off into

[55] SWRCB, 2012. Draft Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the Bay-Delta: San Joaquin River Flows and Southern Delta Water Quality. December.

[56] TGBA, 2008. Turlock Groundwater Basin Groundwater Management Plan. March.

[57] Ibid

alluvial and flood plains associated with the San Joaquin River. The Delta Mendota Canal and California Aqueduct run along the western margin of the subbasin.

Groundwater in the Delta Mendota Subbasin occurs in the Tulare Formation and overlying Holocene alluvium. The top of the Corcoran Clay occurs at depths of approximately 100 to 300 feet below ground surface in this area, and extends from near the western margin of the subbasin to beneath the San Joaquin River. Near the western margin of the subbasin, the Corcoran Clay divides the Tulare Formation into an upper aquifer system that is unconfined to semi-confined and a lower aquifer system that is confined. The Tulare Formation extends to a depth of over 1,000 feet and includes other lacustrine clay units; however, the Corcoran Clay is the most prominent and continuous.[58] Groundwater production wells are completed in both the unconfined and confined aquifer systems; however, most high-capacity wells extend into the confined aquifer system, beneath the Corcoran Clay. Portions of the San Joaquin River are groundwater-connected.[59]

Land use overlying the Delta Mendota Subbasin is primarily agricultural, with agricultural water demand served by surface-water deliveries from Del Puerto Water District, West Stanislaus Irrigation District, and Central California Irrigation District (one of the San Joaquin Exchange Contractors), supplemented by groundwater extraction. Municipal water demand for the City of Patterson is met using groundwater.

DWR has included the Delta Mendota Subbasin on the list of critically overdrafted basins, largely due to subsidence reported outside Stanislaus County to the south.[60] Nevertheless, the unreliability of surface-water deliveries from the State and Federal water projects has resulted in an increase in agricultural and municipal groundwater demand. This trend is expected to continue in the future as climatic conditions and environmental flow requirements continue to affect the reliability of surface-water deliveries. Groundwater levels have fallen over 40 feet in the last 10 years in the southern portion of the Delta Mendota Subbasin in Stanislaus County. In addition, active subsidence of 1 to 2.5 inches has been reported at a continuous survey station near Patterson.[61] DWR has designated the Delta Mendota Subbasin as having a high potential for future subsidence.

3.9 Groundwater Quality

Groundwater is of generally high quality in the portion of the SJVGB that underlies the County.[62,63] Beneficial uses of groundwater in the area are identified as municipal and domestic water supply (MUN), agricultural

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[58] DWR, 2013. California's Groundwater Update 2013, A Compilation of Enhanced Content for California Water Plan Update 2013, Chapter 8 – San Joaquin River Hydrologic Region. April.

[59] SWRCB, 2015. *A Guide for Private Domestic Well Owners.* Website: http://www.waterboards.ca.gov/gama/docs/wellowner_guide.pdf. Accessed September 14, 2016.

[60] DWR, 2015a. Draft List of Critically Overdrafted Basins – August 6, 2015. August.

[61] DWR, 2015b. Groundwater Information Center Interactive Mapping Application. Website: https://gis.water.ca.gov/app/gicima/. Last edited January 15, 2015. Accessed December 2015.

[62] DWR, 2004. *California's Groundwater, Bulletin 118.* Basin description for San Joaquin Valley Groundwater Basin, Modesto Subbasin: Updated February 27.

[63] DWR, 2006. *California's Groundwater, Bulletin 118.* Basin Descriptions for San Joaquin Valley Groundwater Basin, Eastern San Joaquin, Turlock, and Delta-Mendota Subbasins: Updated January 20.

supply (AGR), industrial service supply (IND), and industrial process supply (PRO).[64] Several water quality issues are noteworthy. Some groundwater wells associated with municipal supply systems in the County have been impacted by naturally-occurring contaminants derived from sediments in the aquifer system. On the eastern side of the valley, some wells that serve the communities of Modesto, Ceres and Salida have been impacted by arsenic and uranium in sediments derived from the Sierra Nevada. Further to the west, some wells serving the communities of Newman, Patterson, Grayson and Crows Landing have been impacted by hexavalent chromium in sediments derived from the Diablo Range. Solutes leached from marine sediments from the Diablo Range have also resulted in pockets of lower quality groundwater between the major drainages from the Diablo Range in the western portion of the valley that contains elevated concentrations of sodium and sulfate. In addition, operation of deep water wells has locally caused upwelling of deep saline groundwater that underlies the base of freshwater in the San Joaquin Valley.

Anthropogenic water quality degradation related to historical agricultural activities has impacted portions of the shallow aquifer system at various locations throughout the agricultural regions of the County, and has impacted municipal supply wells in some areas. Elevated concentrations of nitrate and soil fumigant residuals such as 1,2,3-trichloropropane (1,2,3-TCP) and dibromo-chloro-propane (DBCP) have been found in in wells at various locations throughout the valley. Other anthropogenic contaminants that have impacted the shallow aquifer beneath urban areas such as Modesto and Turlock include perchloroethylene (PCE) from historical dry-cleaning operations, and locally, fuel hydrocarbons.

The water quality issues noted above have resulted in some municipal supply wells being taken off line, whereas other systems or wells have been fitted with additional treatment facilities. Various strategies are being pursued to help assure municipal water supply security relative to water quality as the implications of SGMA implementation and other pending regulatory requirements (e.g., unimpaired flow requirements on the Stanislaus and Tuolumne Rivers under the proposed Bay-Delta Water Quality Control Plan amendments) are being worked out. These include conjunctive use projects, blending strategies, treatment, well abandonment or modification, and wellfield management.

3.10 Subsidence

Land subsidence can occur when compressible clays are depressurized from groundwater extraction, triggering water to flow from the clays into the surrounding aquifer, and ultimately consolidation of the clay under pressure from the overlying sediments. Aquifers with strongly confined conditions, such as those below the Corcoran Clay, experience greater head loss from groundwater extraction than unconfined aquifers, and are more susceptible to subsidence. In general, most subsidence occurs when an aquifer is initially depressurized, but can continue for months, or even years, as clays slowly dewater and adjust to the new pressure regime. If groundwater levels subsequently recover, subsidence generally does not resume (or does not progress as rapidly), until groundwater levels fall below historical low levels.

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[64] California Regional Water Quality Control Board, Central Valley Region (RWQCB), 2016. *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board, Central Valley Region, Fourth Edition, The Sacramento River Basin and the San Joaquin River Basin*. Revised July.

DWR has identified three of the four groundwater subbasins in Stanislaus County as having a high or medium to high potential for future subsidence: the Eastern San Joaquin, Modesto, and Delta-Mendota Subbasins. The Delta-Mendota Subbasin is considered critically overdrafted, largely due to subsidence and overdraft reported outside of Stanislaus County to the south, nevertheless DWR has designated the Delta-Mendota Subbsasin as a whole as having a high potential for future subsidence. During the recent drought, from 2011 to 2015, the Modesto and Turlock Subbasins were identified as having 50 percent or more of wells monitored under the CASGEM program at or below the historical spring low groundwater levels, and Eastern San Joaquin and Delta-Mendota Subbasins were identified as having 30 to 50 percent of wells at or below historical spring low water levels. Subsequently, with the end of the drought in 2015, groundwater levels recovered in many wells. While Stanislaus County has five GPS sensors measuring for subsidence in the County, the only one reporting inelastic subsidence is in the southwest near Patterson. DWR reported 1 to 2.5 inches of subsidence from 2005 to the present at continuous survey station P259, located near the northeast corner of the Site at the intersection of Marshall Road and State Highway 33.[65]

Most of the subsidence in the county is believed to have occurred as a result of groundwater extraction from confined aquifers underlying the Corcoran Clay.[66] Subsidence could also occur when groundwater is withdrawn from unconfined or semi-confined aquifers overlying the Corcoran Clay, or outside the Corcoran Clay subcrop area, but it is less likely. The Mehrten Formation is the primary aquifer in the eastern portion of the County. The Mehrten Formation is Miocene in age and consists of well-consolidated sandstone, siltstone, volcanic mudflows and gravels with intervening paleosols. Due to the age and high level of consolidation in this area, subsidence due to groundwater pumping practices has not been reported in this area and is not expected. The Corcoran Clay, and the other lacustrine clay layers beneath it, are demonstrated to be susceptible to compression, and increased pumping in wells screened in the aquifer below the Corcoran Clay can cause subsidence, especially when groundwater levels fall below historical low levels.

3.11 Biological Resources

The biological resources study area for this PEIR is generally defined as unincorporated Stanislaus County.

3.11.1 Regulatory Setting

This section lists the primary laws, ordinances, regulations, and standards applicable, or potentially applicable, to biological resources in Stanislaus County, and describes the existing conditions pertaining to biological resources in the study area. The existing conditions constitute the baseline for this environmental analysis.

Federal Regulations

- National Environmental Policy Act (42 U.S.C. 4321 et seq.)
- Federal Endangered Species Act (16 U.S.C 1531–1543)

[65] DWR, 2017. Groundwater Information Center Interactive Map Application. Website: https://gis.water.ca.gov/app/gicima/. Accessed December 6.

[66] USGS, 2013. *Land Subsidence along the Delta-Mendota Canal in the Northern Part of the San Joaquin Valley, California, 2003-10.* Scientific Investigations Report 2013-5142.

  - Section 7: Interagency Cooperation
  - Section 9: Prohibited Acts
  - Section 10: Habitat Conservation Plans
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.)
- Clean Water Act (33 U.S.C. 1251–1376)
  - Section 10: Rivers and Harbors Act
  - Section 401: State Discharge Certification
  - Section 402: National Pollutant Discharge Elimination System
  - Section 404: Wetland Discharge and Fill
- Fish and Wildlife Coordination Act (16 U.S.C. 661–667e et seq.)
- Migratory Bird Treaty Act (16 U.S.C. 703–712)
- Bald and Golden Eagle Protection Act (16 U.S.C. 668–668d, 54 Stat. 250)
- Executive Order 11990, Protection of Wetlands
- Executive Order 13112, Invasive Species

State Regulations

- California Environmental Quality Act (Title 14 C.C.R. Section 15000 et seq.)
- California Endangered Species Act (Fish and Game Code, Sections 2050 et seq.)
- California Fish and Game Code
  - Lake and Streambed Alteration (Section 1600 et seq.)
  - California Native Plant Protection Act (Fish and Game Code 1900–1913)
  - Oak Woodlands Conservation Act of 2001 (Fish and Game Code 1360-1372)
- Porter-Cologne Water Quality Control Act (California Water Code, Division 7)
- California Natural Community Conservation Planning Act

Local Regulations

- Stanislaus County General Plan

3.11.2 Existing Conditions

The majority of Stanislaus County lies in the San Joaquin Valley and has a mix of primarily agricultural and urban land uses. The eastern portion of Stanislaus County extending into the Sierra Nevada foothills is unincorporated and largely undeveloped. The foothills are interspersed with small creeks and drainages that feed into the larger rivers (the Stanislaus, Tuolumne, and Calaveras Rivers; and Dry Creek) that join the San Joaquin River at the valley bottom.

Stanislaus County is in the Great Central Valley subdivision of the California Floristic Province and the Central Coast and San Joaquin Valley bioregions. The study area is in the San Joaquin Valley bioregion that has a Mediterranean climate and supports a variety habitat types, including annual grassland, alkali desert scrub, blue oak-foothill pine, fresh emergent wetland, valley foothill riparian, blue oak woodland, valley oak woodland, mixed chaparral, and chamise-red shank chaparral.[67] [68]

Special-status, sensitive, natural communities occur in Stanislaus County and include these types: Great Valley Valley Oak Riparian Forest, Northern Hardpan Vernal Pool, Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, Sycamore Alluvial Woodland, and Elderberry Savannah. Sensitive natural communities are of special concern to resource agencies due to their locally or regionally declining status and their provision of important habitat to special-status species. Sensitive, natural communities are monitored and reported in the California Natural Diversity Database (CNDDB), maintained by California Department of Fish and Wildlife (CDFW).

The dominant vegetation communities and land cover in the study area are shown in Figure 3-4 and described below according to how they are presented in the Stanislaus County General Plan. Vegetation communities and land cover of Stanislaus County were categorized based on the Wildlife-Habitat Relationships (WHR) classification of vegetation communities and Gap Analysis Program (GAP) mapping. Some vegetation community types were combined where the descriptions, wildlife habitat functions, and agency regulation would not significantly differ (e.g., blue oak and valley oak were combined into a single oak woodland cover type).[69] Vegetation communities that occur at the west side of the county in the Diablo Range are outside the study area and not discussed here. These include blue oak-foothill pine, Diablan sage scrub, and chaparral vegetation communities. Urban and barren areas are not discussed. Urban areas are outside the study area; barren areas are generally associated with aggregate mining areas and provide very low quality habitat (no food or cover) for wildlife.

Wetlands and other water habitats occur in the study area and include palustrine, riverine, and lacustrine, as mapped by the National Wetland Inventory based on the Cowardin classification system.[70]

Vegetation Communities/Land Cover. San Joaquin Valley oak woodlands, grassland, vernal pool complexes, riparian habitats, rangeland, and agricultural areas provide important wildlife habitat.

<u>Oak Woodland.</u> Oak woodland is a combination of blue oak woodland and valley oak woodland. In the study area, oak woodlands occur in the Sierra Nevada foothills on the east side of the county and along the San Joaquin River, Tuolumne River, Stanislaus River, and Dry Creek.

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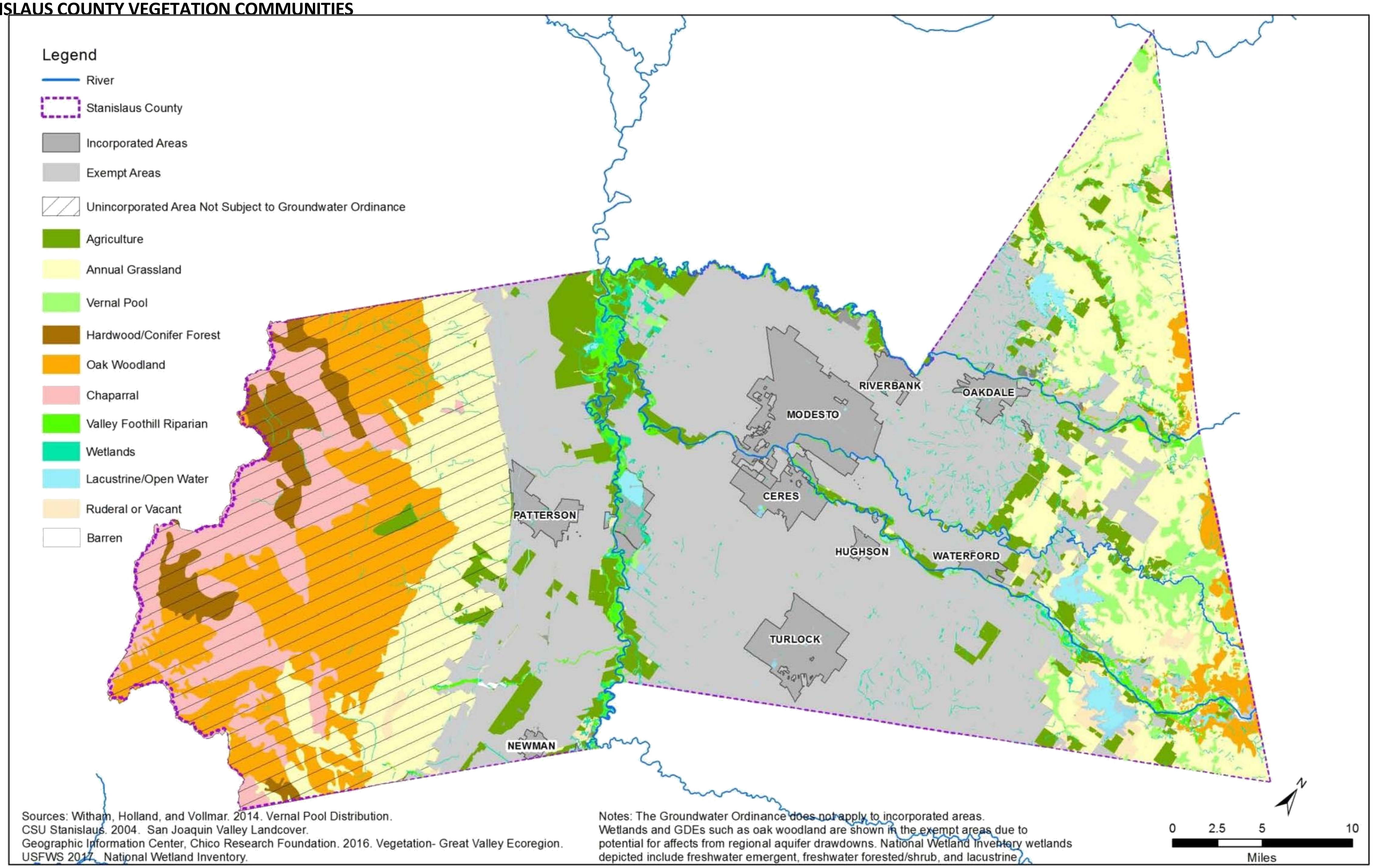
[67] Welsh, Hartwell H., 1994. *Bioregions: An Ecological and Evolutionary Perspective and a Proposal for California*. California Department of Fish and Game.

[68] Baldwin, B.G. and others, 2012. *The Jepson Manual: Vascular Plants of California*. Second Edition, revised. Berkeley: University of California Press.

[69] ICF International, 2016. Stanislaus County General Plan and Airport Land Use Compatibility Plan Update Final Program Environmental Impact Report. July.

[70] Federal Geographic Data Committee, 2013. *Classification of Wetlands and Deepwater Habitats of the United States*. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

FIGURE 3-4 STANISLAUS COUNTY VEGETATION COMMUNITIES



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TETRA TECH

Stanislaus County Well Permitting Program Administrative Draft Program EIR
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
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FIGURE 3-4

Stanislaus County Vegetation Communities

Valley oak woodland is dominated by valley oak (*Quercus lobata*) with California sycamore (*Platanus racemosa*), southern black walnut (*Juglans californica*), interior live oak (*Quercus wislizeni*), box elder (*Acer negundo* var. *californica*), and blue oak (*Quercus douglasii*). Shrub species include blue elderberry (*Sambucus nigra* subsp. *caerulea*), California wild grape (*Vitis californica*), toyon (*Heteromeles arbutifolia*), California coffeeberry (*Frangula californica*), and California blackberry (*Rubus ursinus*). The herbaceous understory is dominated by annual grasses. Valley oak woodland ranges in cover from dense woodlands to savannahs dominated by grasslands with sparse trees. Denser stands of trees and shrubs occur along natural drainages in valley soils, with uplands characterized by more open canopies. Valley oaks in the Great Central Valley overlap with annual grasslands or border agricultural land. In the foothills surrounding the valley, they intergrade with blue oak woodlands or blue oak-foothill pine habitats, and near major rivers and streams they intergrade with valley-foothill riparian vegetation.[71]

Blue oak woodland is dominated by blue oak, with valley oak and interior live oak occurring as associates. The understory is characterized by annual grassland vegetation interspersed with shrubs. The herbaceous layer is dominated by annual grasses. Blue oak density on hill slopes with shallow soils has been documented to be directly correlated with water stress.[72] Based on studies of groundwater uptake by blue oaks, they may be considered obligate phreatophytes (deep-rooted plants that draw their water from near the water table). Studies have found the roots of oaks can extend deeper than 70 feet, through fractured rock, to extract water from the capillary fringe immediately above the water table during the summer and fall. The study found that groundwater reserves provide a buffer to rapid changes in their hydroclimate, as long as groundwater reserves are not depleted by drought or human consumption. Groundwater uptake provides short-term protection in the summer and fall by allowing the oaks to subsist during hot dry conditions. [73,74]

Oak woodlands provide important breeding, forage, and cover for a variety of wildlife. Oak woodland acorns have been documented as a food source for 30 species of birds in California, and the ranges of approximately 80 species of mammals in California overlap with California's oak woodlands. Breeding birds documented in valley oak woodland include red-shouldered hawks (*Buteo lineatus*), California quail (*Callipepla californica*), oak titmouse (*Baeolophus inornatus*), western scrub jay (*Aphelocoma californica*), bushtit (*Psaltriparus minimus*), and acorn woodpecker (*Melanerpes formicivorus*). Fox (non-native red fox [*Vulpes vulpes]*), western gray squirrels (*Sciurus griseus*), California ground squirrel (*Otospermophilus beecheyi*), mule deer (*Odocoileus hemionus*), western fence lizard (*Sceloporus occidentalis*), and common king snake (*Lampropeltis getula*), use

[71] Mayer, K.E., and W.F. Laudenslayer, Jr., 1988. *A Guide to Wildlife Habitats of California.* State of California, Resources Agency, Department of Fish and Game Sacramento, CA. Available: https://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp.

[72] Ibid

[73] Miller and others. 2009. *Groundwater Uptake by Woody Vegetation in a Semi-Arid Oak Savannah*. Water Resources Research. Volume 46. November.

[74] Lewis, D.C. and R.H. Burgy. 1964. "The Relationship between Oak Tree Roots and Groundwater in Fractured Rock as Determined by Tritium Tracing." *Journal of Geophysical Research*. Volume 69, Number 12. June 15.

valley oaks for food and shelter.[75] Special-status species documented as occurring or potentially occurring in oak woodlands in Stanislaus County are listed in Table 3-5.

The CDFW recognizes oak woodlands (and in Stanislaus County, "Great Valley Valley Oak Riparian Forest") as a sensitive natural community. Oak woodlands are a special status natural community for a variety of reasons, including threat of "sudden oak death" disease, declines in oak tree regeneration, lack of recruitment, and competition with nonnative species. California Public Resources Code (Section 21083.4) requires conservation of and mitigation for impacts on oak woodlands. The Oak Woodlands Conservation Act of 2001 (Fish and Game Code 1360-1372) directs the Wildlife Conservation Board to establish a program to issue grants to private land owners for the protection of oak woodlands on their property. The Stanislaus County General Plan contains policies to protect oak woodlands.

<u>Annual Grassland.</u> Much of the grassland in the county has been replaced with agriculture or development. In the study area, annual grasslands occur in the eastern portion of the county, in the Sierra Nevada foothills, in the understory of oak woodlands, and in undeveloped land. Grassland habitats in the San Joaquin Valley were originally composed of a mix of native perennial and annual grasses, but have since been degraded with a dominance of naturalized annual grasses with a mix of native and non-native forbs. Grassland habitats support large populations of small prey species, including deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*), Botta's pocket gopher (*Thomomys bottae*), and California ground squirrel (*Spermophilus beecheyi*). Common reptiles and amphibians of grasslands include western fence lizard (*Sceloporus occidentalis*), common kingsnake (*Lampropeltis getula*), western rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis melanoleucus*), western toad (*Anaxyrus boreas*), and western spadefoot toad (*Spea hammondii*). Grasslands are important foraging areas for a variety of wildlife, including coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), San Joaquin kit fox (*Vulpes macrotis mutica*) (federally endangered and state threatened), American badger (*Taxidea taxus*) (species of special concern), and numerous bird species, including red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), yellow-billed magpie (*Pica nuttalli*), loggerhead shrike (*Lanius ludovicianus*), and savannah sparrow (*Passerculus sandwichensis*). Nesting birds of grasslands include killdeer (*Charadrius vociferous*), ring-necked pheasant (*Phasianus colchicus)*, western kingbird (*Tyrannus verticalis*), western meadowlark (*Strunella neglecta*), and horned lark (*Eremophila alpestris*). The San Joaquin kit fox uses open grasslands and scrub habitats and makes dens where there are loose-textured soils. Other special-status species documented as occurring or potentially occurring in grassland areas in Stanislaus County are listed in Table 3-5.

[75] Mayer, K.E., and W.F. Laudenslayer, Jr., 1988. *A Guide to Wildlife Habitats of California.* State of California, Resources Agency, Department of Fish and Game Sacramento, CA. Available: https://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp.

TABLE 3-5 FEDERAL AND STATE LISTED AND SPECIES OF SPECIAL CONCERN POTENTIALLY OCCURRING IN STANISLAUS COUNTY

Scientific Name	Common Name	Federal Status	California Status	California Fish and Wildlife Status	Habitat
Birds					
Agelaius tricolor	Tricolored Blackbird	None	State Candidate Endangered	Species of Special Concern	Inhabits dense cattail and freshwater marsh. Forages in fields and farms, mostly on insects and seeds. Breeding colonies are densely packed.
Aquila chrysaetos	Golden Eagle	None	None	California Fully Protected	Rolling foothills, mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.
Athene cunicularia	Burrowing Owl	None	None	Species of Special Concern	Inhabits open, dry annual or perennial grasslands, scrublands and deserts characterized by low-growing vegetation. Subterranean nester, dependent upon other burrowing animals for nesting burrows. They are often associated with high densities of burrowing mammals such as prairie dogs, ground squirrels, and tortoises. Also inhabits anthropogenic habitats such as campuses, golf courses, cemeteries, airports, and grazed pastures.
Branta hutchinsii leucopareia	Cackling (=Aleutian Canada) Goose	Delisted	None	None	Breeds in coastal marshes, along tundra ponds and streams, and steep turf slopes above rocky shores. Nest a large open cup, made of dry grasses, lichens, and mosses, lined with down and some body feathers. Usually placed on slightly elevated sites near water. Some cliff nesting.
Buteo swainsoni	Swainson's Hawk	None	Threatened	None	Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as alfalfa or grain fields or grasslands supporting rodent populations.
Charadrius montanus	Mountain Plover	None	None	Species of Special Concern	Short grasslands, freshly plowed fields, newly sprouting grain fields, and sometimes sod farms. Prefers grazed areas and areas with burrowing rodents.
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	Threatened	Endangered	None	Uses wooded habitat with dense cover and water nearby, including woodlands with low, scrubby, vegetation, overgrown orchards, abandoned farmland, and dense thickets along streams and marshes. They breed throughout much of the eastern and central United States and winter almost entirely in South America.
Haliaeetus leucocephalus	Bald Eagle	Delisted	Endangered	California Fully Protected/ Sensitive	Typically nest in forested areas adjacent to large bodies of water. Bald eagles are tolerant of human activity when feeding, and may congregate around fish processing plants, dumps, and below dams where fish concentrate. For perching, prefers tall, mature coniferous or deciduous trees that afford a wide view of the surroundings. They prefer to forage on fish, but will consume reptiles, amphibians, invertebrates, and mammals.
Icteria virens	Yellow-breasted Chat	None	None	Species of Special Concern	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 feet of ground.
Lanius ludovicianus	Loggerhead Shrike	None	None	Species of Special Concern	Broken woodlands, savannah, pinyon-juniper, Joshua tree woodlands, riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.
Melospiza melodia	Song Sparrow (Modesto population)	None	None	Species of Special Concern	Open habitats, including tidal marshes, arctic grasslands, desert scrub, pinyon pine forests, aspen parklands, prairie shelterbelts, Pacific rain forest, chaparral, agricultural fields, overgrown pastures, freshwater marsh and lake edges, forest edges, and suburbs. May also be found in deciduous or mixed woodlands.
Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	None	Inhabits dense, low, shrubby vegetation, generally in early successional stages, or young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brush lands.
Mammals					
Antrozous pallidus	Pallid bat	None	None	Species of Special Concern	Inhabits shrub lands, grasslands, woodlands, deserts and forests. Most common in open, dry, habitats with rocky area for roosting. Roost must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.
Corynorhinus townsendii	Townsend's big-eared bat	None	None	Species of Special Concern	Resides throughout California in a wide variety of habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting, extremely sensitive to human disturbance.
Dipodomys nitratoides exilis	Fresno kangaroo rat	Endangered	Endangered	None	Permanent resident of alkali desert scrub habitat and herbaceous habitats with scattered shrubs. They eat mainly seeds of annual forbs and grasses and occasionally consume some green vegetation. Food is collected and stored temporarily in cheek pouches. Some food later cached in small holes, dug in sides of burrows.
Eumops perotis californicus	Western mastiff bat	None	None	Species of Special Concern	Occurs in open semi-arid to arid habitats such as coniferous and deciduous woodlands, coastal scrub and chaparral. Roosting sites are usually crevices in cliff faces, high buildings, trees and tunnels.
Lasiurus blossevillii	Western red bat	None	None	Species of Special Concern	Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.
Neotoma fuscipes riparia	Riparian (=San Joaquin Valley) woodrat	Endangered	None	Species of Special Concern	Prefer dense shrub cover or in willow thickets with an oak overstory. They are generalist herbivores and consume a wide variety of nuts and fruits, fungi, foliage and some forbs.
Sylvilagus bachmani riparius	Riparian brush rabbit	Endangered	Endangered	None	Inhabits riparian oak forests with a dense understory of wild roses, grapes and blackberries. They have small home ranges and seldom move more than a few feet from cover.
Taxidea taxus	American badger	None	None	Species of Special Concern	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Needs sufficient food, friable soils, and open uncultivated ground. Some populations of the American badger are known to inhabit mountainous areas. Preys on burrowing rodents.

TABLE 3-5 FEDERAL AND STATE LISTED AND SPECIES OF SPECIAL CONCERN POTENTIALLY OCCURRING IN STANISLAUS COUNTY

Scientific Name	Common Name	Federal Status	California Status	California Fish and Wildlife Status	Habitat
Vulpes macrotis mutica	San Joaquin kit fox	Endangered	Threatened	None	Inhabits scrub and grasslands of the San Joaquin valley, usually in loose-textured soils for burrowing. They forage on small mammals such as mice, kangaroo rats, squirrels and rabbits, and ground-nesting birds or insects.
Amphibians and Reptiles					
Ambystoma californiense	California tiger salamander	Threatened	Threatened	None	Inhabits lowlands and foothills in or near permanent sources of deep fresh water with dense, shrubby, or emergent riparian vegetation, and may aestivate in rodent burrows or cracks during dry periods. Needs underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources for breeding.
Emys marmorata	Western pond turtle	None	None	Species of Special Concern	Rivers, ponds, freshwater marshes with exposed areas for basking. Nests in upland areas (sandy banks or grassy open fields) up to 1,640 feet from water.
Gamelia silus	Blunt-nosed leopard lizard	Endangered	Endangered	None	Inhabits flat, open, semiarid grasslands and alkali flats. Will use canopy cover, mammalian dens and burrows for refuge and thermoregulation. Feeds on arthropods and other lizards.
Masticophis flagellum ruddocki	San Joaquin coachwhip	None	None	Species of Special Concern	Occurs in open, dry habitats with little or no tree cover. Found in valley grassland and saltbush scrub in the San Joaquin Valley. Needs mammal burrows for refuge and oviposition sites.
Masticophis lateralis euryxanthus	Alameda whipsnake	Threatened	Threatened	None	Found in open areas in canyons, rocky hillsides, chaparral scrublands, open woodlands, pond edges and stream courses. They eat small reptiles, rodents, birds, frogs, salamanders. Juveniles will consume large insects.
Phrynosoma blainvillii	Coast horned lizard	None	None	Species of Special Concern	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial and abundant supply of ants and other insects.
Rana boylii	Foothill yellow-legged frog	None	Candidate Threatened	Species of Special Concern	Frequents rocky streams and rivers with rocky substrate and open, sunny banks, in forests, chaparral, and woodlands. Sometimes found in isolated pools, vegetated backwaters, and deep, shaded, spring-fed pools. Adults bask on exposed rock surfaces near streams and take refuge under submerged rocks or sediments. During periods of inactivity, especially during cold weather, individuals seek cover under rocks in the streams or on shore within a few meters of water.
Rana draytonii	California red-legged frog	Threatened	None	Species of Special Concern	Requires lowlands and foothills, in or near permanent sources of deep water, with dense shrubby or emergent riparian vegetation. It requires 11 to 20 weeks of permanent water for larval development and must have access to estivation habitat. Restricted to grasslands and low foothills, with seasonal water sources for breeding.
Spea hammondii	Western spadefoot	None	None	Species of Special Concern	Open areas with sandy or gravelly soils, including mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. Rain pools that do not support bullfrogs, fish, or crayfish are required for breeding.
Thamnophis gigas	Giant garter snake	Threatened	Threatened	None	The giant garter snake inhabits agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. Higher elevation uplands for cover and refuge from flood waters are required during the inactive season in the winter.
Fish					
Hypomesus transpacificus	Delta smelt	Threatened	Endangered	None	Typically found in the Sacramento-San Joaquin Delta, seasonally in Suisun Bay, Carquinez Strait, San Pablo Bay and San Francisco Bay. Seldom found at salinities >10 parts per thousand (ppt), most often at salinities <2 ppt.
Lavinia symmetricus ssp.	San Joaquin roach	None	None	Species of Special Concern	Habitat includes rocky pools of headwaters, creeks, and small to medium rivers. Is a habitat generalist; usually it is found in small, warm, intermittent tributaries to larger streams, but also in cold trout streams, human-modified habitats, and in the main channels of rivers; dense populations are often in isolated, well-shaded pools. Most abundant in mid-elevation streams in the Sierra foothills. Spawning occurs in shallow, flowing areas with a substrate of small rocks.
Mylopharodon conocephalus	Hardhead	None	None	Species of Special Concern	Found in low to mid-elevation streams in the Sacramento-San Joaquin drainage and the Russian River. Prefers clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.
Oncorhynchus (=Salmo) mykiss	Steelhead	Threatened	None	None	Requires freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development. Can be found throughout the San Francisco Bay when migrating.
Pogonichthys macrolepidotus	Sacramento splittail	None	None	Species of Special Concern	Tolerant of a wide range of salinity. Prefers slow moving river sections, dead-end sloughs. Requires flooded vegetation for spawning and foraging for young.
Crustaceans					
Branchinecta conservatio	Conservancy fairy shrimp	Endangered	None	None	Inhabits large playa-type vernal pools or smaller long-inundation pools, with water that is cool and moderately turbid. Has been documented in pools from early November to early April.
Branchinecta lynchi	Vernal pool fairy shrimp	Threatened	None	None	Inhabits vernal pools and seasonal wetlands, typically in grasslands. Feeds on smaller plants and animals, including algae, bacteria and protozoa, and eat decaying parts of plants and animals.

TABLE 3-5 FEDERAL AND STATE LISTED AND SPECIES OF SPECIAL CONCERN POTENTIALLY OCCURRING IN STANISLAUS COUNTY

Scientific Name	Common Name	Federal Status	California Status	California Fish and Wildlife Status	Habitat
Lepidurus packardi	Vernal pool tadpole shrimp	Endangered	None	Species of Special Concern	Inhabits vernal pools commonly found in grass bottomed swales of unplowed grasslands in the Sacramento Valley containing clear to highly turbid water.
Insects					
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	Threatened	None	None	Occurs only in the Central Valley of California, in association with blue elderberry (Sambucus nigra subsp. caerula). Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for "stressed" elderberries.
Plants*					
Acmispon rubriflorus	Red-flowered bird's-foot-trefoil	None	None	1B.1	Valley and foothill grassland, cismontane woodland. Can also occur in sand dunes, cliff-tops, and volcanic mudflow deposits.
Allium sharsmithiae	Sharsmith's onion	None	None	1B.3	Occurs in rocky, serpentine soils of cismontane woodland or chaparral.
Amsinckia grandiflora	Large-flowered fiddleneck	Endangered	None	None	Prefers deep loamy soils of sedimentary origin on mesic, north-facing slopes.
Astragalus tener var. tener	Alkali milk-vetch	None	None	1B.2	Alkali playa, valley and foothill grassland, vernal pools. Low ground, alkali flats, and flooded lands; in annual grassland or in playas or vernal pools.
Atriplex cordulata var. cordulata	Heartscale	None	None	1B.2	Occurs in saline or alkaline soils within chenopod scrub, meadows and seeps and valley and foothill grassland.
Atriplex minuscula	Lesser saltscale	None	None	1B.1	Occurs in alkaline sandy soils in chenopod scrub, playas and valley and foothill grassland.
Atriplex persistens	Vernal pool smallscale	None	None	1B.2	Occurs in large, alkaline vernal pools, in the bottoms of the basins as opposed to the edges.
Atriplex subtilis	Subtle orache	None	None	1B.2	Occurs in valley and foothill grassland, often near vernal pools.
Blepharizonia plumosa	Big tarplant	None	None	1B.1	Dry hills and plains in annual grassland. Clay to clay-loam soils; usually on slopes and often in burned areas.
Brodiaea pallida	Chinese camp brodiaea	Threatened	Endangered	None	Grows in mixed soils of volcanic and serpentine origin in vernally moist areas of grassland next to intermittent streams.
California macrophylla	Round-leaved filaree	None	None	1B.2	Occurs in friable clay soils in cismontane woodland and valley and foothill grassland.
Calycadenia hooveri	Hoover's calycadenia	None	None	1B.3	Occurs in cismontane woodland, valley and foothill grassland on exposed, rocky, barren soil.
Campanula exigua	Chaparral harebell	None	None	1B.2	Grows in rocky sites, usually on serpentine in chaparral.
Campanula sharsmithiae	Sharsmith's harebell	None	None	1B.2	Grows in serpentine barrens.
Castilleja campestris var. succulenta	Fleshy owl's-clover (AKA succulent owl's-clover)	Threatened	Endangered	1B.2	Partly parasitic (hemi-parasitic) on the roots of other plants. Occurs on the margins of vernal pools, swales, and some seasonal wetlands, often on acidic soils. Is never dominant and is found in only a few of the pools in an area.
Caulanthus lemmonii	Lemmon's jewelflower	None	None	1B.2	Found in pinyon and juniper woodland, valley and foothill grassland.
Chamaesyce hooveri (AKA Euphorbia hooveri)	Hoover's spurge	Threatened	None	1B.2	Grows in the drying mud crack of vernal pools, usually in the center of the pool.
Cirsium fontinale var. campylon	Mt. Hamilton fountain thistle	None	None	1B.2	Found in seasonal and perennial drainages on serpentine soils.
Clarkia rostrata	Beaked clarkia	None	None	1B.3	Found on north-facing slopes of cismontane woodland, valley and foothill grassland, sometimes on sandstone.
Cryptantha hooveri	Hoover's cryptantha	None	None	1A	Inland dunes and sandy soils in valley and foothill grassland.
Cryptantha mariposae	Mariposa cryptantha	None	None	1B.3	Occurs on serpentine outcrops.
Delphinium californicum ssp. interius	Hospital canyon larkspur	None	None	1B.2	In wet, boggy meadows, openings in chaparral and in canyons.
Downingia pusilla	Dwarf downingia	None	None	2B.2	Valley and foothill grassland (mesic sites), vernal pools. Vernal lake and pool margins with a variety of associates. In several types of vernal pools.
Dudleya setchellii	Santa Clara valley dudleya	Endangered	None	None	Grows in rocky outcrops in serpentine grasslands.
Eriastrum tracyi	Tracy's eriastrum	None	Rare	3.2	Occurs in chaparral, cismontane woodland, and valley and foothill grassland. Typically associated with cheatgrass and red brome.
Eryngium racemosum	Delta button-celery	None	Endangered	1B.1	Occurs in vernally wet and flooded areas near the waterways of the valley. Is a member of the flora in the rare, alkali-sink habitat of the Delta.
Eryngium spinosepalum	Spiny-sepaled button-celery	None	None	1B.2	Occurs in valley and foothill grassland and in 'swale-like' vernal pools.
Erythranthe marmorata	Stanislaus monkeyflower	None	None	1B.1	Occurs in cismontane woodland, lower montane coniferous forest.
Eschscholzia rhombipetala	Diamond-petaled California poppy	None	None	1B.1	Alkaline and clay soils in valley and foothill grassland.
Fritillaria agrestis	Stinkbells	None	None	4.2	Chaparral, cismontane woodland, pinyon and juniper woodland, and valley and foothill grasslands; often found on clay soils, sometimes serpentine soils.
Fritillaria falcata	Talus fritillary	None	None	1B.2	Mostly on serpentine talus, but occasionally on granitics of chaparral, cismontane woodland, or lower montane coniferous forest.
Lagophylla dichotoma	Forked hare-leaf	None	None	1B.1	Found in woodland, valley and foothill grassland, sometimes among clay soils.

TABLE 3-5 FEDERAL AND STATE LISTED AND SPECIES OF SPECIAL CONCERN POTENTIALLY OCCURRING IN STANISLAUS COUNTY

Scientific Name	Common Name	Federal Status	California Status	California Fish and Wildlife Status	Habitat
Legenere limosa	Legenere	None	None	1B.1	Bottoms of vernal pools and other wet depressions in grassland communities.
Leptosyne hamiltonii	Mt. Hamilton coreopsis	None	None	1B.2	Found on steep, shale talus with open southwestern exposure in cismontane woodland.
Lomatium observatorium	Mt. Hamilton lomatium	None	None	1B.2	Occurs in open to partially shaded openings in Pinus coulteri-oak woodland among sedimentary Franciscan rocks and volcanics.
Madia radiata	Showy golden madia	None	None	1B.1	Found mostly on adobe clay in grassland or among shrubs.
Malacothamnus hallii	Hall's bush-mallow	None	None	1B.2	Found in chaparral and coastal scrub. Some populations on serpentine soils.
Monardella leucocephala	Merced monardella	None	None	1A	Occurs in sandy soil in river valley grasslands.
Navarretia gowenii	Lime Ridge navarretia	None	None	1B.1	On calcium carbonate-rich soil with high clay content.
Neostapfia colusana	Colusa grass	Threatened	Endangered	1B.1	Usually found growing in single-species stands in alkaline basins of Sacramento and San Joaquin valleys, and acidic soils along the eastern San Joaquin valley and the Sierra Nevada foothills.
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	Threatened	Endangered	1B.1	Endemic to the Central Valley of California, where it grows only in vernal pools.
Orcuttia pilosa	Hairy Orcutt grass	Endangered	Endangered	1B.1	Inhabits vernal pools in rolling topography on remnant alluvial fans and stream terraces in the Central Valley. Historical range includes the eastern margins of Sacramento and San Joaquin Valleys from Tehama County south to Stanislaus County and through Merced and Madera counties.
Phacelia phacelioides	Mt. Diablo phacelia	None	None	1B.2	Occurs adjacent to trails, on rock outcrops and talus slopes; sometimes on serpentine soils.
Plagiobothrys verrucosus	Warty popcornflower	None	None	2B.1	Prefers to grow in chaparral with shale substrate.
Pseudobahia bahiifolia	Hartweg's golden sunburst	Endangered	Endangered	1B.1	Known from a few small occurrences along the eastern side of the Central Valley and the lower central Sierra Nevada foothills. Grows in grassland and oak woodland habitat; prefers heavy clay soils, particularly along the tops of Mima mounds.
Puccinellia simplex	California alkali grass	None	None	1B.2	Grows in mineral springs, lake margins, vernal pools, and other moist habitat with saline soils.
Sphenopholis obtusata	Prairie wedge grass	None	None	2B.2	Occurs in many habitat types, including prairie, marshes, dunes, and disturbed areas.
Tuctoria greenei	Greene's tuctoria	Endangered	Rare	1B.1	Typically occurs in vernal pools in open grassland on the eastern side of the Sacramento and San Joaquin Valleys.
Verbena californica	Red hills vervain	Threatened	Threatened	None	Grows in moist woodland habitat, often on serpentine soils.

Sources:
CDFW, 2017. California Wildlife Habitat Relationships System, Species' Life History Accounts. https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range
Calfora, 2017. Calflora website. Accessed November 2017: http://calflora.org/
Stebbins, Robert C., 1972. California Amphibians and Reptiles. The University of California Press, 1972.
USFWS species profile pages for federally listed plants and wildlife.
USFWS, 1996. Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes. USFWS, Portland, Oregon. November.

Notes: California Native Plant Society Rankings:
Rare Plant Ranks–
1A= Plants presumed extirpated in California and either rare or extinct elsewhere
1B=Plants rare, threatened, or endangered in California and elsewhere
2B=Plants rare, threatened, or endangered in California, but more common elsewhere
3=Plants about which more information is needed
4=Plants of limited distribution
Threat Ranks (listed after the rare plant rank with the following format [for example]: 1B.1)–
0.1–Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
0.2–Moderately threatened in California (20–80% occurrences threatened/moderate degree and immediacy of threat)
0.3–Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known) (CNPS 2017 http://www.cnps.org/cnps/rareplants/ranking.php)

Vernal Pool/Annual Grassland Complex. Vernal pools occur in small depressions underlain with low permeability substrate that creates ephemeral wetlands in response to winter rains. Vernal pools may fill and empty several times throughout the rainy season, depending on weather conditions and the size and depth of the pool. They dry completely in the summer. Throughout the Central Valley, the acreage of grasslands with vernal pools has declined from historic estimates of 7 million acres (prehistoric) to approximately 895,000 acres in 2005, with 135,000 acres lost over the last three decades. Most of the acreage lost in Stanislaus County, from 1988 to 2005, was due to conversion of vernal pool habitat to orchards, vineyards, and eucalyptus groves, with conversion to plowed agricultural land the second largest contributor.[76]

In the study area, vernal pools occur in annual grassland habitats in the Sierra Nevada foothills, with a few smaller patches toward the valley, and in the San Joaquin River National Wildlife Refuge east of the San Joaquin River, and a smaller occurrence east of the San Joaquin River near Patterson.[77] The species composition of annual grassland in the vernal pool/annual grassland complex is generally as described above. Vernal pools support a variety of native, special status, and nonnative herbaceous plant species (mostly annuals), including these special status plant species: dwarf downingia (*Downingia pusilla*), vernal pool smallscale (*Atriplex persistens*), Colusa grass (*Neostapfia colusana*), Greene's tuctoria (*Tuctoria greenei*), hairy Orcutt grass (*Orcuttia pilosa*), Hoover's spurge (*Chamaesyce hooveri*), and fleshy owl's clover (*Castilleja campestris* subsp. *succulenta*).

Wildlife associated with vernal pools includes migratory and non-migratory birds that feed and rest in Central Valley vernal pools, and common aquatic species such as California linderiella (*Linderiella occidentatlis*), Sierran treefrog *(Pseudacris sierra*), and western toad (*Anaxyrus boreas*). Special-status invertebrates found in vernal pools include federally threatened vernal-pool, fairy shrimp *(Branchinecta lynchi),* federally endangered Conservancy fairy shrimp (*Branchinecta lynchi*), and federally endangered vernal pool tadpole shrimp (*Lepidurus packardi)*. Critical habitat for vernal pool fairy shrimp and Conservancy fairy shrimp is in the valley floor east of San Joaquin River; critical habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp is in multiple locations in the Sierra Nevada foothills.

Various federal, state, and local regulations may be applicable to vernal pool habitats and the species that occupy them. Northern Hardpan Vernal Pool is recognized by the CDFW as a sensitive natural community and occurs in Stanislaus County. The Stanislaus County General Plan contains policies that address protection of sensitive natural communities, such as vernal pools and rare plants. Vernal pools that satisfy the requirements of federally jurisdictional wetlands may have federal protection under the Clean Water Act. Vernal pools contain species listed under the federal or state Endangered Species Act and special status plants protected under the state Native Plant Protection Act.

Valley Foothill Riparian. Valley foothill riparian habitat occurs along the San Joaquin River and the major rivers and creeks feeding into it, including the Stanislaus River, Tuolumne River, and smaller tributaries, including

[76] Holland, R. F., 2009. *California's Great Valley Habitat Status and Loss: Re-photorevised 2005*. Prepared for Placer Land Trust. Auburn, CA. http://www.placerlandtrust.org/vernalpoolreport.aspx.

[77] CDFW, 2017. BIOS Viewer. Vernal Pool Distribution-California's Great Valley-2012. Available at: https://map.dfg.ca.gov/bios/?bookmark=940. Accessed November 20.

Orestimba Creek and Dry Creek. Riparian habitat occurs along the river corridor; riparian vegetation varies depending on the size of the waterway and flow regime. Dominant tree species of Valley Foothill Riparian habitat are generally a mix of Fremont cottonwood, California sycamore, valley oak, with sub-canopy trees such as box elder, black walnut, and Oregon ash. Understory shrubs include wild grape, wild rose, California blackberry, blue elderberry, willows, and poison oak. Herbaceous species include sedges, rushes, grasses, poison-hemlock, and nettle. Riparian areas provide important migration and dispersal corridors, food, breeding, cover, and water for a variety of wildlife and resident, migratory, and wintering birds. California's Central Valley riparian communities have documented use by 55 species of mammals; at least 50 amphibians and reptiles are known to occur in California's lowland riparian systems; and 157 bird species (nesters or winter visitors) were documented in a study done on the Sacramento River.[78] Special status species documented as occurring or potentially occurring in riparian areas in Stanislaus County are listed in Table 3-5.

The CDFW recognizes these sensitive natural riparian communities in Stanislaus County: Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, Great Valley Valley Oak Riparian Forest, Sycamore Alluvial Woodland, and Elderberry Savannah. The Stanislaus County General Plan includes policies for the protection of vegetation along waterways and protection of sensitive natural communities such as riparian areas and rare plants. Riparian areas that meet the definition of wetlands or Waters of the U.S. are also protected under Section 404 and Section 401 of the Clean Water Act. Special status species in riparian areas are afforded protections under the federal and state Endangered Species Act and state Native Plant Protection Act.

<u>Riverine.</u> Riverine is defined as the area between the river banks' ordinary high water marks. The riverine cover type includes the major rivers in the county, the San Joaquin, Stanislaus, Tuolumne, and Calaveras Rivers, Dry Creek, and smaller streams and ditches. Riverine areas that meet the definition of wetlands or Waters of the U.S. are also protected under Section 404 and Section 401 of the Clean Water Act.

Riverine systems in Stanislaus County provide important habitat for fish and wildlife, including special status species listed in Table 3-5. They are fed by snowmelt from the Sierras, groundwater discharge, and managed flows from reservoirs – Don Pedro Reservoir, New Melones Lake, and New Hogan Lake. Reservoirs that feed into the San Joaquin, Stanislaus, and Tuolumne rivers are managed for flows to support fisheries, particularly Central Valley Fall/Late Fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*Oncorhynchus [=Salmo] mykiss*). The Tuolumne, Stanislaus, and San Joaquin Rivers are U.S. Fish and Wildlife Service (USFWS)-designated critical habitat for Central Valley steelhead.

Riverine systems contain a mix of groundwater recharge and discharge areas, with some stretches interconnected with groundwater and other stretches perched above the water table. Interconnected rivers and streams are influenced by groundwater levels; they may either discharge to groundwater (groundwater recharge) when the water table is below river stage or receive groundwater when the water table is above river stage. The major rivers and perennial streams of Stanislaus County are interconnected with groundwater (San Joaquin River, Stanislaus River, Tuolumne River, and the lower reaches of Dry Creek and Littlejohns

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[78] Mayer, K.E., and W.F. Laudenslayer, Jr., 1988. *A Guide to Wildlife Habitats of California.* State of California, Resources Agency, Department of Fish and Game Sacramento, CA. Available: https://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp.

Creek). In the study area, the smaller streams and drainages with ephemeral or intermittent flows are perched above the water table and not influenced by regional groundwater levels. They are surface-fed by precipitation, flows from snowmelt runoff, and perched groundwater. These smaller streams and drainages are mostly tributaries to the larger, more deeply incised stream courses, and occur in the eastern part of the county (and study area) in the foothills of the Sierras.[79]

Lacustrine. Lacustrine includes inland water bodies larger than 20 acres or if smaller than 20 acres, at least 8.2 feet deep at low water.[80] Lacustrine wetlands include lakes (natural or human made) and ponds that are primarily open water and may contain aquatic vegetation and freshwater emergent wetland vegetation at the edges. The largest lacustrine features in Stanislaus County are reservoirs – Woodward Reservoir, Modesto Reservoir, and Turlock Lake. Smaller features include various ponds throughout the valley. Lacustrine habitats are used by migratory waterfowl, shorebirds, and amphibians including Sierran treefrog and western toad. Lacustrine habitats are in U.S. Army Corps of Engineers (USACE) and Regional Water Quality Control Board (RWQCB) jurisdiction and are regulated under Sections 404 and 401 of the Clean Water Act.

Palustrine. Palustrine wetlands mapped by the National Wetlands Inventory in Stanislaus County occur along rivers, floodplains, streams, and smaller drainages, primarily east of I-5. Water regimes include natural and managed hydrology (diking, flooding, or impoundment of water for agricultural or environmental purposes) and include semi-permanently, seasonally, and temporarily flooded features. Palustrine emergent wetlands in Stanislaus County are characterized by herbaceous vegetation and include freshwater emergent wetlands ("wet meadows") and vernal pools. Emergent plants are erect, rooted, herbaceous hydrophytes (adapted to prolonged saturated soils), with all or a portion of their foliage is above water. Vegetation consists of perennial emergent (mostly monocot) plant species. Vernal pool vegetation is as described above for the Annual Grassland/Vernal Pool Complex. Freshwater emergent wetlands provide forage and cover for birds, mammals, reptiles, and insects, and nesting habitat for waterfowl and other birds. Special status species using freshwater emergent wetlands include tricolored blackbird (*Agelaius tricolor*), western pond turtle, and giant garter snake, and special status species that occupy vernal pools, as detailed above.

Palustrine scrub/shrub wetlands and palustrine forested wetlands are dominated by woody vegetation, and, in Stanislaus County, are associated with riparian corridors. Vegetation composition in palustrine scrub/shrub wetlands is as described above for Valley Foothill Riparian.

Coastal and Valley Freshwater Marsh is recognized by the CDFW as a sensitive natural community and occurs in Stanislaus County. Palustrine wetland areas that meet the definition of wetlands or waters of the U.S. are also protected under Section 404 and Section 401 of the Clean Water Act.

Agricultural Areas/Rangeland. Rangeland is managed for foraging livestock and is a mix of herbaceous, dominated by grasses and forbs, and shrub and brush rangeland that has a mix of woody vegetation.

[79] USGS, 2017. National Hydrography Dataset. Viewed online for Stanislaus County: https://nhd.usgs.gov/data.html. Accessed November 21, 2017.

[80] Federal Geographic Data Committee, 2013. *Classification of Wetlands and Deepwater Habitats of the United States*. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

Depending on the level of grazing, rangeland can have sparse or weedy vegetation. Coyote, black-tailed jackrabbit (*Lepus californicus*), and California kangaroo rat (*Dipodomys californicus*) are commonly found in rangeland.

Agricultural areas include two types: (1) cropland and pasture and (2) orchards and vineyards. Irrigated pastures provide foraging and roosting opportunities for shorebirds and wading birds; unirrigated pastures provide forage for seed-eating birds, small mammals, and federally endangered and state threatened San Joaquin kit fox. Crops include row crops, grain crops, rice, and cotton. Rice, corn, and other crop fields left unplowed or flooded after harvest provide important forage for waterbirds, including plant and invertebrate food sources.[81] Small mammals found in pastures include California voles, Botta's pocket gophers, and California ground squirrels that are prey for foraging raptors, including red-tailed hawks, Swainson's hawks, white-tailed kites (*Elanus leucurus*), and prairie falcons (*Falco mexicanus*).

Cropland is more intensively managed and is regularly disturbed throughout the year, generally providing lower quality habitat. Rodent species, such as the California vole, deer mouse, and California ground squirrel, are common and are preyed upon by various raptors. Orchards and vineyards are typically open, single-species habitats that are intensively managed; vineyards are often treated with herbicides to prevent understory growth of competing herbaceous species.

Wetlands and Other Waters. Wetlands and other waters in Stanislaus County include a combination of groundwater- and surface water-fed wetlands and waterways. Wetlands and other waters habitats in the study area include palustrine, riverine, and lacustrine, as mapped by the National Wetland Inventory based on the Cowardin classification system.[82] These habitats are in U.S. Environmental Protection Agency (EPA), USACE, and RWQCB jurisdiction and are regulated under Section 404 of the Clean Water Act by the EPA and USACE, and under Section 401 of the Clean Water Act and the California Porter-Cologne Water Quality Control Act by the RWQCB. "Wetlands" as used in this document includes those natural communities that support vegetation adapted to saturated soil conditions (hydrophytic). This definition includes federally protected wetlands and natural communities that support wetland vegetation but do not meet the hydrology and soils criteria used by the USACE to define jurisdictional and federally protected wetlands.[83] This definition is consistent with the interpretation of wetlands as used by the CDFW, the California Coastal Commission, and the RWQCB. The RWQCB defines "waters of the state" as any surface water or groundwater, including saline waters, within the boundaries of the state. The RWQCB's jurisdiction includes waters of the U.S. that are considered a subset of waters of the state.

The wetlands of California's Central Valley provide one of the most important wintering regions in North America for waterfowl, shorebirds, and other waterbirds. These wetlands support approximately 60 percent

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[81] Matchett, E.L., J.P. Fleskes, 2017. "Projected Impacts of Climate, Urbanization, Water Management, and Wetland Restoration on Waterbird Habitat in California's Central Valley." PLOS One. January 9.

[82] Federal Geographic Data Committee, 2013. *Classification of Wetlands and Deepwater Habitats of the United States*. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

[83] Environmental Laboratory, 1987. *Corps of Engineers Wetlands Delineation Manual*. Wetlands Research Program Technical Report Y-87-1. January.

of the waterfowl population in the Pacific Flyway, 18 percent of the continental waterfowl population, and are documented to support more wintering shorebirds than any other inland location in western North America. Winter foraging in wetland and cropland habitats of the Central Valley supports winter survival and improves body condition for spring migration and breeding. [84]

Wetland and other waters vegetation and wildlife communities are described above for valley-foothill riparian, vernal pool complexes, riverine, palustrine, and lacustrine.

GDEs are ecosystems (terrestrial, aquatic, and coastal) that require access to subsurface stores of water, either permanently or intermittently, to meet some or all of their water requirements to function or persist. GDEs include rivers, streams, palustrine and emergent wetlands, seeps, springs, and lakes, and the vegetation and wildlife that depend on these systems for forage, reproduction, and rest. These features include vegetation such as oak trees in a Mediterranean climate that access and rely at least partly on groundwater through their roots; springs, riverine, palustrine, and lacustrine wetlands that receive groundwater discharge; aquifer and cave ecosystems, and estuarine and marine nearshore systems that receive submarine discharge. During times of drought or extended dry periods, groundwater is critical in maintaining wetland ecosystems and their vegetation as refuge for wildlife. [85] Preliminary mapped GDEs in Stanislaus County are shown on Figure 3-4.

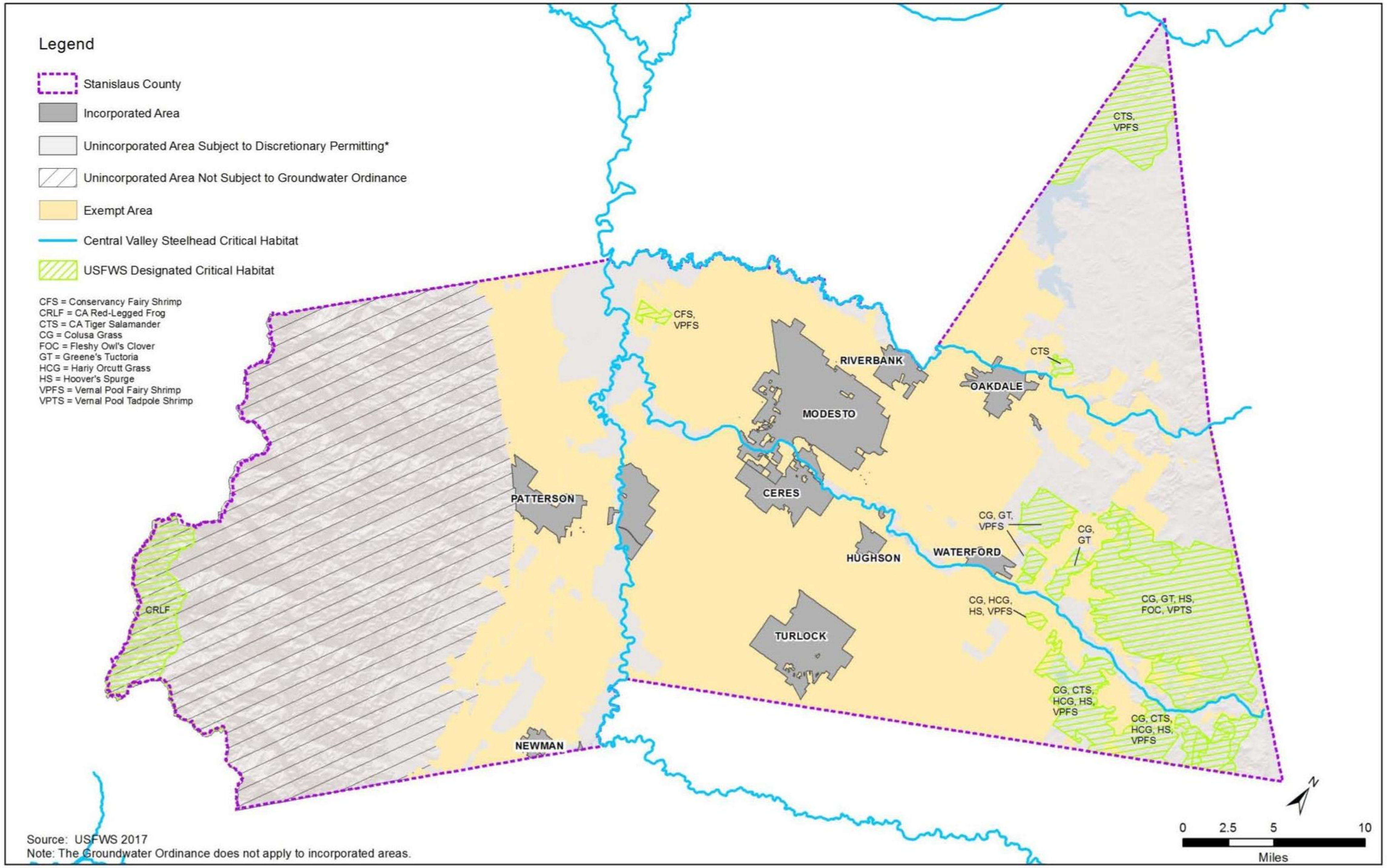
Special Status Species and Critical Habitat. The CDFW maintains the CNDDB, a statewide inventory of reported occurrences of federal- and state-listed threatened or endangered, and special-status plant and animal species. This includes rare plants that are considered threatened and have rare plant rankings by the CNPS. The CNDDB was queried for occurrence records for all of Stanislaus County and an area extending 0.5 mile from the county line to include a query of the surrounding quadrangles. Results of the database query are in Table 3-5, which lists species with the potential to occur in the county and includes a brief description of habitat types where they are documented to occur. Sensitive vegetation communities identified by the CNDDB query include Northern Hardpan Vernal Pool, Coastal and Valley Freshwater Marsh, Elderberry Savannah, Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, Great Valley Valley Oak Riparian Forest, and Sycamore Alluvial Woodland.[86]

The USFWS' Information for Planning and Consultation (IPaC) database was queried for federally listed and federally protected species in Stanislaus County. In Stanislaus County, 15 critical habitats are designated and occur either wholly or partly the county (Figure 3-5).

[84] Matchett, E.L., J.P. Fleskes, 2017. "Projected Impacts of Climate, Urbanization, Water Management, and Wetland Restoration on Waterbird Habitat in California's Central Valley." PLOS One. January 9.

[85] Nelson, R. and L.Szeptycki, 2017. *Understanding California's Groundwater*. Water in the West. Accessed November 2017: http://waterinthewest.stanford.edu/groundwater/conflicts/index.html

[86] California Department of Fish and Wildlife, 2016. California Natural Diversity Database (CNDDB) query of special status plants, wildlife, and community's records for Stanislaus County. August.



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Stanislaus County Well Permitting Program Administrative Draft Program EIR
Stanislaus County, California

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FIGURE 3-5

USFWS Federally Listed Critical Habitat

Critical habitat for California red-legged frog is in the Diablo Range, outside the study area. In the study area, these species and locations are designated USFWS critical habitat:

- The Tuolumne, Stanislaus, and San Joaquin rivers are critical habitat for Central Valley steelhead;
- An area on the valley floor, east of the San Joaquin River and north of the Tuolumne River, is designated for conservancy fairy shrimp and vernal pool fairy shrimp; and
- The Sierra Nevada foothills have numerous locations designated for vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, Colusa grass, Greene's tuctoria, hairy orcutt grass, Hoover's spurge, and fleshy owl's-clover.

The special status plant species occur in a variety of habitats across the county, including annual grassland, vernal pool, oak woodland, riparian, and chaparral. Special status wildlife species, listed in Table 3-5, are primarily associated with annual grasslands/vernal pool complexes at the east side of the county, the riparian habitats along the San Joaquin, Stanislaus, and Tuolumne Rivers, and lands west of I-5 (outside of the study area).

3.12 Agriculture and Forestry Resources

Although Stanislaus County's economy is diversifying, its economic base remains predominantly agricultural. Agriculture generates an annual gross value in excess of a billion dollars into the local economy. Located in the Central Valley, which has long been known as California's agricultural heartland, Stanislaus County consistently ranks among the top ten agricultural counties in the state. Stanislaus County also plays a major role in agriculture at the national level, based on market value of agricultural products sold.

Agricultural land constitutes approximately 85 percent of all land in the county (Stanislaus County 2016a). Table 3-6 summarizes the various agricultural, urban, and other land uses in Stanislaus County in 2014 and 2016, as compiled by the California Department of Conservation. These acreages are for Stanislaus County as a whole, including incorporated and unincorporated areas. In large part, the important farmlands located in the county's unincorporated area are currently zoned for agricultural use and are protected from conversion to residential developments by the provisions of the Stanislaus County General Plan.[87] The agricultural resources study area for this PEIR is defined as unincorporated Stanislaus County outside the service territories of water agencies.

Agriculture in Stanislaus County is characterized by a broad diversity of commodities. The county's top-five farm products are, in order of revenue, almonds, milk, walnuts, cattle and calves, and chickens. In the eastern portion of the County, there is a trend toward conversion of rangeland to crop agriculture (mainly orchards). Based on data provided by the Stanislaus County Agricultural Commissioner, an average of approximately 3,100 acres per year of rangeland was converted permanent crops, including almonds, walnuts and vineyards (Appendix C). At the same time, there has been a trend toward conversion from the cultivation

[87] Stanislaus County, 2016b. Stanislaus County General Plan and Airport Use Land Compatibility Plan Update, Draft Program EIR, 2016. http://www.stancounty.com/planning/pl/gp/current/DraftEIR.pdf. Accessed November 2017.

TABLE 3-6 STANISLAUS COUNTY LAND USE

Land Use Category	Acreage Inventoried (Acres) 2014	2016
Prime Farmland	252,700	249,967
Farmland of Statewide Importance	32,183	33,172
Unique Farmland	105,630	116,210
Farmland of Local Importance	28,142	26,029
Grazing Land	414,013	404,405
Agricultural Land Subtotal	**832,668**	**829,783**
Urban and Built-up Land	65,017	66,230
Other Land	65,023	66,680
Water Area	7,466	7,481
Total Land Inventoried	**970,174**	**970,174**
Source: California Department of Conservation, 2016		

of annual crops to permanent crops (again, mainly orchards) in the remainder of the County. These trends appear to have slowed in recent years due to less favorable economics, and since the adoption of Stanislaus County's Groundwater Ordinance in late 2014.

The success of agriculture in Stanislaus County is largely due to favorable climate, flat, fertile soils, low-cost electricity, and the availability of affordable, high-quality irrigation water. Water is the lifeblood of agriculture in Stanislaus County. To supplement an average rainfall of just 12 inches per year, local agriculture relies on a network of irrigation-water delivery systems to sustain its broad diversity of valuable crops. As discussed in Section 3.8, the main sources of irrigation water are diversions from the Stanislaus, Tuolumne and San Joaquin Rivers throughout the central and western portions of the County, and surface water deliveries from the California Aqueduct and Delta-Mendota Canal in the western portion of the County. Surface water is supplemented with groundwater to meet irrigation demand, but is the main or the only source of irrigation water in the eastern foothills area of the County.

Degraded groundwater quality in areas of the county is having adverse effects on domestic water suppliers (Section 3.8), and indirectly on agricultural lands. As suitable groundwater becomes unavailable for domestic use, other sources are being sought. As a result, urban and agricultural users are becoming more competitive for water supplies. Table 3-6 shows that a small amount of agricultural land is converted countywide each year as a result of suburbanization or land being removed from production. Conjunctive use projects, such as the Stanislaus Regional Water Authority project, are being planned that will affect the evolving balance between agricultural and municipal water use in the county.[88,89] Bay-Delta Water Quality Control Plan

[88] West Yost, 2016. *Preliminary Phasing and Water Treatment Plant Sizing for the SRWA Surface Water Supply Project.* June 16.

[89] West Yost, 2017. *Surface Water Supply Project, Initial Project Capacity, Estimated Cost and Rate Impacts. Presentation to Stanislaus Regional Water Authority.* August 3.

amendments proposed by the SWRCB could profoundly affect the availability of surface water supplies in ways that are not yet known.[90]

3.13 Air Quality

In accordance with the Clean Air Act, the EPA and the California Air Resources Board (CARB) established ambient air quality standards for criteria pollutants: the federal National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS). These criteria pollutants include ozone, carbon monoxide (CO), sulfur dioxide (SO_2), inhalable and fine particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), and nitrogen dioxide (NO_2).[91] Additional criteria pollutants for California include sulfates, visibility-reducing particulates, hydrogen sulfide (H_2S), and vinyl chloride. California set standards for certain pollutants, such as particulate matter and ozone, that are more protective of public health than the corresponding federal standards. California is divided into 15 air basins that group together areas with similar geographical and meteorological features and practical combinations of political boundaries. The CARB designated each area as attainment, nonattainment, or unclassified for each state standard.

3.13.1 San Joaquin Valley Air Basin

The project is in the San Joaquin Valley Air Basin (SJVAB) that includes all of Stanislaus County. The SJVAB covers approximately 25,000 square miles, including San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, and the Valley portion of Kern County. The SJVAB consists of a continuous inter-mountain valley approximately 250 miles long and averaging 80 miles wide. The region's topographic features restrict air movement through and out of the air basin. The SJVAB is highly susceptible to pollutant accumulation over time. Table 3-7 shows the attainment status of the SJVAB for the CAAQS and NAAQS.

It is thought that the bulk of the valley's summer and winter air pollution is caused by emissions generated within the local air basin. Nearly all development projects in the SJVAB have the potential to generate air pollutants, increasing the difficulty in attaining state and federal ambient air quality standards. About 16.7 percent of pollutants in the SJVAB derive from stationary and area sources, and approximately 11.4 percent come from farm equipment.

3.13.2 San Joaquin Valley Air Pollution Control District

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is the agency principally responsible for comprehensive air pollution control in the SJVAB. The SJVAPCD developed plans to attain state and federal standards for ozone and particulate matter. These plans include emissions inventories to measure the sources of air pollutants, to evaluate how well different control methods have worked, and to show how air pollution will be reduced. The SJVAPCD develops rules and regulations, establishes permitting requirements, inspects emissions sources, and enforces such measures though educational programs or fines, when necessary.

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[90] SWRCB, 2015. *A Guide for Private Domestic Well Owners.* Website: http://www.waterboards.ca.gov/gama/docs/wellowner_guide.pdf. Accessed September 14, 2016.

[91] U.S. Environmental Protection Agency, 2016. Air Quality Planning and Standards. https://www3.epa.gov/airquality/cleanair.html. Accessed September.

TABLE 3-7 SJVAB ATTAINMENT STATUS

Pollutant	Designation/Classification	
	NAAQS	CAAQS
Ozone - One hour	No Federal Standard	Nonattainment/Severe
Ozone - Eight hour	Nonattainment/Extreme	Nonattainment
PM_{10}	Attainment	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
Carbon Monoxide	Attainment/Unclassified	Attainment/Unclassified
Nitrogen Dioxide	Attainment/Unclassified	Attainment
Sulfur Dioxide	Attainment/Unclassified	Attainment
Lead (Particulate)	No Designation/Classification	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particles	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

Source: San Joaquin Valley Air Pollution Control District, 2016a. Ambient Air Quality Standards & Valley Attainment Status. http://www.valleyair.org/aqinfo/attainment.htm. Accessed September 2016.

The SJVAPCD is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources. It has responded to this requirement by preparing a series of Air Quality Management Plans (AQMP) covering ozone and particulate matter. The AQMPs were prepared to comply with the federal and state Clean Air Acts and amendments, to accommodate growth, to reduce the high pollutant levels of pollutants in the SJVAB, to meet federal and state air quality standards, and to minimize the fiscal impact of pollution control measures on the local economy. The SJVAPCD adopted the 2016 Plan for the 2008, 8-Hour Ozone Standard in June 2016 and the 2013 Plan for the Revoked 1-Hour Ozone Standard in September 2013. The 2016 plan satisfies Clean Air Act requirements and ensures expeditious attainment of the 75 parts per billion 8-hour ozone standard.[92] On May 21, 2015, CARB approved the SJVAPCD's 2015 $PM_{2.5}$ State Implementation Plan that outlines the strategy to attain the federal 1997, 24-hour $PM_{2.5}$ standard by 2018 and the 1997 Annual $PM_{2.5}$ standard by 2020.[93] The AQMPs identify the control measures that will be implemented to reduce major sources of pollutants. SJVAPCD regulations ensure that stationary source emissions will be reduced or mitigated to below the SJVAPCD's significance thresholds. SJVAPCD implementation of new source review (NSR) ensures that there is no net increase in emissions above specified thresholds from new and modified stationary sources for all nonattainment pollutants and their precursors. Generally, permitted sources emitting more than the NSR offset thresholds for any criteria pollutant must offset all emission increases in excess of the thresholds.

3.13.3 Applicable SJVAPCD Regulations

Regulation II (Permits) deals with permitting emission sources**.**

[92] SJVAPCD, 2016e. Ozone Plans. http://www.valleyair.org/Air_Quality_Plans/Ozone_Plans.htm. Accessed September.

[93] SJVAPCD, 2016f. Particulate Matter Plans. http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm. Accessed September.

Rule 2010 requires operators of emission sources to obtain an authority to construct and permit to operate from the SJVAPCD.

Rule 2201 provides for the review of new and modified stationary sources of air pollution and provides mechanisms, including emission trade-offs, that would allow construction of these sources without interfering with the attainment or maintenance of ambient air quality standards. It would preclude a net increase in emissions above specified thresholds from new and modified stationary sources of all nonattainment pollutants and their precursors.

Rule 2301 provides an administrative mechanism for sources to store emission reduction credits for later use as offsets and transfer emission reduction credits to other sources for use as offsets and defines eligibility standards, quantitative procedures, and administrative practices to ensure that emission reduction credits are real, permanent, quantifiable, surplus, and enforceable.

Regulation VIII, Fugitive PM_{10} Prohibition, was adopted to reduce ambient concentrations of fine particulate matter by requiring actions to prevent, reduce, or mitigate anthropogenic fugitive dust emissions. Regulation VIII requires property owners, farmers, and public agencies to control fugitive dust emissions from specified outdoor sources, including construction sites, paved and unpaved roads, vacant land, bulk material transport, and similar activities.

Rule 8081 limits fugitive dust emissions from agricultural sources associated with transportation of materials and commodities. Farmers must prepare a Fugitive PM_{10} Management Plan to address use of dust suppressants on unpaved roads and unpaved vehicle traffic areas.

Rule 4303, Orchard Heaters, limits air emissions from gas-fired heaters used to protect orchards from frost.

Rule 4550, Conservation Management, requires preparation and implementation of a Conservation Management Plan outlining practices used to limit fugitive dust emissions from agricultural sites.

Rule 4702 regulates emissions from stationary agricultural equipment by requiring non-emergency certified diesel internal combustion engines greater than 50 horsepower to be replaced by Tier 3 engines or by electrified equipment. As of January 2015, Rule 4702 requires all diesel-fired engines to be replaced with the latest tier engines or be electrified.[94]

3.14 Cultural Resources

Early inhabitants of the area, now known as Stanislaus County, were the Northern Valley Yokut and the Miwok. Evidence of settlement in the region dates from 1500 to 1600 A.D. The Northern Valley Yokut's primary habitation was on a strip of land bordering the San Joaquin River and its main tributaries. Most of their settlements were on the banks of watercourses, and they relied heavily on fishing in the rivers for their livelihood.[95] The Miwok lived on the eastern side of the valley, in the foothills.

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[94] SJVAPCD, 2016b. Current District Rules and Regulations. http://www.valleyair.org/rules/1ruleslist.htm. Accessed September.

[95] Wallace, 1978. "Northern Valley Yokuts." In Handbook of North American Indians. Vol. 8, California, edited by Robert F. Heizer, 462-470. Washington, D.C: Smithsonian Institution.

In 1806, Spanish soldier Gabriel Moraga first entered the San Joaquin Valley area (and the area that is now Stanislaus County), returning in 1808 and 1810 to further explore it. Through the 1820s and 1830s, more white Europeans came to the area for exploration, and by 1843, the first settlement, El Pescadero (48,887 acres), was established north of what is now Stanislaus County. Two additional land grants, Rancho del Puerto (13,340 acres) and Rancho Orestimba (26,666 acres), were settled by 1844. During this period, hunters and trappers visited the region, camping along the county's rivers. With the discovery of gold in the Sierra Nevada hills in 1849, people flocked to the area from other parts of the country, hoping to make their fortunes. During this time, ferries were established, toward the hills, to navigate the Stanislaus and Tuolumne Rivers. Many people stayed and established cities and towns. Stanislaus County was established in 1854. Wheat was the primary crop, with barley and other grains also grown. Ferries and riverboats provided the transportation needed to sell these crops to outlying areas until development of the Central Pacific Railroad (later Southern Pacific Railroad) in Stanislaus County. Railroads played a key role in the formation of Stanislaus County's two largest cities, Modesto and Turlock, and smaller towns that grew up along the rail line. Implementation of new irrigation systems expanded opportunities for agricultural diversification in Stanislaus County, including the production of alfalfa, which became a leading crop that provided feed for growing herds of dairy cattle. Orchard crops such as peaches, apricots, almonds, and oranges also became more prevalent. Agriculture is still the major focus of the county's economy.

The Conservation/Open Space Element (Chapter Three) of the Stanislaus County General Plan discusses known cultural resources in Stanislaus County. Under CEQA, cultural resources can be buildings, sites, structures, objects, or districts that are generally 45 years or older and may have historic, pre-historic, architectural, archaeological, or Native American significance. The CEQA Guidelines define three ways a property may qualify as a historical resource for a CEQA review:

1. The resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR).
2. The resource is included in a local register of historical resources, as defined in Section 5020.1[k] of the Public Resources Code (PRC) or identified as significant in a historical resource survey as meeting the requirements of Section 5024.1[g] of the PRC unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. The lead agency determines the resource to be significant, as supported by substantial evidence in light of the whole record (14 CCR 15064.5[a]).

A historical resource may be eligible for inclusion in the CRHR if it meets any of these conditions (14 CCR 4850):

- **Criterion 1.** It is associated with events or patterns of events that made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;
- **Criterion 2.** It is associated with the lives of persons important to local, California, or national history;
- **Criterion 3.** It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master, or possesses high artistic values; and/or.

- **Criterion 4.** It yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Properties listed in or eligible for listing in the National Register of Historic Places (NRHP) are considered eligible for listing in the CRHR and are also significant historical resources for CEQA (PRC Section 5024.1[d][1]).

Although the exact locations of below-ground cultural resources in Stanislaus County are kept confidential, the two primary culturally sensitive areas in the county, identified in this document, are in and around the gold rush towns of Knights Ferry and La Grange. There are also a number of buildings considered historically significant (Stanislaus County 2016). Other goldrush era settlements exist within the county but are not designated as historically significant at this time.

3.14.1 Native American Resources

The General Plan also details the CEQA guidelines concerning Native American resources. PRC Section 5097.9 states that no public agency or a private party on public property "shall…interfere with the free expression or exercise of Native American religion…." The code further states that "…nor shall any such agency or party cause severe or irreparable damage to any Native American sanctified cemetery, place of worship, religious or ceremonial site, or sacred shrine located on public property, except on a clear and convincing showing that the public interest and necessity so require."

3.14.2 Policies Concerning Human Remains

Disturbance of human remains without the authority of law is a felony (California Health and Safety Code Section 7052). If the remains are Native American in origin, they are within the jurisdiction of the Native American Heritage Commission (NAHC) (California Health and Safety Code Section 7050.5c; PRC Section 5097.98). If human remains are discovered or recognized in any location other than a dedicated cemetery, there can be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- The County Coroner has been informed and has determined that no investigation of the cause of death is required; and
- The Coroner makes a determination that the remains are Native American or has reason to believe they are Native American, in which case the Coroner must contact NAHC; and
- NAHC determines the most likely descendant; and
- The most likely descendants of the deceased Native Americans make a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code, Section 5097.98; or
- The NAHC is unable to identify a most likely descendant or the most likely descendent failed to make a recommendation within 24 hours after being notified by the NAHC (California Health and Safety Code Section 7050.5c; PRC Section 5097.98).

Senate Bill (SB) 18 is a process separate from CEQA that requires counties that include traditional tribal cultural places on both public and private lands to consult with federally and non-federally recognized Native American tribes prior to approving projects. A cultural place is a landscape feature, site, or cultural resource that has some relationship to particular tribal religious heritage, or is a historic or archaeological site of significance or potential significance.

Assembly Bill (AB) 52, effective July 1, 2015, establishes new requirements under CEQA for lead agencies to offer Native American tribes the opportunity to formally consult over proposed projects prior to the release of draft environmental documents for public review. The consultation is to cover potential impacts, mitigation measures, and project alternatives that may reduce or avoid impacts. No EIR or Negative Declaration can be approved unless either no tribe requested consultation, the consultation resulted in mutually agreeable mitigation or alternatives, or the lead agency concluded the consultation without an agreement, but after a good faith attempt at consultation. AB 52 expands CEQA's scope to include the potential for significant adverse effects on tribal cultural resources. Consultation generally begins with contacting the NAHC that maintains a list of Native American groups, organized by county, for SB 18 Tribal Consultation.

3.14.3 Paleontological Resources

Paleontological resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth, as defined in the Paleontological Resources Preservation Act of 2009. The General Plan includes information on protecting paleontological resources in the county. Section 5097.5 of the PRC prohibits "knowing and willful" excavation, removal, destruction, injury, and defacement of any paleontological feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction granted express permission. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur from development on public lands. The General Plan states that the University of California Museum of Paleontology (UCMP) database contains 765 records of vertebrate fossils found in the county. Much of the valley is immediately underlain by the Modesto and Riverbank Formations of Late Pleistocene age.[96] These deposits represent sediment eroded from the uplifting Sierra Nevada. California's Pleistocene sedimentary units—especially those that, like the Modesto and Riverbank Formations, record deposition in continental settings—are typically considered highly sensitive for paleontological resources because of the large number of recorded fossil finds in such units throughout the state. The General Plan EIR contains a paleontological sensitivity map for the entire county (Figure 3.6-5 of the General Plan EIR), on which it is shown that most of the county has a high sensitivity for the presence of paleontological resources.

3.15 Greenhouse Gas Emissions

CEQA requires that public agencies refrain from approving projects with significant adverse impacts from greenhouse gas (GHG) emissions and their consequent adverse impacts on the world's climate if feasible

[96] Stanislaus County, 2016b. Stanislaus County General Plan and Airport Use Land Compatibility Plan Update, Draft Program EIR, April 2016. http://www.stancounty.com/planning/pl/gp/current/DraftEIR.pdf.

alternatives or mitigation measures can substantially reduce or avoid these impacts. These gases trap heat in the atmosphere, and the major concern is that increases in GHG emissions are causing global climate change. It is thought that there is a direct link between increased emission of GHGs and long-term global temperature. GHGs allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation and warm up the air. Both natural processes and human activities generate GHGs.

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and water vapor (H_2O). CO_2 is the reference gas for climate change because it is the predominant greenhouse gas emitted. GHG emissions are often quantified and reported as CO_2 equivalents (CO_2e) to account for the varying warming potential of different GHGs.

The Global Warming Solutions Act of 2006 (AB 32) requires that CARB estimate the statewide, 1990, GHG emission level and approve a statewide greenhouse gas emissions limit, equal to the 1990 level, to be achieved by 2020. Assembly Bill 1803, which became law in 2006, made CARB responsible for preparing, adopting, and updating California's GHG inventory. In April 2015, Governor Edmund G. Brown, Jr., issued an executive order to establish a California greenhouse gas reduction target of 40 percent below 1990 levels by 2030.

In August 2007, the legislature adopted Senate Bill 97, requiring the Governor's Office of Planning and Research to prepare and transmit new CEQA guidelines for the mitigation of GHG emissions or the effects of GHG emissions to the Natural Resources Agency by July 1, 2009.

The amendments adopted to the CEQA guidelines became effective on March 18, 2010. A threshold of significance for GHG emissions was not specified in those amendments, nor do they prescribe assessment methodologies or specific mitigation measures. Instead, the amendments encourage lead agencies to consider many factors in doing a CEQA analysis and rely on the lead agencies to make their own significance threshold determinations based on substantial evidence.

In December 2009, the SJVAPCD adopted a policy to assist lead agencies, project proponents, permit applicants, and interested parties in assessing and reducing the impacts of project-specific GHGs on global climate change: District Policy – Addressing GHG Emission Impacts for Stationary Source Projects under CEQA. The policy relies on the use of performance-based standards, otherwise known as Best Performance Standards (BPS) to assess significance of project-specific GHG emissions on global climate change during the environmental review process, as required by CEQA. BPSs for traditional stationary source projects include equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.[97]

Use of BPSs is a method of streamlining the CEQA process of evaluating significance and is not a required emission reduction measure. Projects implementing BPSs would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions from

[97] SJVAPCD, 2009. District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency.

a continuation of existing operations is required to determine that a project would have a less than cumulatively significant impact. The SJVAPCD developed BPSs for these stationary sources: boilers; steam generators; gasoline dispensing facilities; dry cleaners; oil and gas extraction, storage, transportation, refining operations; and co-generation.[98]

The Stanislaus Countywide Regional Community Greenhouse Gas Inventory was prepared to quantify GHG community emissions for the county as a whole for the year 2005. Using the methodology for the regional inventory, separate GHG community inventories were prepared for each jurisdiction in the county and provided to the individual cities and the unincorporated county for their use.[99]

3.16 Hazards and Hazardous Materials

Hazards such as fires, floods, earthquakes, and other natural disasters would not affect or be affected by the program and are not discussed further in this PEIR. Sites that experienced a release of hazardous materials are listed in a number of federal and state databases that provide information regarding the facilities or sites identified as meeting the Cortese List requirements and that list the past and present businesses that have had or are currently experiencing a hazardous materials release in the county. These include CERCLIS, GeoTracker (the leaking underground storage tank database), EnviroStor, the Toxic Release Inventory, and the List of Active Cease and Desist Orders, and Cleanup and Abatement Orders.

Requirements for the drilling, maintenance, and rehabilitation of water wells are detailed in the California Water Well Standards, Bulletin 74-81 and supplements, developed by the California Department of Water Resources, and in the Stanislaus County Well Ordinance (Chapter 9.36 of the County Code). Drilling of water wells in areas where hazardous materials have been released is not allowed unless measures are taken to ensure the water will not be contaminated.

The drilling of water wells may sometimes require the use of clay additives, and sometimes drilling mud conditioners for the boring. These are typically water-based, inert and degradable products used to achieve the appropriate mud weight and viscosity for drilling conditions. The water well standards and other industry performance standards address the development of the well and the flushing of drilling mud from the well during development. The driller is responsible for providing sufficient containment and storage of drilling cuttings and fluids, for removing any waste materials from the site, and disposing of any on-site drill cuttings (soils) in areas where they will not enter nearby water bodies. If the drilling muds require off-site disposal, they are profiled and disposed of at appropriate landfills licensed to accept these wastes. Water well drilling muds requiring off-site disposal are typically disposed of as Designated Waste.

Drilling rigs also require the use of lubricants and fuels. These materials, and any resultant wastes, are contained, stored and handled in accordance with applicable federal, state, and local regulations and Material Safety Data Sheets.

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[98] SJVAPCD, 2016g. Best Performance Standards (BPS) for Stationary Sources. http://www.valleyair.org/programs/CCAP/bps/BPS_idx.htm#Oil&Gas. Accessed September.

[99] Stanislaus County, 2013. Stanislaus Countywide Regional Community Greenhouse Gas Inventory. July 2013.

The water well standards require that any mud or water used as a drilling additive shall be free from sewage contamination. Any oil and water used for lubrication of the pump and pump bearing shall also be free from contamination. Wells subjected to chemicals during development, redevelopment, or reconditioning operations shall be thoroughly pumped, immediately after the completion of operations, to remove the agents and residues. Chemicals, water, and other wastes removed from the well shall be disposed of in accordance with applicable local, state, and federal requirements.

3.17 Noise

Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. Three components make up sound: source, path, and receiver. All three components must be present for sound to exist. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) measured in decibels (dB) – zero dB approximately corresponds to the threshold of human hearing, and 120 to 140 dB corresponds to the threshold of pain. The perception of sound and noise is determined by its effects on receptors. Examples of sensitive noise receptors are facilities or areas, including residential areas, hospitals, and schools, where excessive noise levels would be considered an annoyance. The "A-weighted" noise scale (measured in A-weighted decibels (dBA)) was developed because it corresponds, more closely to people's subjective judgment of sound levels.

Noise sources are classified in two forms: (1) point sources, such as stationary equipment or individual vehicles; and (2) line sources, such as a roadway with large number of cars. Sound generated by a point source typically attenuates at a rate of 6 dBA for each doubling of distance from the source to the receptor at acoustically soft sites such as vacant land.[100] Sound levels can also be attenuated by placement of barriers, such as solid walls or berms between the source and receptor.

Community reaction to noise is assessed on a scale that averages varying noise exposures over time and quantifies the results in terms of a single value. The Community Noise Equivalent Level (CNEL) is an average A-weighted scale measured over 24-hours and adjusted to account for increased sensitivity to noise levels during evening and nighttime hours. A CNEL noise measurement is obtained after adding 5 decibels to sound levels occurring during the evening from 7:00 p.m. to 10:00 p.m. and 10 decibels to sound occurring during the nighttime from 10:00 p.m. to 7:00 a.m. The major sources of noise in Stanislaus County are roadway traffic, railroad noise, airport operations, and industrial activities. The quietest areas of unincorporated Stanislaus County are those that are removed from major transportation-related noise sources and local industrial or other stationary noise sources. Examples of these quiet areas are rural areas, such as Hickman, Valley Home, and La Grange. The maximum noise levels in these areas are generated by local automobile traffic or heavy trucks. Other sources of maximum noise levels include occasional aircraft overflights and, in some areas, railroad operations, particularly horns. Background noise levels in the absence of these sources

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[100] La Plata County, 2002. La Plata County Impact Report, Coal Bed Methane Development. October 20002. http://lpccds.org/UserFiles/Servers/Server_1323669/File/2002%20Oil%20and%20Gas%20Impact%20Report.pdf. Accessed September 2016.

derive from distant traffic, wind in the trees, running water, birds, and distant industrial or other stationary noise sources.[101,102]

Vibration is sound radiated through the ground. Typical sources of ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. They can create vibration waves that propagate through the soil to the foundations of nearby buildings. Ground-borne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived without the effects associated with the shaking of a building, the motion does not provoke the same adverse human reaction. The rumbling sound caused by the vibration of room surfaces is called ground-borne noise that is usually characterized with the A-weighted sound level. Ground-borne noise is perceived as louder than the same broadband noise because the human ear perceives sound dominated by low-frequency components as louder than broadband sounds that have the same A-weighted level. The background vibration velocity level perceptibility threshold is about 65 vibration decibels (VdB), and human response to vibration is not usually significant unless the vibration exceeds 70 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels.[103]

General Plan Noise Element. The Stanislaus County General Plan Noise Element was designed to limit the exposure of the community to excessive noise levels. The plan prohibits new development of noise-sensitive land uses in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise. These measures include:

- For transportation noise sources, 60 dBA CNEL or less in outdoor activity areas of single-family residences, 65 dBA CNEL or less in community outdoor space for multi-family residences, and 45 dBA CNEL or less in noise-sensitive interior spaces. An exterior noise level of up to 65 dBA CNEL will be allowed where best available noise-reduction technology cannot produce the prescribed noise level. Interior noise with the windows and doors closed in residential uses may not exceed 45 dBA CNEL.[104]
- The standards for other noise sources, such as local industries or other stationary noise sources (such as groundwater well pumps), are listed in Table 3-8. These standards apply at a residential or other noise-sensitive land use and not on the property of a noise-generating land use. Where measured ambient noise levels exceed the standards, the standards would be equal to those ambient noise levels.

[101] Stanislaus County Planning and Development Department, 2005. Stanislaus County General Plan Update, Technical Reference Document for Noise Analysis. Modesto, California. November 25, 2005.

[102] Stanislaus County Planning and Development Department, 2016. Stanislaus County General Plan Noise Element. http://www.stancounty.com/planning/pl/gp/gp-chapter4.pdf. Accessed September.

[103] U.S. Department of Transportation, Federal Transit Authority, Office of Planning and Environment, 2006. Transit Noise and Vibration Impact Assessment. May 2006.

[104] Stanislaus County Planning and Development Department, 2016. Stanislaus County General Plan Noise Element. http://www.stancounty.com/planning/pl/gp/gp-chapter4.pdf. Accessed September.

TABLE 3-8 MAXIMUM ALLOWABLE NOISE EXPOSURE FROM STATIONARY SOURCES

	Daytime 7:00 AM to 10:00 PM	**Nighttime 10:00 PM to 7:00 AM**
Average equivalent continuous noise level (dBA)	55	45
Maximum noise level (dBA)	75	65
Source: Stanislaus County Code, 2016. Chapter 10.46, Noise Control. http://qcode.us/codes/stanislauscounty/?view=desktop&topic=10-10_46-10_46_080. Accessed September.		

Stanislaus County Noise Ordinance. The Stanislaus County Noise Control Ordinance is codified in Chapter 10.46 of the Municipal Code. This ordinance restricts creation of noise that causes the exterior noise level, when measured at any property situated in either the incorporated or unincorporated area of the county, to exceed adopted noise levels. Agricultural activity is exempt under the ordinance. Construction equipment noise beyond the property line of any property with a dwelling unit cannot exceed an average sound level greater than 75 dBA between 7:00 p.m. and 7:00 a.m.[105]

[105] Stanislaus County Code, 2016. Chapter 10.46, Noise Control. http://qcode.us/codes/stanislauscounty/?view=desktop&topic=10-10_46-10_46_080. Accessed September.

4.0 ENVIRONMENTAL IMPACTS

This chapter discusses the impacts of issuing well construction permits under the County's discretionary well permitting program prior to the adoption of GSPs, and, after GSPs are adopted, the regulation of wells determined by the County to be extracting groundwater unsustainably. It lists the thresholds of significance that form the basis of the environmental analysis and assesses whether issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance would result in significant environmental impacts. The subsequent sections of this chapter address the approach and methodology used for each resource area; the individual impacts relative to the thresholds of significance; mitigation measures to minimize, avoid, rectify, reduce, eliminate, or compensate for significant impacts; and the overall significance of the impact with mitigation incorporated.

This programmatic analysis of potential impacts takes into consideration that the Ordinance and discretionary well permitting program are intended to minimize or prevent adverse environmental effects associated with the unsustainable development of groundwater resources. As such, implementation of the permitting program is intended, and expected, to decrease potential impacts related to groundwater withdrawal by permitted wells. The thresholds and requirements of the permitting program that have been adopted by the county to prevent potential "undesirable results" as they are defined in the Ordinance are examined to determine whether it is reasonable to conclude they are sufficient to ameliorate potential impacts to a less than significant level.

As discussed in Section 1.0, the Ordinance has been deliberately aligned with the requirements of the SGMA, including the avoidance and amelioration of "undesirable results." As such, the well permitting program that is being evaluated is intended to bridge the gap between the present and 2020 or 2022, when GSPs will be adopted in the groundwater subbasins underlying the county. The terms of groundwater extraction permits issued under the well permitting program are limited to the dates that GSPs must be adopted for the subbasin in which permitted well is located, and thereafter are renewed for 5-year terms coincident with the regulatory cycle for GSP updates. In order to prepare and update the required GSPs, additional studies will be conducted that will further refine thresholds and requirements that are currently embodied in the well permitting program, and update compliance requirements, thus assuring that groundwater management will be informed by the most up to date information regarding sustainability criteria and measurable objectives. After GSPs are adopted, GSAs will be responsible for their implementation and enforcement, with specific requirements for future "undesirable results" to be avoided, and existing "undesirable results" to be ameliorated in accordance with specific milestones. If GSAs fail to adopt adequate GSPs, or fail to adequately implement them, the SGMA requires that the state intervene to assure that the required sustainability goals are met. The Ordinance allows the county to intervene and regulate unsustainable extraction prior to state intervention; however, as explained previously, this is considered an unlikely scenario.

These aspects of SGMA implementation, and the alignment of the permitting program with these requirements, are reasonably foreseeable and are considered in the evaluation of the potential impacts from the relatively short period during which wells will be permitted under the program evaluated in this PEIR. The impact analysis in the following sections includes an evaluation of the likelihood that permitting of wells under the county's discretionary well permitting program will result in undesirable results and significant impacts before GSPs are adopted in 2020 and 2022. After GSPs are adopted, the potential effects of continuing the well permitting program and of regulating unsustainable wells are discussed, but it is assumed that the thresholds and requirements of the permitting program will be refined and permit conditions updated, as needed to prevent future potential undesirable results or significant impacts under the program. The thresholds of significance used to assess whether impacts are potentially significant were adopted from Appendix G of the state CEQA Guidelines and modified as follows:

- Potential impacts associated with aesthetics, mineral resources, population and housing, public services, recreation, and transportation and traffic were determined to be less than significant in the Initial Study completed to scope the PEIR and included with the Notice of Preparation. Impacts of the program associated with these resource areas are therefore presumed to be less than significant and have been eliminated from further consideration.
- A number of the threshold questions associated with agriculture and forestry resources, air quality, biology, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, and utilities and service systems were also eliminated from further consideration because the Initial Study determined that the impacts associated with these questions would be less than significant.
- Several threshold questions associated with biology, geology and soils, and hydrology and water quality were edited, or new questions were added, to align the impact evaluation with the definition of Undesirable Results in the Groundwater Ordinance and SGMA. Specifically, these changes were adopted to focus the analysis more precisely on the impacts potentially associated with construction and operation of wells and with the unsustainable extraction of groundwater:
    - **Biology.** The threshold question regarding potential impacts to riparian and other sensitive natural communities was expanded to specifically include impacts to groundwater-dependent ecosystems and groundwater-connected streams, lakes, and reservoirs.
    - **Geology and Soils.** The threshold question regarding potential impacts from geologic units that are unstable or could become unstable was replaced with a specific reference to subsidence: "Would the project cause inelastic subsidence that could substantially interfere with land surface infrastructure or uses?"
    - **Hydrology and Water Quality.**
        - The question regarding whether the project would violate any water quality standards or waste discharge requirements was amended to include "degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the California Regional Water Quality Control Board's Water Quality Control Plan."

The question regarding potential depletion of groundwater supplies or interference with recharge was replaced with two questions: "Would the project cause interference drawdown to existing wells that substantially interferes with their ability to support existing land uses, or land uses for which permits have been granted?" and "Would the project cause groundwater drawdown or storage depletion that will interfere with the ability of other well operators to support existing or permitted land uses, or that will substantially increase the cost to pump groundwater in the area?" The program being evaluated does not, in itself, propose any site-specific development activities, but rather, consists of future actions under the Ordinance that may lead to changes in the environment. Specifically, the impact analysis in this PEIR focuses on potential reasonably foreseeable impacts of future discretionary well permitting under the Ordinance and subsequent well construction and operation. The indirect impacts of permitting wells that make it possible for rangeland to be converted to cultivated agricultural use are also evaluated. Such agricultural conversion is already a permitted use on agriculturally-zoned land; however, if the agricultural conversion would not be possible "but for" construction of the well, the associated impacts are considered an indirect effect of the project that must be evaluated under CEQA. Other indirect effects that are not associated with project environmental impacts may be discussed at a programmatic level to provide perspective for the impact analysis, but are not evaluated for environmental impact significance. This includes indirect effects from installation of wells that provide water to parcels that are already used for irrigated agriculture. Under these circumstances, the well supports continuation of an existing permitted land use and no change in how the property is used takes place, so no environmental impact occurs. In addition, indirect effects from the denial of permits or the imposition of decreased pumping requirements are considered regulatory actions for the protection of the environment and are not evaluated as environmental impacts under CEQA.

No specific level of future well permitting was forecast in the impact evaluation because the actual number of applications that will be received is not known.[106] The locations and uses of such wells also is not known (i.e., supplemental irrigation on existing agricultural land versus new irrigation needs due to land conversion to agricultural use). This PEIR qualitatively assesses potential impacts on biological resources from implementation of the permitting program and subsequent well development and operation. This assessment is not site-specific, and no site-specific investigations were done for this analysis. Desktop analysis, literature review, and environmental and planning documentation review were done. The Stanislaus County General Plan and associated environmental documents were reviewed for baseline/current conditions and land use planning policies that apply to biological resources and future projects in the County.

Additional discretionary actions that may occur under the Ordinance and that are evaluated in this PEIR include the regulation of wells the county finds are being operated unsustainably after GSPs are adopted. In essence, these are existing wells that do not appear to be operated in compliance with a GSP. As discussed in Section 2, it is unlikely that such a finding will ever be made because GSAs are responsible to regulate groundwater extraction within their jurisdictions to assure compliance with SGMA. Nevertheless, because the county has the authority to implement such an action, it is evaluated in this PEIR. Such action would generally result in a decrease in the level of impact for most resource areas because groundwater extraction and potentially related agricultural activities would be decreased. Therefore, this action is only evaluated for

[106] The hydrologic effects analysis discussed in Appendix D was completed based on the assumption that 10 wells would be permitted and constructed per year between 2018 and 2022 to provide perspective on the impact analysis (Appendix D). This number was selected for the forecast analysis to provide perspective on potential program level impacts, and represents what is believed to be a reasonable, maximum number of wells that may be permitted; however, it should not be considered a programmatic limit or forecast.

the resource areas where potential adverse impacts from such an action are possible, specifically agricultural resources and utilities & service systems.

Unless otherwise noted, the baseline for the environmental impact analysis is October 2016, when the Notice of Preparation was issued.

4.1 Agriculture and Forestry Resources

4.1.1 Introduction

This section discusses the impacts of the proposed program to agriculture. Because Stanislaus County does not have land designated as forest land or timberland, there is no further discussion of forestry resources.

In large part, the county's important farmlands are in the unincorporated areas, and a significant portion of this area falls outside jurisdictional boundaries of water agencies covered by a GMP, and within the APE evaluated in this PEIR.

4.1.2 Impact Analysis

Approach and Methodology. This analysis addresses the potential for the County's discretionary well permitting program to result in short- and long-term adverse impacts on agricultural resources, specifically whether the program policies would result directly or indirectly in conversion of agricultural lands to non-agricultural uses.

Existing conditions as of October 2016 are the baseline against which the significance of the program's potential impacts on agricultural land are evaluated – the reasonably foreseeable impacts of program implementation are compared with the existing environment. The Farmland Mapping and Monitoring Program's (FMMP) most recent available census of agricultural land use is 2016, so that year is used as the baseline for this analysis.

Because the construction and operation of wells is within the scope of agricultural activities that are permitted on agricultural-zoned properties and do not, by themselves, constitute a change in how a property is used, this analysis focuses on potential indirect impacts that could occur from permitting new wells under the Ordinance that could support the conversion of rangeland to cultivated agricultural use, and on the potential effects of regulating wells found by the County to be operated unsustainably for existing agricultural use.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and			X	

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Monitoring Program of the California Resources Agency, to non-agricultural use?				
Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?			X	

Impact AGR-1: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use (Less than Significant Impact)

Implementation of the program is not a typical development project in that it would not result in direct physical changes to the environment with the potential to convert farmland to non-agricultural use. The construction and operation of wells is an agricultural activity within the scope of permitted uses in agriculturally-zoned areas. The program would not directly change existing agricultural uses in the County.

The program may indirectly affect the use and availability of groundwater for future agricultural use by imposing permit conditions that limit the amount of groundwater that may be extracted from a new well or by denying a permit for a new well. Under the program, applications for new groundwater wells are reviewed to determine if an applicant has provided substantial evidence that the new well would not extract groundwater unsustainably. If an applicant cannot demonstrate this, the permit may be denied, or permit conditions may be imposed that limit the amount of groundwater that may be withdrawn. Any related proposed changes to agriculture dependent on the new well would not occur or may need to be scaled back. For example, an applicant may not be able to change as much acreage from pasture land or rangeland to nut orchard as planned. The potential effects associated with this program would involve changes in the type of agricultural use, not the conversion of agricultural land to non-agricultural use. In addition, the implementation of regulatory restrictions on a project for protecting natural resources is not considered an impact under CEQA.

Under some circumstances, this program could, indirectly, result in the loss of productive use of Prime Farmland and farmland of statewide or local importance if the county regulates an existing well after GSPs are adopted. Where the current level of groundwater withdrawal from existing wells is determined by the county to be unsustainable, in violation of the Ordinance, the level of groundwater withdrawal could be required to be reduced.[107] This reduction could result in a change in the current agricultural use of farmland. This change could convert irrigated cropland to non-irrigated crops or rangeland, or may result in the land

[107] Regulation of groundwater extraction after GSPs are adopted is required to be implemented by GSAs, and the State is expected to intervene in cases where GSAs do not uphold their responsibilities. As such, the county's regulation of such wells is secondary, and would occur only if a GSA fails to implement its mandated requirements for regulation under the SGMA. This is considered unlikely.

lying fallow. These potential indirect effects would involve changes in the type of agricultural use, not the conversion of agricultural land to non-agricultural use.

However, potential indirect effects on current and planned agricultural uses may also cause some agricultural operations to be unable to change with market demands and no longer be economically viable. Under these circumstances, the current agricultural use may be suspended, with the field allowed to lie fallow. If the conditions remained unchanged, there could be increased economic pressure to sell the land for non-agricultural use. If any of these affected farmlands are Prime Farmland or farmland of statewide or local importance, the indirect impacts under these limited circumstances would be potentially significant. The state and county currently mitigate these pressures through implementation of the Williamson Act that allows taxation at lower rates for operations that commit that their farmland will remain in agricultural use for 10 years. The General Plan Agricultural Element includes several tools for the county to use to promote the preservation of productive farmland. Because these indirect effects would be limited to areas of unsustainable groundwater extraction, the fact that county intervention in ongoing groundwater extraction is unlikely, the unknown effect of market forces, and existence of other state and county actions to limit the conversion of agricultural land, this impact would be less than significant.

Impact AGR-2: Involve other changes in the existing environment that, because of their location or nature, could result in the conversion of farmland to non-agricultural use (Less than Significant Impact)

Implementation of the program is not a typical development project in that it would not result in direct physical changes to the environment with the potential to affect agricultural resources. The program would not directly change the existing environment in the County relative to agricultural resources.

The program may indirectly affect the use and availability of groundwater for current and future planned agricultural uses under limited circumstances in limited areas. As a result, some agricultural operations unable to change with market demands may no longer be economically viable. Under these limited circumstances, the current agricultural use may be suspended, with the field allowed to lie fallow. If the conditions remained unchanged, there could be increased economic pressure to sell the land for development of non-agricultural uses. Because these indirect effects would be limited to areas of unsustainable groundwater extraction, the fact that County intervention in ongoing groundwater extraction is unlikely, the unknown effect of market forces, and the existence of other state and County actions to limit the conversion of agricultural land, this impact would be less than significant.

4.2 Air Quality

4.2.1 Introduction

This section discusses the impacts of the program on air quality. Operation of permitted wells and their associated infrastructure could increase concentrations of air pollutants. New wells for which discretionary permits are issued would be developed in unincorporated parts of the county, mainly in agricultural settings, and likely away from population centers. Assuming that operation would generally be limited to the typical period of irrigation (from March through October) and would most often involve electrical pumps, these potential emissions would be minimized. Issuing discretionary well permits could result in an increase in the conversion of rangeland to irrigated farmland. An increase in irrigated farmland could increase the level of air pollution, as a result of increased use of pump engines, boilers, vehicles, and orchard heaters, and from travel on unpaved roads.

4.2.2 Impact Analysis

Approach and Methodology. The impacts on air quality are examined at a general level in this analysis because the number of discretionary well permits that will be issued, their locations, and how many of the proposed wells will be used to convert new land to cultivated agricultural use is not known at this time. An increase in stationary agriculture-related emissions sources and vehicle traffic does not necessarily result in a significant impact on air quality. Program-related construction would have a less than significant impact if it complies with control measures outlined in Regulation VIII and generates less than the SJVAPCD threshold of 100 pounds per day of any criteria pollutant. New stationary sources of criteria pollutants would have less than significant impacts by complying with SJVAPCD Rule 2201 that provides mechanisms, including emission trade-offs, by which Authorities to Construct such sources may be granted, without interfering with the attainment or maintenance of Ambient Air Quality Standards and no net increase in emissions above specified thresholds from new and modified Stationary Sources of all nonattainment pollutants and their precursors. However, permits for stationary sources are not expected to be needed to operate wells.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Conflict with or obstruct implementation of the applicable air quality plan?			X	
Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?			X	

Impacts AQ-1: Conflict with or obstruct implementation of the applicable air quality plan (Less than Significant Impact)

Direct Effects During Construction. Well construction would involve exhaust emissions from construction equipment, motor vehicles traveling to and from the site, and fugitive dust generated by travel on unpaved roads. Given the short-term nature of construction-related activity, and assuming compliance with control measures outlined in Regulation VIII, construction emissions would fall below the SJVAPCD threshold of 100 pounds per day of any criteria pollutant. Emission estimates were calculated for reactive organic gas (ROG), nitrogen oxides (NO_x), CO, SO_2, PM_{10}, and $PM_{2.5}$ using the CalEEMod model, and are provided in Appendix E (Appendix E was created for a typical well drilling project in this region). These construction-related emissions would not likely affect implementation of an air quality plan, and direct impacts from well construction will be less than significant.

Direct Impacts During Well Operation. There would be no direct impacts to implementation of SJVAB air quality plans associated with the operations of wells permitted under the program, as discretionary permits would be issued for wells that would be constructed and operated in compliance with these plans. Operational emissions would be minimal since groundwater wells will mostly be operated on a limited schedule when irrigation is required (typically March through October), and pumps would generally be powered by electricity. Since all stationary air pollutant sources would be subject to SJVAPCD permit requirements, they can be presumed to have a less-than-significant impact on local pollutant concentrations. Moreover, few mobile source emissions are associated with wells, so emissions would be well below the thresholds of 10 tons per year for both ROG and NO_x. For these reasons, direct impacts from well operation would be less than significant.

Indirect Impacts. An increase in the number of discretionary well permits and a consequent increase in the conversion of rangeland to irrigated farmland could increase the level of air pollution, which could conflict with implementation of the AQMPs. Potential increases in PM_{10} as a result of increased cultivation would be reduced to less than significant levels by enforcing District Rule 4550. In 2004, the SJVAPCD adopted District Rule 4550 - Conservation Management Practices. The rule is designed to limit fugitive dust emissions from agricultural operations by implementing and documenting a plan (a Conservation Management Practice [CMP] Plan) to reduce dust and PM_{10} emissions from on-farm sources, such as unpaved roads and equipment yards, land preparation, harvest activities, and other agricultural practices. Farmers with 100 acres or more of contiguous farmland, including fallowed land, are required to prepare and implement a CMP Plan for each crop they farm. The CMP plan provides several options for PM_{10} emissions reduction. Most of these include basic good farming practices that are commonly in use, such as speed reductions on unpaved roads and yards, night harvesting, and reducing agricultural chemical applications through use of integrated pest management.[108] Compliance with SJVAPCD Rule 2201 for new and existing stationary sources, such as diesel pumps for new wells if required, also would reduce the effects of these sources. With implementation of these requirements, indirect impacts will be less than significant.

[108] SJVAPCD, 2016h. Compliance Assistance Bulletin. Conservation Management Practice Plans, Frequently Asked Questions. February 2016.

Impact AQ-2: Violate any air quality standard or contribute substantially to an existing or projected air quality violation (Less than Significant Impact)

Direct Impacts During Construction. Well construction would involve exhaust emissions from construction equipment, motor vehicles traveling to and from the site, and fugitive dust generated by travel on unpaved roads. Given the short-term nature of construction-related activity, and assuming compliance with control measures outlined in Regulation VIII, construction emissions would fall below the SJVAPCD threshold of 100 pounds per day of any criteria pollutant. These construction-related emissions would not likely contribute to a violation of any air quality standard, and impacts would be less than significant.

Direct Impacts During Operation. Operation of permitted wells and their associated infrastructure could increase concentrations of air pollutants. Operation would generally be limited to the typical period of irrigation for most wells (from March through October) and would most often involve electrical pumps. Few mobile emission sources are associated with well operation, and any stationary sources would be subject to SJVAPCD permit requirements. For these reasons, potential emissions would be less than significant.

Indirect Impacts. Some irrigation wells for which discretionary permits could be issued would be used to facilitate new agricultural cultivation in areas that were previously uncultivated. Increased farm operations could increase the level of air pollution in the SJVAB as a result of increased use of farm equipment. The SJVAPCD requires agricultural operations to comply with a variety of regulations designed to limit fugitive dust from crop cultivation and exhaust emissions from agricultural equipment. Future agricultural operations in the SJVAB would be subject to these requirements, which would minimize the contribution of new agricultural operations to a violation of air quality standards. Potential increases in PM_{10} as a result of increased cultivation would be less than significant levels by enforcing District Rule 4550, as described under Impact AQ-1.

The requirements of Rule 4103 – Open Burning – amended to address the agricultural burn permit prohibitions on weed abatement burning – would mitigate the contribution of additional agricultural impacts to pollutants during weed control burning to a less than significant level. As of June 1, 2005, the rule includes provisions that weed abatement burning along fencerows and berms and on pastures and open lands is not permitted and places restrictions on burning in other areas. The restrictions often require examining other weed control methods as an alternative to burning before a permit would be issued.[109]

The EPA provided funding to the SJVAPCD for testing and demonstration of early stage air pollution reduction technologies. To reduce the magnitude of adverse impacts, the County should require implementation of these technologies, as they become available, to further reduce the contribution of agricultural activities to air emissions. Some of these technologies include a plug-in, hybrid, wheel loader; a zero-emissions yard tractor; a plug-in, electric, hybrid, propane, utility work-truck designed to reduce NOx and greenhouse gas emissions, and provide fuel savings; and an electric, autonomous, agricultural, spray vehicle that is expected to reduce emissions from the numerous agricultural tractors in the San Joaquin Valley. Solar agriculture irrigation pumps would be tested as an alternative option for remote diesel-powered agricultural irrigation

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[109] SJVAPCD, 2006-2012a. Pilot Program for the Real-Time Air Advisory Network (RAAN), Weed Abatement Burning. http://valleyair.org/BurnPrograms/Weed_Abatement_Burning.htm. Accessed November 2017.

pumping systems. A mobile air-curtain burner, tested as a low-emissions alternative to open burning for paper raisin trays during grape harvest, has already been shown to significantly reduce visible smoke and particulate matter emissions compared to open burning.[110]

Impact AQ-3: Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (Less than Significant Impact)

Increased air emissions would result from a potential increase in the number of wells that are constructed and operated, the conversion of rangeland to cultivated farm operations, and the consequent increase in the amount of equipment and travel generating emission as an indirect consequence of implementation of the permitting program.

The sources of air pollution from agriculture include tractors, irrigation pump engines, boilers, vehicles, and orchard heaters, and from travel on unpaved roads, weed burning, and work trucks. The SJVAB exceeds both the federal annual and 24-hour PM_{10} standards for ambient air quality. According to air quality monitoring data, exceedances of the 24-hour standard are generally seasonal and occur during fall and winter months – outside of the cultivation season. The greater the increase in discretionary well permits and irrigated farmland, the greater the potential for conflict with AQMPs and the potential contribution of farmland to PM_{10} emissions in excess of the federal and state standards and in a cumulatively considerable net increase in this criteria pollutant. However, the number of additional wells permitted is under the program is expected to be relatively modest, as discussed in Section 4.1.

Cumulative increases of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard would be less than significant, as outlined under Impact AQ-1 and Impact AQ-2.

4.3 Biological Resources

4.3.1 Introduction

This section discusses the impacts of the discretionary well permitting program with respect to biological resources. It lists the thresholds of significance that form the basis of the environmental analysis, lists the major sources used in the analysis, and assesses whether issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance would cause significant impacts to biological resources. The text addresses the approach and methodology; the individual impacts relative to the thresholds of significance; mitigation measures to minimize, avoid, rectify, reduce, eliminate, or compensate for significant impacts; and the overall significance of the impact with mitigation incorporated.

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[110] U.S. Environmental Protection Agency, 2017. Clean Air Technology Initiative Projects. https://www.epa.gov/cati/clean-air-technology-initiative-projects. Accessed November 2017.

4.3.2 Impact Analysis

Major sources of information used in the impacts analysis include:

- California Natural Diversity Database;[111]
- CNPS Inventory of Rare and Endangered Plants;[112]
- USFWS Species List for Stanislaus County;[113]
- USFWS Critical Habitat Maps;[114]
- California Wildlife Habitat Relationships;[115]
- National Wetland Inventory;[116]
- Preliminary mapping data for GDEs;[117]
- Vegetation Classification and Mapping Program;[118]
- USGS GAP Land Cover Data;[119]
- Vernal Pool Distribution-California's Great Valley-2012;[120] and
- Stanislaus County General Plan and General Plan Environmental Impact Report.[121,122]

Approach and Methodology. Because the program being evaluated does not, in itself, propose any site-specific development activities, this analysis focuses on potential, reasonably foreseeable impacts of future discretionary well permitting under the Ordinance, and subsequent well construction and operation. The indirect impacts of permitting wells that make it possible for rangeland to be converted to cultivated agricultural use are also evaluated. Biological resources impacts are discussed at a programmatic level. No specific level of future well permitting was forecast because the actual number of applications that will be received are not known. The hydrologic effects analysis discussed in Appendix D was completed based on the assumption that 10 wells would be permitted and constructed per year between 2018 and 2022. The

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[111] CDFW, 2017. California Natural Diversity Database, RareFind 5. Records search for Stanislaus County and surrounding quadrangles. Sacramento, CA. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed: November 15.

[112] CNPS, 2017. Inventory of Rare and Endangered Plants, 7th edition (v7-16 aug 8-16-17). Records search of Stanislaus County. Available at: http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi. Accessed: November 15.

[113] USFWS,.2017. Information for Planning and Consultation (IPaC). Records search for Stanislaus County. Available at: https://ecos.fws.gov/ipac/location/index. Accessed: November 15.

[114] USFWS, 2017. Environmental conservation Online System (ECOS). USFWS Threatened and Endangered Species Active Critical Habitat Report. Online mapper. Available at: https://ecos.fws.gov/ecp/report/table/critical-habitat.html. Accessed November 20.

[115] CDFW, 2017. California Wildlife Habitat Relationships System. A Guide to Wildlife Habitats of California (1988). Available at: https://www.wildlife.ca.gov/Data/CWHR/Wildlife-Habitats. Accessed November.

[116] USFWS, 2017. National Wetland Inventory Mapper. Available at: https://www.fws.gov/wetlands/Data/Mapper.html. Accessed November 22.

[117] The Nature Conservancy, 2017. Preliminary mapped groundwater dependent ecosystems database. Unpublished.

[118]CDFW, 2017. Vegetation Classification and Mapping Program (VegCAMP). Available at: https://www.wildlife.ca.gov/Data/VegCAMP. Accessed November.

[119] USGS, 2017. Land Cover Data and Modeling, GAP Land Cover Data. Available at: https://gapanalysis.usgs.gov/gaplandcover/data/. Accessed November.

[120] CDFW, 2017. BIOS. Vernal Pool Distribution-California's Great Valley-2012. Available at: https://map.dfg.ca.gov/bios/?al=ds36. Accessed November 23.

[121] Stanislaus County, 2015. Stanislaus County General Plan. August 23.

[122] ICF International, 2016. Stanislaus County General Plan and Airport Land Use Compatibility Plan Update Final Program Environmental Impact Report. July.

locations and uses of these wells is not known (i.e., supplemental irrigation on existing agricultural land versus new irrigation needs due to land conversion to agricultural use). Consequently, this PEIR qualitatively assesses potential impacts on biological resources from implementation of the permitting program and subsequent well development and operation. This assessment is not site-specific, and no site-specific, species-specific, or habitat field surveys were done for this analysis. Desktop analysis, literature review, and environmental and planning documentation review were done using the sources listed. The Stanislaus County General Plan and associated environmental documentation were reviewed for baseline/current conditions and land use planning policies that apply to biological resources and future projects in the county. The major sources were reviewed for information on natural communities and special status species in Stanislaus County.

This assessment takes into consideration the current habitats in the study area and the potential for those habitats to be affected by actions that could directly or indirectly result from implementation of the proposed project. Impacts to special status species are analyzed based on potential effects to their habitats and based on impacts from project actions (such as direct injury, mortality, disturbance, etc.). The analysis of direct impacts addresses temporary and permanent impacts from well construction and operation, and the potential drawdown of groundwater from increased extraction. The analysis of indirect impacts addresses the potential increase in irrigated agriculture or conversion of rangeland (including grassland and shrub communities) to irrigated cropland, orchards, or vineyards by issuing new permits.

This PEIR includes proposed mitigation measures to reduce potential impacts on biological resources to a less-than-significant level. Project-specific analyses will further refine and identify appropriate mitigation measures necessary to reduce impacts. Project-specific biological resource impacts will be assessed in project-specific environmental documents that will be prepared during the discretionary well application and approval process. At that time, the precise magnitude and extent of impacts can be analyzed and will depend on the specific location, size, anticipated use, and site-specific factors that are currently undefined.

As stated previously in Sections 1.0 and 2.0, this analysis takes into consideration that the Ordinance and discretionary well permitting program are intended to minimize or prevent adverse environmental effects associated with the unsustainable development of groundwater resources, and that implementation of the permitting program is expected to decrease potential impacts related to groundwater withdrawal by permitted wells. The Ordinance has been deliberately aligned with the requirements of the SGMA, including the avoidance and amelioration of "undesirable results," which are in turn directly related to the threshold questions for impact significance examined in this impact analysis. The discretionary well permitting program adopted by the county to implement the Ordinance includes triggers, requirements, and permit conditions that are specifically designed to prevent potential "undesirable results," recognizing that in 2020 or 2022 (depending on the groundwater subbasin), GSPs are required to be adopted that will further refine and potentially replace this framework, and provide the basis for long-term sustainable groundwater management by GSAs in compliance with the SGMA. As such, the well permitting program that is being evaluated herein is intended to bridge the gap between the present and 2020 or 2022, when GSPs will be adopted.

The terms of groundwater extraction permits issued under the county's discretionary well permitting program are initially limited to the dates that GSPs must be adopted, and thereafter are renewed for 5-year terms that coincide with the regulatory cycle for GSP updates. It is recognized that in order to prepare and update the required GSPs, detailed studies will be conducted throughout each of the subbasins in the county in order to establish management thresholds, measurable objectives, milestones and monitoring programs that meet state requirements for sustainable groundwater management under the SGMA. These studies are expected to provide information and insight beyond that available at this time, and refine, update, and potentially replace the thresholds and requirements currently embodied in the county's discretionary well permitting program. After GSPs are adopted, GSAs will be responsible for their implementation and enforcement, with specific requirements for future "undesirable results" to be avoided, and any existing "undesirable results" to be ameliorated by 2042 in accordance with identified milestones. If GSAs fail to adopt adequate GSPs, or fail to adequately implement them, the SGMA requires that the state intervene to assure that the required sustainability goals are met. The Ordinance allows the county to intervene and regulate unsustainable extraction prior to state intervention, thus providing an additional safeguard against unsustainable groundwater extraction; however, as explained previously, this is considered unlikely to be needed.

The county's discretionary well permitting program includes the following application requirements, thresholds, and permit requirements (Appendix B), which are considered in the analysis of effects and referred to in the biological resources impacts analysis. Requirements most pertinent to biological resources, and the rationale for them are as follows:

- **Surface Water Protection Zones:** The county has established surface water protection zones within which studies of surface-groundwater interaction are required prior to construction of a discretionary well. If the project includes a new well that extracts groundwater from the upper 200 feet of the aquifer system and is within 1 mile of a groundwater-connected stream or reservoir or that extracts groundwater from below the upper 200 feet of the aquifer system and is within 2,500 feet of a groundwater-connected stream or reservoir, a Groundwater-Surface Water Interaction Study must be done to demonstrate that the proposed extraction will not have significant and unreasonable adverse impacts on the beneficial uses of surface water. If a potential for significant impacts is identified, the Study must present recommendations for measures that will decrease these impacts to a less than significant level, and the applicant must accept these recommendations as mitigation for the project as part of the project-specific CEQA review process. Examples of mitigation options that may be considered include distance setbacks, well depth and construction requirements, seasonal restrictions or limits on withdrawal, enhanced recharge programs, groundwater offsets, mitigation fees, or other measures.

  Rationale: The above setback distances and well depths were determined through a groundwater modeling study that demonstrate streamflow depletion effects from a reasonable maximum number of wells constructed at the above depths and distances prior to 2022 would not result in measurable effects on streamflow. Note that minimum flows for special status aquatic species in the rivers within the county are mandated to be maintained through water releases from the reservoirs along these rivers. More detailed studies are expected to be conducted and incorporated into GSPs in 2020 and 2022, and may result in adjustment of the permitting program requirements or permit conditions when permit terms for groundwater extraction permits are renewed.

- **GDE Protection:** The county requires the following special studies to identify and assure protection of GDEs that are hydraulically connected to the aquifer system that will be pumped by a proposed well. First, the applicant must conduct an evaluation of the groundwater distance-drawdown relationship in the regional pumped aquifer surrounding the proposed well over the lifetime of the well, generally assumed to be 20 to 30 years. The analysis must identify the distance from the proposed well to the predicted ½-foot drawdown contour at the time when GSPs are scheduled to be adopted in the subbasin in which the well is located (either 2020 or 2022). Second, a desktop study must be conducted to determine whether any GDEs that may be hydraulically connected to the pumped aquifer occur within the predicted ½ -foot drawdown contour, or within 3 miles of the well, whichever is greater. Third, if the distance-drawdown analysis indicates that drawdown induced by the well may exceed ½ foot in the regional shallow aquifer beneath a GDE that may be hydraulically connected to the pumped aquifer, a GDE Study must be prepared to investigate the effects of the proposed groundwater extraction on the GDE. If impacts to GDEs are found to be potentially significant, the Study must include recommendations that will decrease potential impacts to a less than significant level, and the applicant must accept these recommendations as mitigation during the project-specific CEQA review process. Examples of mitigation options that maybe considered include distance setbacks, well depth and construction requirements, seasonal restrictions or limits on withdrawal, surface water diversions, enhanced recharge projects, groundwater offsets, mitigation fees, or other measures.

  Rationale: The following rationale was applied by the county as a basis for selecting a threshold of ½ -foot of predicted drawdown in the pumped aquifer beneath a GDE as a protective standard:

  - The drawdown predictions on which the individual permit analyses will be based are within the pumped aquifer. The permitting program requires that a surface seal at 100 feet be constructed for all new discretionary wells; therefore, drawdown at the water table near GDEs will be significantly attenuated as it propagates upwards through the overlying soil column. This soil column typically includes lower-permeability sediments, especially near the surface beneath the GDE where fine-grained silts and clays accumulate in still water or through overbank deposition during flood events. This material will mute the drawdown effect that is experienced by the GDE.
  - Seasonal variation of groundwater levels in the shallow aquifer system in the central and western portions of the county, which are most sensitive to potential GDE impacts from groundwater pumping, typically ranges from 5 to 10 feet but can be as low as 2 feet or as high as 40 feet or more, depending on the location. A threshold of ½ -foot drawdown for GDE Studies represents less than one quarter of the seasonal groundwater level changes, and would be indistinguishable from natural variations in groundwater levels.

- With the exception of deep-rooted phreatophyte woodlands (such as oak woodlands), GDEs in Stanislaus County occur where the water table is close to the ground surface. For groundwater that is hydraulically connected to the shallow regional aquifer system (i.e., that is not perched), this occurs only near the major rivers near the valley axis, within approximately 2 to 3 miles of the San Joaquin River. Proximity to the rivers assures that additional drawdown will induce recharge from surface water, decreasing or eliminating the drawdown effect from pumping (see map in Appendix D).

Based on the above information, the analysis of potential impacts to biological resources follows the following general steps:

- Potential direct adverse impacts to habitat and species at the ground surface from construction and operation of proposed wells on habitat and species are evaluated.
- Potential indirect adverse impacts to habitat and species at the ground surface that could arise from changes in property use or development made that is made possible by the well will be evaluated. This includes the conversion or rangeland to cultivated agricultural use, when it is made possible through the use of the water supplied by a proposed well.
- Potential impacts to aquatic habitat and GDEs, and the species they support, that result from the hydraulic effects of groundwater withdrawal from proposed wells will be evaluated primarily for the time period before GSPs are adopted (prior to 2020 or 2022). This analysis will consider the effectiveness of the triggers, requirements and permit conditions in the county's discretionary well permitting program to prevent or ameliorate potential significant impacts. After GSPs are adopted, it is assumed that implementation of the GSPs, and adoption of updated permit conditions when groundwater extraction permits are renewed, will be sufficient to protect aquatic habitat, GDEs and protected species from potential adverse impacts.
- The potential effects of regulating unsustainable wells, although unlikely to be implemented (unless GSAs fail to adopt adequate GSPs or fail to adequately implement them), is assumed to result in a net benefit to the environment and to result in less than significant impacts to biological resources.

Impacts and Mitigation Measures. Based on the findings of the Initial Study, topics in the table for which impacts were found to be potentially significant at the initial study level were carried forward for this PEIR. The thresholds of significance as stated in Appendix G of the State CEQA Guidelines were modified to address potential impacts to GDEs, as detailed in the table below.

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or		**X**		

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
regional plans, policies, or regulations, or by the California Department of Fish and Wildlife[123] or U.S. Fish and Wildlife Service?				
Have a substantial adverse effect on any riparian habitat, groundwater-dependent ecosystem, groundwater-connected stream or reservoir, or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		X		
Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		X		
Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?		X		

Impact BIO-1: Substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service (Less than Significant Impact with Mitigation Incorporated)

<u>Direct Impacts During Well Construction.</u> The construction of wells and associated infrastructure could result in the loss or disturbance of habitat, injury or mortality to special status species, and disruption of normal behaviors that could reduce reproductive output and overall survivorship. The study area contains the following sensitive natural communities that provide unique habitat for many endemic species, including special-status plants, birds, invertebrates, and amphibians: oak woodland, vernal pools (annual grassland/vernal pool complex), palustrine wetlands and riparian areas. These communities provide habitat for federal- and state-listed and special-status plant species including fleshy owl's clover, Hoover's spurge, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, and Greene's tuctoria in vernal pools; Delta button-celery in riparian habitat; and Tracy's eriastrum (*Eriastrum tracyi*) and Hartweg's golden sunburst (*Pseudobahia bahiifolia*) in oak woodland and valley and foothill grassland. Special-status wildlife that could

[123] Beginning January 1, 2013, the California Department of Fish and Game (CDFW) officially changed its name to California Department of Fish and Wildlife (CDFW). CEQA Guidelines in Appendix G, Environmental Checklist Form, has not been updated to reflect this name change.

be affected include Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, California tiger salamander, Swainson's hawk, and San Joaquin kit fox.

The specific effects on species and natural communities would depend on the size of the construction footprint and its location relative to sensitive natural communities, species' occurrences and species' use of and dependence on the site for foraging or breeding. Constructing new wells permitted under the Ordinance has the potential have significant impacts on special-status species or their habitats. The potential will be evaluated on a site-specific basis as specified in Mitigation Measure BIO-1a prior to approving any discretionary well permits, and project-specific impacts to special status species from ground disturbance and construction activities will be mitigated to a less-than-significant level. Potential impacts to raptors and bird species regulated under the Migratory Bird Treaty Act (MBTA) will be mitigated to a less than significant level by implementation Mitigation Measure BIO-1b through work scheduling, nesting surveys, and implementation of necessary consultation and project-specific mitigation.

<u>Direct Impacts During Well Operation.</u> Well surface completions will occupy a relatively small, set area, and surface operating activities will be limited to periodic pump maintenance and occasional well rehabilitation. These activities will be limited to the area near the wellhead and are unlikely to affect special-status species or their habitats, even if they are located near a well. Temporary disturbance of foraging or dispersal patterns may occur due to increased activities and noise at the well site during maintenance activities, but are expected to be short-term and less than significant. So potential direct impacts to special-status species or their habitats from operating activities at the ground surface will have a less-than-significant impact.

Groundwater extraction from discretionary wells permitted under the Ordinance would result in groundwater level drawdown that could affect natural communities and the special status species that depend on them. Groundwater drawdown could result in decreased surface discharge to GDEs, including rivers, wetlands, and riparian communities, that could result in habitat degradation or damage. If these impacts occur, they could be significant if not mitigated.

Based on the results of the conceptual hydrologic effects analysis (see Chapter 3 and Appendix D), potential effects will differ between the eastern and western portions of the county.

The eastern foothills are predicted to experience the greatest drawdown from the permitting of new wells under the program. Upland creeks and GDEs in this area are associated with perched aquifers, are underlain by compact, indurated and relatively low permeability duripans (hard, cemented soils) and paleosols (ancient buried soils), and are not hydrologically connected with the regional pumped water supply aquifers. These creeks and GDEs in the eastern foothills, and the special-status species that may inhabit them, are not reasonably expected to be affected by pumping from new wells in this area.

The Stanislaus and Tuolumne Rivers in the eastern region of the county are incised beneath the surrounding upland areas and are connected to the regional shallow aquifer system. Flow depletion in these riverine systems would be limited by managed reservoir releases and flow mandates. The Stanislaus, Tuolumne, and San Joaquin Rivers are federally-listed critical habitat for steelhead; as a requirement of Federal Energy Regulatory Commission (FERC) licensing, surface flows are managed to protect aquatic habitat and fisheries, particularly runs of Chinook salmon and steelhead. Drawdown in wetland areas adjacent to these rivers (riparian corridor and freshwater marsh) would be limited by the managed reservoir releases; river flows would recharge groundwater losses in these habitats. In addition, the county has established Surface Water Protection Zones under the discretionary well permitting program around groundwater-connected streams, rivers, and lakes in the county where new groundwater pumping could have a potentially measurable effect on surface water. The well permitting program requires that a Surface-Groundwater Interaction Study be performed for any new wells proposed in a Surface Water Protection Zone, and mitigation recommendations be adopted as needed to prevent the proposed groundwater extraction from having a potentially significant effect on surface water resources and aquatic habitat. Based on the above information, groundwater withdrawal from permitted wells and the resultant expected groundwater drawdown would have less-than-significant impacts on fisheries, riparian vegetation, and the special-status species dependent on riverine systems, riparian corridors, and associated reservoirs.

Groundwater drawdown is not expected to affect vernal pools and the special-status species that inhabit these systems. Vernal pools are surface depressions underlain by low permeability substrate, perched above the aquifer; they are not connected to regional groundwater aquifers, and would experience less-than-significant impacts from groundwater drawdowns.

Computer modeling was conducted to assess the potential regional and programmatic effects of the discretionary well permitting program, and is discussed in Appendix D. The number of wells that will be permitted under the county's discretionary well permitting program, their locations, uses, and pumping rates are not known at this time. The modeling was conducted based on an assumed 10 wells being permitted under the program each year from 2018 to 2022, to provide perspective on the general extent and amount of drawdown that could conceivably occur as a result of implementing the program. The modeling indicates that drawdown between 1 and 2 feet may occur by 2022 in the shallow (upper pumped) aquifer system in some areas of the central and western portions of the county, that could overlay GDEs (see Figures 6-7 and 6-9 in Appendix D). The areas where drawdown is predicted to exceed 1 foot are projected to increase somewhat in size by 2042. It should be noted that the wells producing the drawdown will draw water from the aquifer at depths of at least 100 feet or more below ground level, and the upper aquifer system is modeled as a single layer; therefore, the actual drawdown that could be experienced by GDEs at the ground surface is expected to attenuate through the sediments overlying the pumped aquifer and be less than predicted. Conversely, since the locations of the actual wells that will be permitted are not known, and the model used in the drawdown predications is regional in nature, local drawdown near a new well could be greater than predicted. Wetlands associated with the major rivers would likely have minimal impacts because they would be expected to derive much of their water needs from surface water sources, and mandated surface water flows would offset groundwater drawdown. Wetlands that may be sensitive to groundwater drawdown would be those that may occur in the central and western portions of the county that have limited surface water inputs. A comprehensive identification and analysis of GDEs and their respective water budgets is beyond the scope of this PEIR.

The amount of drawdown predicted by the modeling analysis is less than or at the lower end of the range of typical seasonal groundwater level fluctuations in the shallow aquifer in the area, which range from approximately 2 to 40 feet of fluctuation. As stated above, areas of greatest predicted drawdown are in the eastern portion of the county, where upland creeks and GDEs are not hydrologically connected with the regional pumped water supply aquifers. Drawdown between 1 and 2 feet at the central and western portions is less than or at the lower range of seasonal fluctuation. Risk assessment guidelines for GDEs developed by the State of New South Wales in Australia characterize impact risks associated with drawdowns that are less than seasonal fluctuations as low.[124] Permits issued under the county's discretionary well permitting program would expire with the adoption of GSPs (by the year 2020 or 2022), which will provide additional studies that will be used to reassess drawdown thresholds and ensure prevention of "undesirable results."

The possibility and extent of drawdown effects on wetland GDEs in the central and western portions of the county will depend on the actual location and construction details of the wells, well operating schedules, local aquifer and shallow soil conditions, and the location and nature of the GDEs. The ecological water requirements and thresholds of response to changes in groundwater levels differ among GDEs. Deep-rooted obligate phreatophytes such as oak trees, are not expected to be significantly affected by the predicted amount and rate of drawdown, which is within the range of natural groundwater level fluctuations and would occur over a period of years. The gradual change would allow the root systems to adapt. Similarly, the effect of the predicted amount of drawdown on riparian woodlands and wetlands that have significant surface water inflows from area streams, canals and drains is expected to be less than significant. However, it is possible that some wetlands that are highly groundwater dependent and contain sensitive communities in the central and western portions of the county could be adversely affected by the predicted amount of drawdown. These include seeps, springs, and palustrine or emergent wetlands that may occur beyond the influence of recharge from surface water, at the outer edges of the floodplain and within a few miles of the rivers near the valley axis.

The ability of such GDEs to adapt or recover from groundwater declines depends largely on the degree to which the GDE is dependent on groundwater and the overall water budget. The degree of interaction between wetlands and groundwater can vary greatly and depends on many factors including their position in the landscape, the permeability of the substrate, depth to water table, and seasonal fluctuations in inputs. GDEs develop in response to unique timing, duration, frequency and chemistry of water inputs. Major changes in wetland hydrology would be expected to significantly affect ecological function. However, minor changes in hydrology may result in little to no change in the ecological function of wetlands, depending on baseline conditions and whether those changes are short or long-term and offset by seasonal recharge of the aquifer or surface inputs.

The condition and species composition of wetland vegetation can serve as an early warning indicator of water stress. A compilation of studies conducted by The Nature Conservancy that examined plant response of 17 herbaceous wetland indicator species (11 common and 6 rare) to groundwater drawdown, indicated gradual loss of indicator species starting with as little as 0.66 feet (0.2 meter) drawdown, with a median of 2.99 feet (0.91 meter), and complete loss at 6.23 feet (1.9 meter).[125] A study of the effects of regulatory drawdown

[124] NSW Department of Primary Industries. 2012. Risk Assessment Guidelines for Groundwater Dependent Ecosystems, Volume 1 – The Conceptual Framework. May.

[125] Gerla, P.A. et al. 2015. Environmental Flows and Levels for Groundwater-Dependent Swale Wetlands of the Sheyenne National Grasslands, North Dakota. The Nature Conservancy and the USDA Forest Service. Portland, Oregon.

thresholds on inundation area and plant community composition in southeast Australia, suggest that drawdowns from 0.82 feet (0.25 meter) to 0.98 feet (0.3 meter) represent a threshold where community composition is likely to change. The study setting was a regional unconfined aquifer with shallow groundwater levels and wetlands dependent on groundwater discharge, and included wetlands considered sensitive to even small declines in groundwater level. Thresholds were assigned based on ecological value, with higher functioning wetlands sensitive to changes assigned a threshold of up to 0.82 feet (0.25 meter) of acceptable drawdown over the course of 5 years; regional triggers were set at 1.64 feet (0.50 meter) over 5 years. [126] Drawdown in shallow groundwater systems may alter community composition by increasing cover of exotic and terrestrial species, and increasing soil salinity from evapotranspiration; drawdown in deeper water systems may result in community change with conditions supporting greater cover of sedge species.

Based on the above information, the likelihood that additional wells and groundwater extraction permitted under the county's discretionary well permitting program could have adverse effects on GDEs in the central and western portions of the county is considered relatively low; however, the possibility of significant adverse impacts cannot be ruled out at the program level. Evaluation of the nature and location of GDEs that could be impacted is beyond the scope of this programmatic study, and the locations and nature of wells that will be permitted is not known at this time. For this reason, special-status species that depend on GDEs could be affected and these impacts could be potentially significant if not mitigated. However, the county's discretionary well permitting program includes thresholds, requirements, and permit conditions to prevent these impacts. Specifically, the drawdown associated with a proposed well is required to be evaluated and compared to the results of a desktop study to identify the locations of GDEs that have a potential to be hydraulically connected to the pumped aquifer system. If the predicted drawdown in the pumped aquifer system exceeds ½ foot beneath a GDE that may be hydraulically connected to the pumped aquifer, a GDE Impact Study is required. If a potential for significant impacts is identified, then recommendations must be adopted that will mitigate the impact to a less than significant level. This measure, which is described in detail in the introduction of the impact analysis approach to this section, is expected to reduce the impacts from a proposed new well to GDEs that are sensitive to groundwater level changes to a less than significant level.

It is also possible that the drawdown induced by operating a proposed new well could add incrementally to an adverse stress that has already occurred at a GDE. Because evaluation of the nature, condition, and location of GDEs that could be impacted is beyond the scope of this programmatic study, and the locations and nature of wells that will be permitted is not known at this time, the baseline stress condition of GDEs that may be sensitive to groundwater level changes induced by well pumping, if they exist in the area, is not known. However, as discussed above, the likelihood of adverse drawdown impacts is relatively low and will be further mitigated through the implementation of the GDE protection measures that are included in the county's discretionary well permitting program. In addition, the period over which impacts could occur is relatively short (2018 through 2020 in critically overdrafted basins, and 2018 through 2022 in other basins).

[126] Deane, D.C. et al. 2017. "Predicted risks of groundwater decline in seasonal wetland plant communities depend on basin morphology." Wetlands Ecology and Management. September 25.

After GSPs are adopted, further adverse impacts are required to be prevented, and adverse effects that exist as of a 2015 baseline are required to be reversed. For these reasons, impacts will be less than significant.

<u>Indirect Impacts.</u> Indirect impacts may occur from operation of new discretionary wells permitted under the Ordinance and result in conversion of rangeland, including grassland and shrub communities, to irrigated farmland. These indirect impacts could include the degradation, modification or damage of sensitive habitats by grading, plowing or planting, or by the installation of irrigation pipelines and access roads. Such impacts would only occur in areas that are currently occupied by uncultivated rangeland. This would include the annual grassland/vernal pool complex and could include oak woodlands and palustrine wetlands. The conversion of vegetation communities and land cover that provide habitat for special-status species could have negative impacts on these species by removal of habitat and disruption of normal behavior (foraging, rest and breeding) and movement (migration and dispersal) patterns. The study area has a variety of special-status plants and wildlife that could be affected, as listed in Table 3-5 of Chapter 3. The specific effects on species and their habitats would depend on the size of the construction footprint and its location relative to the plant population or species' foraging or breeding area, and the type of habitat modification (land conversion).

If new wells are used to irrigate crops on parcels already irrigated and cultivated, the effects would differ depending on how the property is used and the crop cover prior to construction of the new well. Some species adapt to, depend on, and forage in agricultural land. Irrigated crops provide an important food source for wintering and migrating birds and waterfowl. If the well permitting program facilitates conversion of rangeland and irrigated pasture to cultivated land (such as orchards or vineyards), important foraging and resting grounds for migrating birds and waterfowl would be lost. This would be a potentially significant impact on these species. If the new well results in no change in the type of agricultural use (i.e., if irrigation of cultivated crops is already taking place) or conversion, then there would be no impact on sensitive species or habitat.

Land conversion from rangeland to cultivated crops could negatively affect the San Joaquin kit fox. Suitable habitat for the fox is at the eastern portion of the county, in the study area where well permitting and land conversion has the most potential to occur. USFWS records show the current range of this species, in the study area, is the San Joaquin valley and Sierra Nevada foothills, with CDFW (CNDDB) records of occurrences in the study area at the east end of the county near the Tuolumne River, with potential core breeding areas identified along the San Joaquin and Stanislaus Rivers.[127,128] The San Joaquin kit fox occupies grassland and scrub habitats and occasionally forages in agricultural lands, but, anthropogenic disturbances related to practices such as irrigation, chemical treatment, harvest, and control of vertebrate pests limit denning opportunities and prey availability. Recent studies indicate foxes have a limited capacity to use agricultural land. This presents a barrier to their movement and dispersal, isolating foxes and decreasing genetic exchange. Lack of dens in agricultural areas exposes foxes to increased predation when attempting to cross

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[127] Science and Collaboration for Connected Wildlands. 2014. San Joaquin Kit Fox Connectivity Modeling for the California Bay Area Linkage Network.

[128] CDFW. 2017. BIOs Viewer. San Joaquin kit fox occurrence records. Available at: https://map.dfg.ca.gov/bios/?al=ds85.

fields to access other more suitable habitat.[129] Habitat fragmentation, loss, and degradation are a threat to the fox. Pesticides and rodenticides are also a threat, either directly through exposure, or indirectly, by reducing prey.[130] Loss of grassland and scrub habitats to agricultural lands would have a potentially significant impact on the San Joaquin kit fox that already faces habitat fragmentation throughout its range.

The conversion of rangeland or fallow fields to orchards or vineyards will also have an indirect effect on Swainson's Hawk, by decreasing the value of those areas as forage habitat. Rangeland and fallow fields provide much higher value foraging habitat than orchards, which have low prey density and vegetation structure that interferes with the ability to swoop on prey. Land conversion would not be considered "urban development" as specified in the CDFW guidance document for Swainson's Hawk mitigation,[131] and agricultural conversion would maintain a site use as agricultural in nature and would not include or support urban development. Nevertheless, studies have shown that the Swainson's Hawk is sensitive to fragmented landscapes. Forage habitat use will decline as suitable patch size decreases. Foraging ranges of Central Valley Swainson's Hawk can extend out from 830 to over 21,000 acres, and the effects are diminished when the area being converted represents a small patch that is isolated from much larger areas available for foraging in the general vicinity.

Species endemic to vernal pools could be impacted by loss of habitat from conversion of annual grassland/vernal pool complex to agricultural uses. This includes federally-threatened vernal pool fairy shrimp, federally endangered Conservancy fairy shrimp, and federally endangered vernal pool tadpole shrimp, and special status plants listed in Table 3-5.

It is not known where new discretionary wells that would result in conversion of rangeland to irrigated farmland possible will be located, so the indirect impacts associated with these wells cannot be adequately evaluated. Constructing and operating new wells, permitted under the Ordinance, in undeveloped rangeland portions of the county has the potential cause significant indirect impacts to sensitive species and habitats.

New well permit applications will be reviewed on a site-specific basis as specified in Mitigation Measure BIO-1a. This will assess habitat suitability for special status species and consider project-specific mitigations, as needed. Mitigation Measure BIO-1b will assure that construction work is conducted during the non-breeding season of MTBA-regulated birds and raptors, such as the Swainson's Hawk, or that nesting sites are not disturbed. Federal and state laws for the protection of species and habitats are detailed in Chapter 3. County protections are in place for sensitive species and habitats to avoid and minimize impacts. The Stanislaus County General Plan contains land use planning policies to protect sensitive species and habitats. The County's discretionary well permitting program includes application requirements and thresholds to prevent impacts.

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[129] Cypher, B.L. et al. 2005. *Foxes in Farmland: Recovery of the Endangered San Joaquin Kit Fox on Private Lands in California*. Prepared for the National Fish and Wildlife Foundation. June 27.

[130] USFWS. 1998. *Recovery Plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pages.

[131] CDFW. 1994. Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California.

Finally, rangeland conversion will result in the loss of some foraging habitat for raptors such as the Swainson's Hawk, and will potentially contribute to fragmentation of habitat for the San Joaquin kit fox. However, the amount of rangeland that can be converted by the permitting of wells between 2018 and 2022 will be limited by the limited availability of groundwater in the eastern portion of the county, where the majority of agricultural conversion would occur. Based on information provided by the Stanislaus County Agricultural Commissioner, since 2015, the pace of rangeland conversion has slowed to less than 500 acres per year across eastern Stanislaus County. Groundwater modeling discussed in Appendix D suggests that the amount of agricultural conversion that can be supported in the eastern portion of the county will be self-limiting based on potential drawdown impacts, and is likely in the range of a few hundred acres per year. If the rate of agricultural conversion were to continue at the current rate, less than approximately 1 percent of additional available rangeland in the eastern portion of the county could be converted by 2022, with the areas converted being distributed at various locations throughout the eastern county. It is unlikely that this amount of agricultural conversion would represent a significant loss of available foraging habitat or fragmentation of habitat.

Based on the above findings, with implementation of the mitigation measures described below, impacts would be less than significant.

Mitigation Measure BIO-1a. A qualified biologist shall investigate the potential presence or absence of sensitive habitats and wetlands, and special-status plants or wildlife in areas that will be disturbed by well construction or conversion of rangelands to cultivated use that is made possible by the well, prior to well permit approval or project implementation. Documentation could involve any of these tasks:

- Desktop review of existing site records through the county records and general plan, CNDDB, CNPS inventory, environmental documents and surveys to determine likelihood of occurrence near (within ½ mile) the well site, any rangeland converted to cultivated agricultural use that is supplied by the well, and any related construction areas.
- Conduct field reconnaissance. A field reconnaissance survey shall be conducted, including a habitat assessment to determine whether suitable conditions exist for special-status species.
- Determine the need for additional species-specific surveys or wetland delineation. If warranted, coordinate with appropriate agencies (USFWS, CDFW, or USACE) as may be necessary to determine appropriate survey timing and effort.
- Coordinate with appropriate agencies and the County as may be necessary based on the results of additional species-specific surveys or wetland delineation, to identify and implement mitigation measures as necessary to avoid, minimize, or otherwise mitigate potential impacts to special-status species, wetlands or other habitat to a less-than-significant level.

Mitigation Measure BIO-1b. The applicant shall endeavor to conduct any drilling, construction work and/or ground-disturbing activities associated with installation of the proposed well or the conversion of rangeland to cultivated agricultural use that will be irrigated using the well during the non-breeding season of any birds and raptors protected under the Migratory Bird Treaty Act (generally September 16 through January 31). If construction activities must be scheduled during the nesting season (generally

February 1 to September 15), pre-construction surveys for raptors, migratory birds, and special-status bird species shall be done by a qualified biologist to identify active nests near the site. This shall include a buffer extending out from the construction or disturbance area to a distance of approximately ½ mile. If active nests are found, no drilling construction activities shall occur within 500 feet of the nest until the young have fledged and the nest is no longer active (as determined by the qualified biologist). Survey timing and frequency requirements differ among species; species-specific surveys should follow all timing and frequency requirements of CDFW and USFWS. Consultation with the CDFW and/or USFWS shall occur if required, and may result in additional requirements.

Because this PEIR evaluates impacts at the programmatic level, all project circumstances are not foreseeable. The incorporation of these mitigation measures, applied to site-specific well application projects, for special-status species would avoid and minimize ground disturbance impacts to special-status species to a less-than-significant level. Impacts from ground disturbance are potentially significant without mitigation. Compliance with local, state, and federal regulations, and with the best management practices and conservation measures prescribed in site-specific resource survey reports and federal, state, and county permits, would reduce impacts. Impacts to species or habitat from land conversion will be reduced to less than significant through implementation of Mitigation Measure BIO-1a, which requires assessment of habitats or species that may be affected by land conversion, and coordination with appropriate agencies and implementation of mitigation, as necessary. The application requirements, thresholds, and conditional requirement for a Surface-Groundwater Interaction Study and a GDE Impact Study would reduce impacts to species that inhabit GDEs to less than significant.

Impact BIO-2: Substantial adverse effect on any riparian habitat, groundwater-dependent ecosystem, groundwater-connected stream or reservoir, or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service (Less than Significant Impact with Mitigation Incorporated)

<u>Direct Impacts During Well Construction.</u> The construction of wells and associated infrastructure could result in ground disturbance around the well site, causing temporary or permanent damage, modification, or removal of sensitive, natural communities in and adjacent to the construction site. The study area contains sensitive natural communities that could experience effects: oak woodland, vernal pools (annual grassland/vernal pool complex), palustrine wetlands, and riparian areas. The specific effects would depend on the size of the well (and associated infrastructure) footprint, and its location relative to sensitive natural communities. Potential direct impacts include disturbance, modification, damage or degradation from clearing, grading, drilling or other activities. Specifically, construction of well pads, access roads and power service connections, operation of drilling and other construction equipment, alteration of localized drainage patterns, or discharge of soil or other construction wastes all could degrade or damage existing sensitive habitats. Such impacts would be potentially significant if they are not mitigated. It is not known where discretionary wells permitted under the Ordinance would be, so the actual impacts of constructing these wells on sensitive habitats cannot be adequately evaluated. At a program level, it is concluded that constructing new wells permitted under the Ordinance has the potential to cause significant impacts to sensitive habitats, and potential for these impacts will be evaluated on a site-specific basis as specified in Mitigation Measure

BIO-1a prior to approving any discretionary well permits. Impacts to these communities from ground disturbance will be mitigated to a less-than-significant level by implementing Mitigation Measure BIO-1a.

Federal, state, and county protections are in place for sensitive natural communities. California regulations require a lead agency to determine whether a project in its jurisdiction may result in significant effects to oak woodlands. If an agency determines that there may be a significant effect to oak woodlands from a project, the agency must require oak woodlands mitigation alternatives to mitigate the significant effect. The mitigation alternatives include: conservation through the use of conservation easements; planting and maintaining an appropriate number of replacement trees; or the contribution of funds for purchasing oak woodlands conservation easements. Wetlands and jurisdictional waters are protected from disturbance through the Clean Water Act that requires avoidance, minimization, and mitigation. The Stanislaus County General Plan contains policies to protect sensitive natural communities such as vernal pools, riparian habitats, oak woodlands, and rare plants from disturbance. The Conservation/Open Space Element policies include:

- Policy Three: "Areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways and other waterfowl habitats, etc.) including those habitats and plant species listed by state or federal agencies shall be protected from development or disturbance."
- Policy Four: "Protect and enhance oak woodlands and other native hardwood habitat."
- Policy Six: "Preserve natural vegetation to protect waterways from bank erosion and siltation."
- Policy Twenty-Nine: "Habitats of rare and endangered fish and wildlife species, including special status wildlife and plants, shall be protected."

<u>Direct Impacts During Well Operation.</u> Well surface completions would occupy a relatively small, set area, and surface operating activities would be limited to periodic pump maintenance and occasional well rehabilitation. These activities would be limited to the area near the well surface, and are unlikely to affect sensitive habitats, even if they are located near a well. So potential direct impacts to sensitive habitats from operating activities at the ground surface would have a less-than-significant impact.

Groundwater extraction from discretionary wells permitted under the Ordinance would result in drawdown that could affect natural communities. Groundwater drawdown could result in decreased surface discharge to GDEs, including rivers, wetlands, and riparian communities that could result in habitat degradation or damage. If these impacts occurred, they could be significant if not mitigated.

Computer modeling was conducted to assess the potential regional and programmatic effects of the discretionary well permitting program, and is discussed in Appendix D. The number of wells that will be permitted under the county's discretionary well permitting program, their locations, uses, and pumping rates are not known at this time. The modeling was conducted based on an assumed 10 wells being permitted under the program each year from 2018 to 2022, to provide perspective on the general extent and amount of drawdown that could conceivably occur as a result of implementing the program. Based on the results of this hydrologic effects analysis, drawdown effects would differ between the eastern and western portions of the county. The eastern foothills are predicted to experience the greatest drawdown; however, upland creeks and GDEs (including vernal pools and oak woodlands) in this area are associated with perched aquifers and underlain by compact, indurated duripans (hard, cemented soils) and paleosols (ancient buried soils), and are not hydrologically connected with the regional pumped aquifers. The upland creeks and GDEs in the eastern foothills would not be affected by pumping from new wells in this area.

The Stanislaus and Tuolumne Rivers in the eastern region of the county are incised beneath the surrounding upland areas and are connected to the shallow aquifer system and would experience reduced surface flows from reduced groundwater discharge; however, drawdown in riverine systems and riparian corridors would be limited by flow mandates for fisheries that maintain required flows and would recharge groundwater in these areas. The conceptual hydrologic effects analysis indicates that drawdown in the shallow aquifer system in the eastern portion of the county would be limited near the rivers due to additional recharge from the rivers flowing into the aquifer system (see Figures 6-7 and 6-9 in Appendix D). In addition, the county has established Surface Water Protection Zones under the discretionary well permitting program around groundwater-connected streams, rivers, and lakes in the county where new groundwater pumping could have a potentially measurable effect of surface water. The well permitting program requires that a Surface-Groundwater Interaction Study be performed for any new wells proposed in a Surface Water Protection Zone, and mitigation recommendations be adopted as needed to prevent the proposed groundwater extraction from having a potentially significant effect on surface water resources and riparian habitat. Based on flow mandates, the measures incorporated into the county's discretionary well permitting program, and the limited predicted groundwater drawdown near the rivers, the program would have less-than-significant impacts on riverine and riparian corridors.

The modeling conducted for the hydrologic effects analysis indicates that drawdown between 1 and 2 feet may occur by 2022 in the shallow (upper pumped) aquifer system in some areas of the central and western portions of the county, that could overlay GDEs (see Figures 6-7 and 6-9 in Appendix D). The areas where drawdown is predicted to exceed 1 foot are projected to increase somewhat in size by 2042. As discussed above (Impact BIO-1), this is less than, or in the lower range of, typical seasonal groundwater level fluctuations in the shallow aquifer system, and does not represent the actual drawdown at the ground surface, which would be further attenuated by vertical groundwater flow impedance from sediments that overlie the pumped aquifer. Risk assessment guidelines for GDEs developed by the state of New South Wales in Australia characterize impact risks associated with drawdowns that are less than seasonal fluctuations as low.[132] Conversely, since the locations of the actual wells that will be permitted are not known, and the model used in the drawdown predications is regional in nature, local drawdown near a new well could be greater than predicted. The possibility and extent of drawdown effects on these GDEs depends on the actual location of wells, local aquifer and shallow soil conditions, and the location and nature of GDEs. The ecological water requirements and thresholds of response to changes in groundwater levels differ among GDEs. Additional wells and groundwater extraction could have adverse effects on GDEs in the county including wetlands and,

[132] NSW Department of Primary Industries. 2012. Risk Assessment Guidelines for Groundwater Dependent Ecosystems, Volume 1 – The Conceptual Framework. May.

to a lesser extent, oak woodlands. The rate, magnitude, and duration of groundwater changes would determine the short- and long-term impacts to GDEs.[133]

Woody vegetation, such as oak trees in upland areas, are known to tap into groundwater as deep as 23 feet to 79 feet below ground surface. Groundwater sustains oaks during extended dry periods when soil moisture reserves are depleted; groundwater drawdown beyond the maximum root depth could be deleterious to oak woodlands during periods of drought or a longer than usual dry season.[134] Studies indicate that the roots of groundwater dependent vegetation may adapt in response to gradual changes to groundwater level, but if changes are rapid, root systems may not adequately adapt. As a result of rapid changes, effects on oak woodlands could include reduced vigor to withstand disease, decreased productivity and recruitment, and increased mortality. Gradual reductions in groundwater levels, such as those likely to occur as a result of more distant groundwater pumping, allow rooting systems to adapt to water stress; however, vegetation community composition may shift to include opportunistic invasive species with deeper rooting systems.[135] If such impacts occurred, they could be significant if not mitigated. Drawdowns of the rates and amount predicted to occur on a regional basis are not likely to adversely affect oak woodlands and other obligate phreatophytes. Since the locations of individual wells permitted under the program are unknown, local drawdown could be greater or could occur more rapidly; however, as shown on Figure 3-4, oak woodlands occur in the eastern, foothills portion of the county, where the uppermost groundwater zones are perched on lower permeability layers and are not hydraulically connected to the regional pumped aquifers. Valley oak woodland occurs in the Valley Foothill Riparian vegetation type shown on Figure 3-4, which would receive surface water inputs from flow mandates. Based on the distribution of oak woodlands in the county and the general slow progression of drawdown impacts, impacts to oak woodlands will be less than significant.

Most of the riparian habitats and wetland GDEs in the central and western portions of the county receive significant surface water inflow and groundwater recharge from nearby streams, canals, and drains, and are unlikely to experience significant adverse effects from the amount of drawdown predicted in the hydrologic effects analysis. However, it is possible that some wetlands that are highly groundwater dependent and contain sensitive communities occur in the central and western portions of the county, and could be adversely affected by the predicted amount of drawdown. These could include seeps, springs, and palustrine or emergent wetlands that may occur beyond the zone of influence of surface water recharge, at the outer edges of the floodplain and within a few miles of the rivers near the valley axis. As stated earlier, no field studies or comprehensive assessment of wetland resources were conducted for this PEIR; as such, it is unknown at this time whether and where such wetlands may exist in the county, and how sensitive they would be to groundwater drawdown. Most wetland water budgets are a combination of surface and groundwater inputs.

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133 Rhode, M.M. et al. 2017. "A Global Synthesis of Managing Groundwater Dependent Ecosystems Under Sustainable Groundwater Policy." *Groundwater*. Vol. 55, No. 3. May-June. Pages 293-301.

134 Miller et al. 2010. "Groundwater uptake by woody vegetation in a semiarid oak savannah." *Water Resources Research*. Vol. 46. October.

135 Rhode, M.M. et al. 2017. "A Global Synthesis of Managing Groundwater Dependent Ecosystems Under Sustainable Groundwater Policy." *Groundwater*. Vol. 55, No. 3. May-June. Pages 293-301.

As discussed under BIO-1, the condition and species composition of wetland vegetation can serve as an early warning indicator of water stress. Studies have indicated gradual loss of indicator species starting with as little as 0.66 feet (0.2 meter) drawdown, with a median of 2.99 feet (0.91 meter), and complete loss at 6.23 feet (1.9 meter).[136] A study in southeast Australia suggested that drawdowns from 0.82 feet (0.25 meter) to 0.98 feet (0.3 meter) represent a threshold where community composition is likely to change.[137] The drawdown modeling analysis discussed in Appendix D suggests that drawdown exceeding these thresholds could occur. Impacts from such drawdown could be potentially significant if not mitigated. However, the county's discretionary well permitting program includes thresholds, requirements, and permit conditions to prevent these impacts. Specifically, the drawdown associated with a proposed well is required to be evaluated and compared to the results of a desktop study to identify the locations of GDEs that have a potential to be hydraulically connected to the pumped aquifer system. If the predicted drawdown in the pumped aquifer system exceeds ½ foot beneath a GDE that may be hydraulically connected to the pumped aquifer, a GDE Impact Study is required. If a potential for significant impacts is identified, then recommendations must be adopted that will mitigate the impact to a less than significant level. This measure, which is described in detail in the introduction of the impact analysis approach to this section, is expected to reduce the impacts from a proposed new well to drawdown-sensitive GDEs to a less than significant level.

Impact BIO-3: Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) or waters of the State through direct removal, filling, hydrological interruption, or other means (Less Than Significant Impact with Mitigation Incorporated)

<u>Direct Impacts During Well Construction.</u> The construction of wells and associated infrastructure could result in the disturbance or loss of federal and state protected wetlands and waters in and adjacent to the construction site, including creeks, rivers, streams, vernal pools, marshes, and other types of seasonal and perennial wetland communities. Wetlands and other waters of the U.S. could be affected through direct removal, filling, hydrological interruption (including groundwater drawdown or dewatering), alteration of bed and bank, and other construction-related activities, resulting in long-term degradation of a sensitive plant community, fragmentation, or isolation of an important wildlife habitat, and disruption of natural wildlife movement corridors. Federal- and state-protected wetlands and waters, such as streams, rivers, wet meadows, and vernal pools, provide unique aquatic habitat (perennial and ephemeral) for many endemic species, including special-status plants, birds, invertebrates, and amphibians. The specific effects on protected wetlands and waters would depend on the size of the construction footprint and its location relative to the protected wetlands and waters, and the type of disturbance or loss. At this point, it is not known where wells permitted under the program will be located, so this impact cannot be adequately evaluated at the program level. Well applications will be evaluated on a site-specific basis as specified in Mitigation Measure BIO-1a, to assess impacts and consider mitigation measures for significant effects on the environment, prior to

[136] Gerla, P.A. et al. 2015. Environmental Flows and Levels for Groundwater-Dependent Swale Wetlands of the Sheyenne National Grasslands, North Dakota. The Nature Conservancy and the USDA Forest Service. Portland, Oregon.

[137] Deane, D.C. et al. 2017. "Predicted risks of groundwater decline in seasonal wetland plant communities depend on basin morphology." Wetlands Ecology and Management. September 25.

approving any discretionary well permits. With the implementation of these Mitigation Measure BIO-1a, impacts would be less than significant.

The mitigated less-than-significant impacts would be further reduced by compliance with the following requirements. Wetlands and jurisdictional waters are protected from disturbance through the Clean Water Act that requires avoidance, minimization, and mitigation. California Department of Fish and Game Code Sections 1600-1607 requires that any work that substantially diverts or obstructs that natural flow or changes the bed, channel, or bank of any river, stream, or lake must be authorized by CDFW in a Lake or Streambed Alteration Agreement. This requirement also applies to work undertaken in the 100-year floodplain. The Stanislaus County General Plan contains policies to protect vernal pools, riparian habitats, from disturbance. The Conservation/Open Space Element policies include:

- Policy Three: *"Areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways and other waterfowl habitats, etc.) including those habitats and plant species listed by state or federal agencies shall be protected from development or disturbance."*
- Policy Six: *"Preserve natural vegetation to protect waterways from bank erosion and siltation."*
- Policy Twenty-Nine: *"Habitats of rare and endangered fish and wildlife species, including special status wildlife and plants, shall be protected."*

<u>Direct Impacts During Well Operation.</u> Well surface completions would occupy a relatively small, defined area, and surface operating activities would be limited to periodic pump maintenance and occasional well rehabilitation. These activities would be limited to the area near the well surface completion and are unlikely to affect federal- and state-protected wetlands and waters, even if they are located near a well. For this reason, potential direct impacts to federal- and state-protected wetlands and waters from operating activities at the ground surface would have a less-than-significant impact.

Groundwater drawdown that results in reduction of available water in the rooting zone of hydrophytic vegetation could result in conversion of wetland to upland vegetation, depending on the amount and duration of drawdown. Decreased surface discharge to wetlands could reduce the size of a wetland feature. As a result, federal- and state-protected wetlands and waters could be degraded or damaged. Such impacts could be significant if not mitigated.

Computer modeling was conducted to assess the potential regional and programmatic effects of the discretionary well permitting program, and is discussed in Appendix D. The number of wells that will be permitted under the county's discretionary well permitting program, their locations, uses, and pumping rates are not known at this time, so the modeling was conducted based on an assumed 10 wells being permitted under the program each year from 2018 to 2022, to provide perspective on the general extent and amount of drawdown that could conceivably occur as a result of implementing the program. Based on the results of this hydrologic effects analysis, drawdown effects would differ between the eastern and western portions of the county. The eastern foothills are predicted to experience the greatest drawdown; however, wetlands and vernal pools in the upland areas between the major drainages in this area are associated with perched aquifers and underlain by compact, indurated duripans (hard, cemented soils) and paleosols (ancient buried soils), and are not hydrologically connected with the regional pumped aquifers. The wetlands and vernal pools in the upland areas in the eastern foothills would not be affected by pumping from new wells in this area.

The Stanislaus and Tuolumne Rivers in the eastern region of the county are incised beneath the surrounding upland areas and are connected to the shallow aquifer system and would experience reduced surface flows from reduced groundwater discharge; however, drawdown in riverine systems and riparian corridors would be limited by flow mandates for fisheries that maintain required flows and would recharge groundwater in these areas. The conceptual hydrologic effects analysis indicates that drawdown in the shallow aquifer system in the eastern portion of the county would be limited near the rivers due to additional recharge from the rivers flowing into the aquifer system (see Figures 6-7 and 6-9 in Appendix D). In addition, the county has established Surface Water Protection Zones under the discretionary well permitting program around groundwater-connected streams, rivers, and lakes in the county where new groundwater pumping could have a potentially measurable effect of surface water. The well permitting program requires that a Surface-Groundwater Interaction Study be performed for any new wells proposed in a Surface Water Protection Zone, and mitigation recommendations be adopted as needed to prevent the proposed groundwater extraction from having a potentially significant effect on surface water resources and adjacent wetland areas. Based on flow mandates, the measures incorporated into the county's discretionary well permitting program, and the limited predicted groundwater drawdown near the rivers, the program would have less-than-significant impacts on wetlands in riverine and riparian corridors in the eastern portion of the county.

The modeling conducted for the hydrologic effects analysis indicates that drawdown between 1 and 2 feet may occur by 2022 in the shallow (upper pumped) aquifer system in some areas of the central and western portions of the county, that could overlay wetlands (see Figures 6-7 and 6-9 in Appendix D). The areas where drawdown is predicted to exceed 1 foot are projected to increase somewhat in size by 2042. As discussed above (Impact BIO-1), this is less than, or in the lower range of, typical seasonal groundwater level fluctuations in the shallow aquifer system, and does not represent the actual drawdown at the ground surface, which would be further attenuated by vertical groundwater flow impedance from sediments that overlie the pumped aquifer. Risk assessment guidelines for GDEs developed by the state of New South Wales in Australia characterize impact risks associated with drawdowns that are less than seasonal fluctuations as low.[138] Conversely, since the locations of the actual wells that will be permitted are not known, and the model used in the drawdown predications is regional in nature, local drawdown near a new well could be greater than predicted. The possibility and extent of drawdown effects on wetlands in this area depends on the actual location of wells, local aquifer and shallow soil conditions, and the location and nature of wetlands. The ecological water requirements and thresholds of response to changes in groundwater levels differ among wetlands. Additional wells and groundwater extraction could have adverse short- or long-term effects on wetlands, depending on the rate, magnitude, and duration of groundwater changes.[139]

[138] NSW Department of Primary Industries. 2012. Risk Assessment Guidelines for Groundwater Dependent Ecosystems, Volume 1 – The Conceptual Framework. May.

[139] Rhode, M.M. et al. 2017. "A Global Synthesis of Managing Groundwater Dependent Ecosystems Under Sustainable Groundwater Policy." *Groundwater*. Vol. 55, No. 3. May-June. Pages 293-301.

Most of the wetlands in the central and western portions of the county receive significant surface water inflow and groundwater recharge from nearby streams, canals and drains, and are unlikely to experience significant adverse effects from the amount of drawdown predicted in the hydrologic effects analysis. However, it is possible that some wetlands that are highly groundwater dependent and contain sensitive communities in the central and western portions of the county could be adversely affected by the predicted amount of drawdown. These could include seeps, springs, and palustrine or emergent wetlands that may occur beyond the influence of recharge from surface water, at the outer edges of the floodplain and within a few miles of the rivers near the valley axis. As stated earlier, no field studies or comprehensive assessment of wetland resources were conducted for this PEIR; as such, it is unknown at this time whether and where such wetlands may exist in the county, and how sensitive they would be to groundwater drawdown. Most wetland water budgets are a combination of surface and groundwater inputs.

As discussed under BIO-1, the condition and species composition of wetland vegetation can serve as an early warning indicator of water stress. Studies have indicated gradual loss of indicator species starting with as little as 0.66 feet (0.2 meter) drawdown, with a median of 2.99 feet (0.91 meter), and complete loss at 6.23 feet (1.9 meter).[140] A study in southeast Australia suggested that drawdowns from 0.82 feet (0.25 meter) to 0.98 feet (0.3 meter) represent a threshold where community composition is likely to change.[141] The drawdown modeling analysis discussed in Appendix D suggests that drawdown exceeding these thresholds could occur. Impacts from such drawdown could be potentially significant if not mitigated. However, the county's discretionary well permitting program includes thresholds, requirements, and permit conditions to prevent these impacts. Specifically, the drawdown associated with a proposed well is required to be evaluated and compared to the results of a desktop study to identify the locations of wetlands and other GDEs that have a potential to be hydraulically connected to the pumped aquifer system. If the predicted drawdown in the pumped aquifer system exceeds ½ foot beneath a GDE that may be hydraulically connected to the pumped aquifer, a GDE Impact Study is required. If a potential for significant impacts is identified, then recommendations must be adopted that will mitigate the impact to a less than significant level. This measure, which is described in detail in the introduction of the impact analysis approach to this section, is expected to reduce the impacts from a proposed new well to drawdown-sensitive wetlands to a less than significant level.

<u>Indirect Impacts.</u> Indirect impacts may occur from disturbance of wetlands such as vernal pools (annual grassland/vernal pool complex), or perennial or seasonal palustrine wetlands during conversion of un-cultivated land to irrigated farmland that is supplied by a well permitted under the program. These indirect impacts could include the degradation, modification or damage of wetlands by grading, plowing or planting, or by the installation of irrigation pipelines and access roads. The specific effects on wetlands would depend on the size of the construction footprint and its location relative to the wetland, and the type of habitat modification (e.g., grading or land conversion). If impacts occurred, they could be significant if not mitigated.

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[140] Gerla, P.A. et al. 2015. Environmental Flows and Levels for Groundwater-Dependent Swale Wetlands of the Sheyenne National Grasslands, North Dakota. The Nature Conservancy and the USDA Forest Service. Portland, Oregon.

[141] Deane, D.C. et al. 2017. "Predicted risks of groundwater decline in seasonal wetland plant communities depend on basin morphology." Wetlands Ecology and Management. September 25.

Because it is not known where new discretionary wells will be, it is concluded that constructing and operating new wells permitted under the Ordinance in undeveloped rangeland portions of the county has the potential to result in significant indirect impacts to wetlands, if not mitigated. The potential for such impacts will be evaluated and addressed on a site-specific basis as specified in Mitigation Measure BIO-1a. With the implementation of these Mitigation Measure BIO-1a, impacts will be less than significant.

The following requirements will further decrease the mitigated less-than-significant impacts. Wetlands and jurisdictional waters are protected from disturbance through the Clean Water Act, which requires avoidance, minimization, and mitigation. California Department of Fish and Game Code Sections 1600-1607 requires authorization by CDFW in a Lake or Streambed Alteration Agreement, for work that may affect rivers, streams, lakes, or occurs in the floodplain. The Stanislaus County General Plan also contains policies to protect vernal pools, riparian habitats, from disturbance. The Conservation/Open Space Element policies include:

- Policy Three: *"Areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways and other waterfowl habitats, etc.) including those habitats and plant species listed by state or federal agencies shall be protected from development or disturbance."*
- Policy Six: *"Preserve natural vegetation to protect waterways from bank erosion and siltation."*
- Policy Twenty-Nine: *"Habitats of rare and endangered fish and wildlife species, including special status wildlife and plants, shall be protected."*

Because this PEIR evaluates impacts at the programmatic level, all project circumstances are not foreseeable, and the specific impacts associated with new wells cannot be completely evaluated at the program level. The incorporation of mitigation measure BIO-1a to site-specific well application projects, together with the implementation of the triggers, requirements and permit conditions included in the county's discretionary well permitting program, will reduce potential impacts to wetland resources to less than significant. Compliance with local, state, and federal regulations will further decrease potential impacts.

Impact BIO-4: Conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance (Less than Significant Impact with Mitigation Incorporated)

<u>Direct Impacts During Well Construction.</u> The construction of wells and associated infrastructure could result in conflicts with local policies or ordinances that protect locally significant biological resources, including heritage or native trees. The specific effects on biological resources and potential conflict with local policies or ordinances would depend on the size of the construction footprint and its location relative to the protected biological resource, and the type of disturbance or loss. Based on the lack of detailed, site-specific information, this impact cannot be adequately evaluated at the program level. Well applications will be evaluated as specified in Mitigation Measure BIO-4. This will assess impacts and conflicts with local policies or ordinances, and consider mitigation measures for significant effects on the environment. Where there is a potential for the well permitting program to conflict with local policies or ordinances that protect locally significant biological resources, conflicts will be mitigated to a less-than-significant level by incorporation of project-specific mitigation measures to developed in accordance with the mitigation measures described for Impact BIO-1.

Federal, state, and county protections are in place for protection of locally significant biological resources that will further reduce the mitigated less-than-significant impacts. California regulations require a lead agency to determine whether a project in its jurisdiction may result in significant effects to oak woodlands. If an agency determines that there may be a significant effect to oak woodlands as a result of a project, the agency must require oak woodlands mitigation alternatives to mitigate the significant effect. Wetlands and jurisdictional waters are protected from disturbance through the Clean Water Act that requires avoidance, minimization, and mitigation. The Stanislaus County General Plan contains policies to protect sensitive natural communities such as vernal pools, riparian habitats, oak woodlands, and rare plants from disturbance. The Conservation/Open Space Element policies include:

- Policy Three: *"Areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways and other waterfowl habitats, etc.) including those habitats and plant species listed by state or federal agencies shall be protected from development or disturbance."*
- Policy Four: *"Protect and enhance oak woodlands and other native hardwood habitat."*
- Policy Six: *"Preserve natural vegetation to protect waterways from bank erosion and siltation."*
- Policy Twenty-Nine: *"Habitats of rare and endangered fish and wildlife species, including special status wildlife and plants, shall be protected."*

Direct Impacts During Well Operation. Well maintenance and occasional well rehabilitation would be limited to area near the wellhead and are unlikely to affect locally significant biological resources or conflict with local policies and ordinances. So, potential direct impacts from operating activities at the ground surface would have a less-than-significant impact.

Groundwater drawdown that results in degradation, damage, or loss of reduction of significant biological resources would be in conflict with local policies and ordinances and would be a potentially significant impact if not mitigated. The County's discretionary well permitting program includes application requirements, thresholds, and permit requirements to help prevent such impacts (see Appendix B and Section 4.3.2 Approach and Methodology). It is not known where discretionary wells permitted under the Ordinance would be, so the actual specific impacts of these wells on significant biological resources and their conflict with policies and ordinances cannot be adequately evaluated. At a program level, operating new wells permitted under the Ordinance has the potential to result in significant impacts, if not mitigated. The potential for such impacts will be evaluated and mitigated on a site-specific basis as specified in Mitigation Measure BIO-4.

Indirect Impacts. Indirect impacts may occur from operation of new discretionary wells permitted under the Ordinance that support the conversion of rangeland to irrigated farmland. Such indirect impacts could include the degradation, modification or damage of sensitive natural communities by grading, plowing or planting, or by the installation of irrigation pipelines and access roads. Such impacts would be significant, if not mitigated. It is not known where new discretionary wells would be that would result in land conversion, so the indirect impacts associated with these wells cannot be adequately evaluated. At a program level, constructing and operating new wells that are permitted under the Ordinance in undeveloped rangeland portions of the county could have significant, indirect impacts to sensitive natural communities and would be in conflict with local policies and ordinances that direct protection of locally significant biological resources. The potential for such impacts will be evaluated and mitigated on a site-specific basis as specified in Mitigation Measure BIO-4.

New well permit applications will be reviewed as specified in Mitigation Measure BIO-4, to assess presence of significant biological resources and consider project-specific mitigations, such as those described for Impacts BIO-1a and -1b. Compliance of the discretionary well permitting program with the requirements of specific ordinances and policies and federal and state laws and regulations and implementation of Mitigation Measures BIO-1a and -1b (listed under discussion for Impact BIO-1) would reduce impacts to less than significant. Implementation of the mitigation measures that are part of the County's discretionary well permitting program (application requirements and thresholds to help prevent impacts) would reduce the potential for conflict with local policies and ordinances to a less-than-significant level.

> **Mitigation Measure BIO-4.** Evaluate well construction permit applications to assess potential conflicts with local policies or ordinances that protect biological resources, and consider mitigation measures for significant effects on the environment on a project-specific basis.

4.4 Cultural Resources

4.4.1 Introduction

This section discusses the approach and methodology used to assess the impacts of the program, discusses the individual impacts relative to the thresholds of significance, and identifies mitigation measures.

4.4.2 Impact Analysis

Under CEQA, a substantial adverse change in the significance of a cultural resource means the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the historical resource would be materially impaired. Actions that would materially impair the significance of a historic resource are any actions that would demolish or adversely alter the physical characteristics that convey the property's historical significance and qualify it for inclusion in the California Register of Historical Resources (CRHR), the National Register of Historic Places (NRHP), or in a local register or survey that meets the requirements of Public Resources Code Sections 5020.1[k] and 5024.1[g].

Approach and Methodology. For this PEIR, the General Plan Conservation/Open Space Element for Stanislaus County, adopted in 2016, was reviewed to determine if goals and implementation policies in that document would apply to cultural resources and future projects in the county. Where the implementation policies apply to this PEIR, they are included in the impacts analysis. No new field work or background record searches were done for the preparation of this PEIR.

The Conservation/Open Space Element includes goals, policies, and implementation measures related to cultural resources and projects that occur in unincorporated areas of the county. Under Implementation Measure 5, "[t]he county shall utilize the CEQA process to protect archaeological or historic resources." The Conservation/Open Space Element Implementation Measure 6 ("The county shall make referrals to the Office of Historic Preservation and the Central California Information Center as required to meet CEQA requirements") is also relevant to the discretionary well permitting process and the rangeland conversion process. Conservation/Open Space Element, Goal Eight, Policy 24 ("Preserve areas of national, state, regional, and local historical importance") is implemented by Measure 24 that requires the county to support the preservation its cultural legacy of historical and archaeological resources for future generations.

Following the CEQA Guidelines, in Section 15064.5 (f), require that a lead agency make provisions for the accidental discovery of historical or archaeological resources and that, these provisions should include "an immediate evaluation of the find by a qualified archaeologist. If the find is determined to be an historical or unique archaeological resource, contingency funding and a time allotment sufficient to allow for implementation of avoidance measures or appropriate mitigation should be available. Work could continue on other parts of the building site while historical or unique archaeological resource mitigation takes place."

Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. This could cause a localized substantial adverse change in the significance of a prehistoric, historic, or paleontological resource if the resource is located on or adjacent to the site of the new well and depths of the project reach native soils. The conversion of rangeland to irrigated cultivation may be made possible by some wells, and may cause substantial adverse change in the significance of a cultural resource (historic and prehistoric) if the rangeland is in or adjacent to the area that would be disturbed by cultivation and depths of the conversion process reach native soils.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?		X		
Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?		X		
Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		X		
Disturb any human remains, including those interred outside of dedicated cemeteries?		X		

Impact CUL-1: A substantial adverse change in the significance of a historical resource as defined in § 15064.5 (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. Identified historical areas within Stanislaus County are generally found in and around the gold rush towns of Knights Ferry and La Grange;[142] however, historical resources may be found at numerous locations throughout the county in the vicinity of other historical settlements, travel routes and other features. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. This could cause a localized substantial adverse change in the significance of a prehistoric, historic, or paleontological resource if the resource is located on or adjacent to the site of the new well and depths of the project reach native soils. These impacts could be significant, if not mitigated. At this time, the locations at which new wells would be constructed are not known, so potential impacts to historical resources cannot be adequately assessed at the program level. In some cases, the drilling of a well boring may be the only ground disturbing activity, in which the likelihood of adversely affecting historical resources would be minimal, and the only measure needed to prevent the potential for significant impacts would be a requirement to stop work if unanticipated resources are discovered during hand excavation of the upper 5 feet of the well boring.[143] If additional ground disturbing activities are planned (such as preparation of a drilling pad, access road or electrical service line, or the conversion of range land to cultivated agricultural use), the potential for existence of historical resources at the site and in the vicinity will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving such discretionary well permits. If it is determined that historical resources may be present at the site or the site area has a high sensitivity for the potential presence of historical resources, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or in a historic resource, the well would be relocated to avoid substantial changes to the historic resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known historical resources in or adjacent to the well construction area, the construction of a well could still cause a substantial adverse change in the significance of a historic resource if a previously unidentified historic resource was located below ground and construction activities encountered the resource. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, impacts will be less than significant.

Direct Impacts During Operation. Well surface completions will occupy a relatively small, set area, and surface operating activities will be limited to periodic pump maintenance and occasional well rehabilitation. These activities will be limited to the area near the wellhead and are unlikely to affect historical resources, even if

[142] Open Space and Conservation Element Supporting Documentation, Stanislaus County General Plan 2015.

[143] The County has received some applications that are exempt from the Ordinance for the installation of wells associated with the subdivision of existing agricultural operations in compliance with existing zoning requirements. In such cases, wells can often be drilled on existing well pads with no need for any other ground disturbing activities. The upper 5 feet of well borings must be hand excavated in order to comply with existing laws for the protection of underground utilities, which would allow the drillers to stop work before potential resources are destroyed in the event that unexpected resources were encountered.

they are located near a well. There would be less than significant direct impacts to historical resources during operation of the well.

<u>Indirect Impacts.</u> Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, the activities of which can also impact historical resources in previously undisturbed areas. At this time, the locations at which rangeland may be converted to irrigated agricultural use in connection with a well permitted under the program are not known, so potential impacts to historical resources cannot be adequately assessed at the program level. The potential for existence of historical resources once the parcels that would be converted are identified will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving a discretionary well permit for such a well. If it is determined that historical resources may be present at the site or the site area has a high sensitivity for the potential presence of historical resources, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or in a historic resource, the well would be relocated to avoid substantial changes to the historic resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known historical resources in or adjacent to the well construction area, the construction of a well could still cause a substantial adverse change in the significance of a historical resource if a previously unidentified historical resource was located below ground and construction activities encountered the resource. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, impacts will be less than significant.

Mitigation Measure CUL-1a. For projects with anticipated ground disturbance that would extend beyond previously disturbed soils, a qualified cultural resources professional shall investigate the potential presence of archaeological or historical resources in the vicinity of the well, the well pad, any appurtenant access drives and electrical service lines, and any rangeland tracts converted to cultivated agricultural use that will be irrigated by the well, through a desktop review. The review shall include records at the Central California Information Center, records at the University of California Berkeley Museum of Paleontology, a Sacred Lands File search at the Native American Heritage Commission, Native American tribal consultation, CRHR, and NRHP.

Mitigation Measure CUL-1b. If it is determined through implementation of Mitigation Measure CUL-1a that archaeological, historical or paleontological resources or human remains may be located on a site or the area is judged to have a high degree of sensitivity relative to these resources, prior to any project-related ground disturbing or construction activities, a qualified archaeologist, historian or paleontologist (as applicable) shall conduct an archaeological/historical/paleontological resources survey (as applicable). If it is determined that the proposed well is in an area adjacent to or in one of these resources, the well would be relocated and the project reconfigured to avoid substantial changes to the resource.

Mitigation Measure CUL-1c. If the construction staff or others observe previously unidentified archaeological, historical or paleontological resources, or human remains, during drilling or other ground disturbing activities associated with well construction or conversion of rangeland to cultivated agricultural use, they will halt work within a 100-foot radius of the find(s), delineate the area of the find with flagging tape or rope (may also include dirt spoils from the find area), immediately notify the lead agency, and retain a qualified cultural resources specialist to review the observed resources. Construction will halt within the flagged or roped-off area. The archaeologist will assess the resource as soon as possible and determine appropriate next steps in coordination with the lead agency. Such finds will be formally recorded and evaluated. The resource will be protected from further disturbance or looting pending evaluation.

Impact CUL-2: A substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5 (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. Archaeological resources are known to be present throughout Stanislaus County. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. This could cause a localized substantial adverse change in the significance of a prehistoric, historic, or paleontological resource if the resource is located on or adjacent to the site of the new well and depths of the project reach native soils. These impacts could be significant, if not mitigated. At this time, the locations at which new wells would be constructed are not known, so potential impacts to archaeological resources cannot be adequately assessed at the program level. In some cases, the drilling of a well boring may be the only ground disturbing activity, in which the likelihood of adversely affecting archaeological resources would be minimal, and the only measure needed to prevent the potential for significant impacts would be a requirement to stop work if unanticipated resources are discovered during hand excavation of the upper 5 feet of the well boring.[144] If additional ground disturbing activities are planned (such as preparation of a drilling pad, access road or electrical service line, or the conversion of range land to cultivated agricultural use), the potential for existence of archaeological resources at the site and in the vicinity will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving such discretionary well permits. If it is determined that archaeological resources may be present at the site or the site area has a high sensitivity for the potential presence of archaeological resources, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or in an archaeological resource, the well would be relocated to avoid substantial changes to the archaeological resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known archaeological resources in or adjacent to the well construction area, the construction of a well could still cause a substantial adverse change in the significance of an archaeological resource if a previously unidentified archaeological resource was located below ground and construction activities encountered the resource. Mitigation

[144] The County has received some applications that are exempt from the Ordinance for the installation of wells associated with the subdivision of existing agricultural operations in compliance with existing zoning requirements. In such cases, wells can often be drilled on existing well pads with no need for any other ground disturbing activities. The upper 5 feet of well borings must be hand excavated in order to comply with existing laws for the protection of underground utilities, which would allow the drillers to stop work before potential resources are destroyed in the event that unexpected resources were encountered.

Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, impacts will be less than significant.

Direct Impacts During Operation. Well surface completions will occupy a relatively small, set area, and surface operating activities will be limited to periodic pump maintenance and occasional well rehabilitation. These activities will be limited to the area near the wellhead and are unlikely to affect archaeological resources, even if they are located near a well. There would be less than significant direct impacts to archaeological resources during operation of the well.

Indirect Impacts. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, the activities of which can also impact archaeological resources in previously undisturbed areas. At this time, the locations at which rangeland may be converted to irrigated agricultural use in connection with a well permitted under the program are not known, so potential impacts to archaeological resources cannot be adequately assessed at the program level. The potential for existence of archaeological resources once the parcels that would be converted are identified will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving a discretionary well permit for such a well. If it is determined that archaeological resources may be present at the site or the site area has a high sensitivity for the potential presence of archaeological resources, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or within an archaeological resource, the well would be relocated to avoid substantial changes to the archaeological resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known archaeological resources in or adjacent to the well construction area, the construction of a well could still cause a substantial adverse change in the significance of a historic resource if a previously unidentified archaeological resource was located below ground and construction activities encountered the resource. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, impacts will be less than significant.

Impact CUL-3: Direct or indirect destruction of a unique paleontological resource or site or unique geologic feature (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. Most of the geologic units within the county are highly sensitive for paleontological resources because the valley is immediately underlain by the Modesto and Riverbank Formations of Late Pleistocene, which are typically considered highly sensitive for paleontological resources.[145] Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. This could cause destruction of a unique paleontological resource or site or unique geologic feature if the resource or feature is located on or adjacent to the site of the new well and depths of the project reach native soils. These impacts could be significant, if not mitigated. At this time, the locations at which new wells would be constructed are not known, so potential impacts unique paleontological resources or sites or unique geologic features cannot be adequately assessed at the program

[145] Open Space and Conservation Element Supporting Documentation, Stanislaus County General Plan 2015.

level. In some cases, the drilling of a well boring may be the only ground disturbing activity, in which the likelihood of adversely affecting paleontological resources would be minimal, and the only measure needed to prevent the potential for significant impacts would be a requirement to stop work if unanticipated resources are discovered during hand excavation of the upper 5 feet of the well boring.[146] If additional ground disturbing activities are planned (such as preparation of a drilling pad, access road or electrical service line, or the conversion of range land to cultivated agricultural use), the potential for existence of paleontological resources and unique geological features at the site and in the vicinity will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving such discretionary well permits. If it is determined that paleontological resources or unique geological features may be present at the site or the site area has a high sensitivity for the potential presence of these resources, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or within in a paleontological resource or unique geological feature, the well would be relocated to avoid destruction of the resource or feature. If, after implementing CUL-1b, it is determined that there are no known paleontological resources or unique geological features in or adjacent to the well construction area, the construction of a well could still destruction a paleontological resource or unique geological feature if a previously unidentified paleontological resource or unique geological feature was located below ground and construction activities encountered it. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1b and CUL-1c, impacts will be less than significant.

<u>Direct Impacts During Operation.</u> Well surface completions will occupy a relatively small, set area, and surface operating activities will be limited to periodic pump maintenance and occasional well rehabilitation. These activities will be limited to the area near the wellhead and are unlikely to destroy paleontological resources and unique geological features, even if they are located near a well. There would be less than significant direct impacts to paleontological resources and unique geological features during operation of the well.

<u>Indirect Impacts.</u> Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, the activities of which can also destroy paleontological resources and unique geological features. At this time, the locations at which rangeland may be converted to irrigated agricultural use in connection with a well permitted under the program are not known, so potential impacts to paleontological resources and unique geological features cannot be adequately assessed at the program level. The potential for existence of paleontological resources and unique geological features once the parcels that would be converted are identified will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving a discretionary well permit for such a well. If it is determined that paleontological resources and unique geological features may be present at the site or the site area has a high sensitivity for the potential presence of paleontological resources and unique geological features, a field survey will be conducted prior to any construction or ground disturbing activities

[146] The County has received some applications that are exempt from the Ordinance for the installation of wells associated with the subdivision of existing agricultural operations in compliance with existing zoning requirements. In such cases, wells can often be drilled on existing well pads with no need for any other ground disturbing activities. The upper 5 feet of well borings must be hand excavated in order to comply with existing laws for the protection of underground utilities, which would allow the drillers to stop work before potential resources are destroyed in the event that unexpected resources were encountered.

per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or within paleontological resources and unique geological features, the well would be relocated to avoid destruction. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known paleontological resources and unique geological features in or adjacent to the well construction area, the construction of a well could still cause destruction of paleontological resources and unique geological features if a previously unidentified paleontological resources or unique geological features was located below ground and construction activities encountered it. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, impacts will be less than significant.

Impact CUL-4: Disturbance of human remains, including those interred outside of dedicated cemeteries (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. Human remains, including those interred outside of dedicated cemeteries may be found at numerous locations throughout the county. Construction of new wells for which discretionary permits are issued would include below-ground drilling, staging of drilling equipment in a temporary well pad, and construction of appurtenant access routes and electrical service lines. This could disturb human remains, if the remains are located on or adjacent to the site of the new well and depths of the project reach native soils. These impacts could be significant, if not mitigated. At this time, the locations at which new wells would be constructed are not known, so potential impacts to human remains, including those interred outside of dedicated cemeteries cannot be adequately assessed at the program level. In some cases, the drilling of a well boring may be the only ground disturbing activity, in which the likelihood of adversely affecting human remains would be minimal, and the only measure needed to prevent the potential for significant impacts would be a requirement to stop work if unanticipated resources are discovered during hand excavation of the upper 5 feet of the well boring.[147] If additional ground disturbing activities are planned (such as preparation of a drilling pad, access road or electrical service line, or the conversion of range land to cultivated agricultural use), the potential for existence of human remains and burials at the site and in the vicinity will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving such discretionary well permits. If it is determined that human remains may be present at the site or the site area has a high sensitivity for the potential presence of human remains or burials outside of dedicated cemeteries, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or in an archaeological resource, including burials, the well would be relocated to avoid substantial changes to the resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known human remains in or adjacent to the well construction area, the construction of a well could still cause disturb human remains if previously unidentified human remains or burials were located below ground and

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[147] The County has received some applications that are exempt from the Ordinance for the installation of wells associated with the subdivision of existing agricultural operations in compliance with existing zoning requirements. In such cases, wells can often be drilled on existing well pads with no need for any other ground disturbing activities. The upper 5 feet of well borings must be hand excavated in order to comply with existing laws for the protection of underground utilities, which would allow the drillers to stop work before potential resources are destroyed in the event that unexpected resources were encountered.

construction activities encountered the resource. Mitigation Measure CUL-1c will be implemented to address this eventuality.

Following California Health and Safety Code Section 7050.5c; Public Resources Code Section 5097.98, if human remains are discovered or recognized in any location other than a dedicated cemetery, there can be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until several steps are taken. Those steps are outlined in Assembly Bill (AB) 52, effective July 1, 2015 It requires a lead agency to begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project, if the tribe requested to the lead agency, in writing, to be informed by the lead agency of proposed projects in that geographic area and the tribe requests consultation, prior to determining whether a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report is required for a project. That bill includes examples of mitigation measures that may be considered to avoid or minimize impacts on tribal cultural resources. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, and compliance with California Public Resource Code (PRC) Section 5097.98, impacts will be less than significant.

<u>Direct Impacts During Operation.</u> Well surface completions will occupy a relatively small, set area, and surface operating activities will be limited to periodic pump maintenance and occasional well rehabilitation. These activities will be limited to the area near the wellhead and are unlikely to affect human remains or burials, even if they are located near a well. There would be less than significant direct impacts to human remains, including those interred outside of dedicated cemeteries, during operation of the well.

<u>Indirect Impacts.</u> Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, the activities of which can disturb human remains, including those interred outside of dedicated cemeteries. At this time, the locations at which rangeland may be converted to irrigated agricultural use in connection with a well permitted under the program are not known, so potential impacts to human remains, including those interred outside of dedicated cemeteries, cannot be adequately assessed at the program level. The potential for existence of human remains, including those interred outside of dedicated cemeteries, once the parcels that would be converted are identified will be investigated on a site-specific basis as specified in Mitigation Measure CUL-1a prior to approving a discretionary well permit for such a well. If it is determined that human remains or burials may be present at the site or the site area has a high sensitivity for the potential presence of human remains, a field survey will be conducted prior to any construction or ground disturbing activities per Mitigation Measure CUL-1b. CUL-1b specifies that if it is determined that the proposed well is in an area adjacent to or in a human remains or burials, the well would be relocated to avoid disturbing the resource. If, after implementing CUL-1a and CUL-1b, it is determined that there are no known burials in or adjacent to the well construction area, the construction of a well could still disturb human remains, including those interred outside of dedicated cemeteries, if a previously unidentified burial was located below ground and construction activities encountered the resource. Mitigation Measure CUL-1c will be implemented to address this eventuality. With the implementation of Mitigation Measures CUL-1a, CUL-1b and CUL-1c, and compliance with California Public Resource Code (PRC) Section 5097.98, impacts will be less than significant.

4.5 Geology and Soils

4.5.1 Introduction

This section discusses the approach and methodology used to assess the impacts of the program to geology and soils, discusses the individual impacts relative to the thresholds of significance, and identifies mitigation measures.

4.5.2 Impact Analysis

The primary impact evaluated in this section is the potential for groundwater extraction from wells permitted under the county's discretionary well permitting program to cause land subsidence. Operation of new wells for which discretionary permits are issued would increase the quantity of groundwater extracted from aquifers in the County, resulting in groundwater level drawdown. While each new well will have a local drawdown affect in a cone of depression surrounding the well and is likely to have only an incremental impact on decreasing the water table in the region, the combined impact of all new wells that will be permitted under the County's discretionary well permitting program can cause widespread drawdown and aquifer depletion. Consequently, the operation of individual wells has the potential to cause localized subsidence, and the operation of all wells permitted under the Ordinance could cause more widespread subsidence, if not evaluated and potentially mitigated prior to permitting.

Approach and Methodology. No specific level of future well permitting was forecast for this analysis because the actual number of applications that will be received are not known. The hydrologic effects analysis discussed in Appendix D was completed based on the assumption that 10 wells would be permitted and constructed per year between 2018 and 2022. The locations, completion depths and pumping rates of these wells are not known. Consequently, this PEIR qualitatively assesses potential impacts on geology and soils from implementation of the permitting program and subsequent well development and operation. This assessment is not site-specific, and no site-specific geologic or geotechnical studies were done for this analysis. Desktop analysis, literature review, and environmental and planning documentation review were conducted as referenced below and in Section 3.0. In addition, as the program being evaluated in this PEIR is a well permitting program that will directly affect groundwater resources, substantial background study and groundwater resources effects analysis was done to support the impact analysis. The SCHM was constructed for evaluating the potential groundwater impacts associated with this program, and for documenting the potential effects of planned and foreseeable projects and trends to inform the understanding of the environmental setting and the analysis of cumulative impacts. The data and approach used to construct and calibrate the SCHM, and the results of the forecast modeling are in the Technical Memorandum in Appendix D.

As stated previously in Sections 1.0 and 2.0, this analysis takes into consideration that the Ordinance and discretionary well permitting program are intended to minimize or prevent adverse environmental effects associated with the unsustainable development of groundwater resources, and that implementation of the permitting program is expected to decrease potential impacts related to groundwater withdrawal by permitted wells. The Ordinance has been deliberately aligned with the requirements of the SGMA, including the avoidance and amelioration of "undesirable results," which are in turn directly related to the threshold question for impact significance examined in this impact analysis. The discretionary well permitting program adopted by the county to implement the Ordinance includes triggers, requirements, and permit conditions that are specifically designed to prevent potential "undesirable results," recognizing that in 2020 or 2022 (depending on the groundwater subbasin), GSPs are required to be adopted that will further refine and potentially replace this framework, and provide the basis for long-term sustainable groundwater management by GSAs in compliance with the SGMA. As such, the well permitting program that is being evaluated herein is intended to bridge the gap between the present and 2020 or 2022, when GSPs will be adopted.

The terms of groundwater extraction permits issued under the county's discretionary well permitting program are initially limited to the dates that GSPs must be adopted, and thereafter are renewed for 5-year terms that coincide with the regulatory cycle for GSP updates. It is recognized that in order to prepare and update the required GSPs, detailed studies will be conducted throughout each of the subbasins in the county in order to establish management thresholds, measurable objectives, milestones and monitoring programs that meet state requirements for sustainable groundwater management under the SGMA. These studies are expected to provide information and insight beyond that available at this time, and refine, update, and potentially replace the thresholds and requirements currently embodied in the county's discretionary well permitting program. After GSPs are adopted, GSAs will be responsible for their implementation and enforcement, with specific requirements for future "undesirable results" to be avoided, and any existing "undesirable results" to be ameliorated by 2042 in accordance with identified milestones. If GSAs fail to adopt adequate GSPs, or fail to adequately implement them, the SGMA requires that the state intervene to assure that the required sustainability goals are met. The Ordinance allows the county to intervene and regulate unsustainable extraction prior to state intervention, thus providing an additional safeguard against unsustainable groundwater extraction; however, as explained previously, this is considered unlikely to be needed.

Potential impacts to geology and soils were evaluated using the following stepwise approach:

- The nature of the potential impacts and the processes or root causes leading to their occurrence were identified.
- The potential for groundwater extraction from wells permitted under the county's discretionary well permitting program to cause or contribute to subsidence was evaluated primarily for the time period before GSPs are adopted (prior to 2020 or 2022). The analysis considers the effectiveness of the triggers, requirements and permit conditions in the county's discretionary well permitting program to prevent or ameliorate potential significant impacts. After GSPs are adopted, it is assumed that implementation of the GSPs, and adoption of updated permit conditions when groundwater extraction permits are renewed, will be sufficient to prevent potential adverse impacts related to subsidence.
- The potential effects of regulating unsustainable wells, although unlikely to be implemented (unless GSAs fail to adopt adequate GSPs or fail to adequately implement them), is assumed to result in a net benefit to the environment and to result in less than significant impacts related to subsidence.

- The results of the hydrologic effects analysis in Appendix D and other pertinent data were considered, with the baseline for effects analysis being water year (WY) 2015 conditions.

For this PEIR, the General Plan Safety Element for Stanislaus County, adopted in 2016, was reviewed to determine if goals and implementation policies in that document would apply to subsidence and future projects in the county. Where implementation policies apply to this PEIR, they are included in the impacts analysis. Stanislaus County plans and policies related to subsidence include Stanislaus County General Plan Safety Element that indicates subsidence can occur as a hazard in the County and the community must be protected against any unreasonable risks associated with the hazard.

Impacts and Mitigation Measures

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off site inelastic subsidence that could substantially interfere with land surface infrastructure or uses?		**X**		

Impact GEO-1: Be on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site inelastic subsidence that could substantially interfere with land surface infrastructure or uses (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Well Construction. No groundwater extraction will occur during well construction, so no subsidence impacts would occur. Other direct impacts related to soil instability would not occur during, or as a result of, well construction.

Direct Impacts During Well Operation. Drawdown induced by discretionary wells will incrementally add to regional drawdown trends and could draw groundwater levels down below historical low levels and cause subsidence. Such impacts, if they occur, would be significant if not mitigated. The County's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts. These requirements and the rationale for them are as follows:

- The County has designated the area within 2 miles of the Corcoran Clay subcrop boundary, as identified by the USGS, as a Subsidence Study Zone. Applications to construct new discretionary wells in this area are required to include drawdown calculations at the end of the well's operating life and for seasonal drawdown maxima, compared to historical low groundwater levels. If the well is proposed to extract groundwater from the confined aquifer system, or from the unconfined aquifer system if it contains 50 or more feet of clay in the saturated zone, and operation of the well may be reasonably expected to decrease groundwater levels below historical low levels during the life of the well, the applicant is required to submit a Geotechnical Subsidence Study. The study must demonstrate that significant subsidence is not likely to occur, or the applicant must accept any recommendations in the study to eliminate subsidence as mitigation under the project-specific CEQA analysis.

- If a well is proposed in the Subsidence Study area and predicted drawdown at the property boundary or beneath potentially sensitive infrastructure exceeds 5 feet in the deeper aquifer or 10 feet in the shallow aquifer, implementation of a Subsidence Monitoring Program is required as a permit condition.

This program is based on the fact that reported subsidence in Stanislaus County has been limited to areas underlain by the Corcoran Clay, where groundwater extraction from highly confined aquifers beneath the clay resulted in the dewatering of the compressible clay deposits. The aquifers overlying the Corcoran Clay are not confined, so wells completed in these deposits are at substantially less risk of inducing subsidence, although it remains possible. In the eastern part of the County, most groundwater production is from semi-confined aquifers in the Mehrten Formation that does not tend to contain compressible clay deposits. Similarly, the alluvial fan deposits between the Mehrten Formation outcrops to the east and the Corcoran Clay subcrop area to the west tend to be unconfined to semi-confined, and not to contain significant compressible deposits. Requiring the performance of subsidence investigations for areas underlain by the Corcoran Clay or within 2 miles of the boundary is protective and warranted to avoid potential undesirable results.

New discretionary wells for which permits are issued in the eastern portion of the County would likely be screened in the Mehrten Formation, where subsidence has not been documented and is geologically unlikely. The potential for subsidence in the eastern foothills area of the county is less than significant. Similarly, subsidence is not likely in areas more than 2 miles outside the Corcoran Clay subcrop area. If regional pumping patterns do not change further in these areas, groundwater levels are expected to remain stabilized at elevations that are unlikely to result in significant subsidence.

The Stanislaus County Hydrologic Model: Development and Forecast Modeling Technical Memorandum[148] (in Appendix D) includes groundwater head change predictions for the operation of new wells permitted under the County's discretionary well permitting program for years 2022 and 2042 (Figures 6-7 through 6-10 in Appendix D). For wells screened above the Corcoran Clay, groundwater levels may decrease up to 2 feet in select areas of the shallow aquifer system in the central and western portions of the County, but little to no change is predicted for most of that area. Modeled results for wells screened in the deeper aquifer predict groundwater head change of up to 5 feet beneath the Corcoran Clay for the same years. Five feet of drawdown is unlikely to result in significant subsidence in the confined aquifer system, but local drawdown may be greater and the locations of wells that will be permitted under the discretionary well permitting program are not known at this time. Greater amounts of drawdown have the potential to cause subsidence during periods of regional groundwater level decline, such as droughts. This will be addressed through the

[148] Jacobson James & Associates, Inc., 2017. Technical Memorandum, Stanislaus County Hydrologic Model: Development and Forecast Modeling, Stanislaus County. Draft: December 20.

implementation of the well permitting program requirements discussed above; therefore, impacts are expected to be less than significant.

Indirect Impacts. Indirect effects from permitting new wells under the County's discretionary well permitting program will not result in subsidence.

4.6 Greenhouse Gas Emissions

4.6.1 Introduction

This section discusses the broad-scale impacts of issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance with respect to GHG emissions and assesses whether the proposed measures would result in significant impacts with respect to these resources.

4.6.2 Impact Analysis

Approach and Methodology. Under the SJVAPCD District Policy – Addressing GHG Emission Impacts for Stationary Source Projects under CEQA, using BPSs is not a required mitigation of project-related impacts but a means of streamlining the CEQA review process. Projects implementing BPSs are considered to have a less than significant individual and cumulative impact on global climate change. If a project or new activity generating GHG emissions does not implement BPSs, project-specific GHG emissions would need to be evaluated. To be determined to have a less than significant individual and cumulative impact on global climate change, such projects must be determined to have reduced or mitigated GHG emissions by 29 percent as compared to normal operations of the equipment (business as usual [BAU]). BAU is the projected emissions caused by growth, without any GHG reduction measures.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			X	
Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?			X	

Impact GHG-1: Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment (Less than Significant Impact)

Direct Impacts During Construction. Developing new wells for which discretionary permits are issued could increase GHGs during construction through operation of construction vehicles and operation of construction equipment generating CO_2. BPSs have not been established for construction equipment in general. A CalEEMod emissions analysis for construction of a typical well is included in Appendix E, and indicates that typical annual emissions during well construction would be about 50 metric tons-CO_2e/year. This is considerably less than 230 metric tons-CO_2e/year, per SJVAPCD policy,[149,150] which would be a less than significant level.

Financial incentives offered by SJVAPCD in its Heavy-Duty Engine Program provides funds for the differential cost associated with the reduced-emission technology, as compared with the cost of conventional technology for heavy-duty, on-road vehicles (such as heavy-duty trucks, transit, and school buses with a gross vehicle weight over 14,000 pounds), off-road vehicles (including self-propelled vehicles such as tractors, backhoes, and excavators).[151,152,153] Using these incentives, and consequently the increasingly available reduced-emission technology during well construction, would further reduce construction-related GHGs.

Direct Impacts During Operation. Well operations could generate GHGs from the use of electricity to power electrical well pumps and occasional motor vehicle emissions associated with periodic maintenance at the well site. In a limited number of cases where pump electrical service is unavailable or impractical, additional GHG emissions may result from operation of the well pump using a diesel engine. Operational emissions would be much lower than the 25,000 metric tons/year of CO_2e annual limit that represent major facilities required to report GHG emissions to the state. Activities of smaller projects are assumed not to conflict with the State's ability to reach AB 32 overall goals, since the Air Resources Board will focus upon the largest emitters of GHG emissions to achieve maximum reductions. While the SJAVPCD has not yet adopted BPS for well operation, best management practices (BMPs) that are typically implemented include achieving operational efficiency by properly matching the pump to the well conditions and water demand, thus minimizing the horsepower required by a pump in order to reduce energy use. The pump selected for the Project will be one that provides enough total head to lift groundwater to pressurize an irrigation system while operating at a low brake horsepower rating. The use of turbine pumps with high efficiency motors (such as, for example, variable frequency drives) is common. It can be concluded that inclusion of such energy efficient features would be consistent with the SJVAPCD's approach of implementing BPSs. For these reasons, the permitting of wells under the program would not conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of GHGs, and impacts would be less than significant.

Indirect Impacts. Indirect impacts related to GHGs emissions could result if a well facilitates the conversion of rangeland to irrigated farmland resulting in an expansion of agricultural activity. Operation of farm vehicles and equipment, such as tractors, orchard heaters, and other equipment requiring diesel fuel, could increase emissions of GHGs in the SJVAB. None of these increases would produce GHGs at a level that would

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[149] SJVAPCD, 2006. *Heavy Duty Engine Program, SJVAPCD Off-Road Vehicle Component, Engine Repower Option, Eligibility Criteria and Application Guidelines, Revised October 5, 2006*.

[150] SJVAPCD, 2016f. Particulate Matter Plans. http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm. Accessed September.

[151] SJVAPCD, 2006-2012b. In-Use Off-Road Diesel / SOON Program. http://www.valleyair.org/Programs/SOON/SOONIdx.htm. Accessed November 2017.

[152] SJVAPCD, 2006. *Heavy Duty Engine Program, SJVAPCD Off-Road Vehicle Component, Engine Repower Option, Eligibility Criteria and Application Guidelines, Revised October 5, 2006*.

[153] SJVAPCD, 2007. *Heavy Duty Engine Program, SJVAPCD Off-Road Fork Lift Component, Engine Repower and Retrofit Option, Eligibility Criteria and Application Guidelines, Revised November 5, 2007*.

significantly adversely affect the environment. Operational emissions would be much lower than the 25,000 metric tons/year of CO_2e annual limit that represent major facilities required to report GHG emissions to the state. Activities of smaller projects are assumed not to conflict with the State's ability to reach AB 32 overall goals, since the Air Resources Board will focus upon the largest emitters of GHG emissions to achieve maximum reductions. While the SJAVPCD has not yet adopted BPS for well operation, BMPs that are typically implemented include the use of operational efficiency measures, energy efficient features that are consistent with the SJVAPCD's approach of implementing BPSs and minimizing GHGs. For example: using new reduced-emissions, certified, agricultural pump engines; and replacing existing engines in off-road vehicles with a new or remanufactured engine – with at least a 15 percent reduction of NOx emissions from the existing engine and no net increase of PM emissions and certified or re-certified by CARB for sale in California. Such BMPs would further reduce the contribution of new irrigated agricultural operations.[154]

Based on the information above, it is anticipated that impacts will be less than significant.

Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases (Less than Significant Impact)

An increase in the number of wells and an increase in farming activity that is indirectly made possible by these wells could increase the level of GHGs generated in the SJVAB; however, any conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases would be less than significant. Compliance with the goals in AB 32 and the SJVAPCD's guidance and policy for addressing GHG emissions would minimize these potential effects. Further reductions in GHG emissions that would comply with applicable plans, policies, and regulations can be achieved by using new reduced-emissions certified agricultural pump engines[155] and replacing existing engines in off-road vehicles with a new or remanufactured engine, with at least a 15 percent reduction of NOx emissions.[156,157] It is anticipated that as new emissions-reduction technologies techniques are tested, approved, and put into use they will reduce the potential for these impacts in the future.

4.7 Hazards and Hazardous Materials

4.7.1 Introduction

Potential impacts related to hazards and hazardous materials from the permitting of wells under the County's discretionary well permitting program could result from the use and handling of hazardous materials during drilling, well operation, and, in cases where wells are used to irrigate new crops on rangeland that was previously not cultivated, and the handling and application of soil amendments and other agri-chemicals.

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[154] SJVAPCD, 2006b. *Heavy Duty Engine Program, SJVAPCD Agricultural Pump Engine Component, Diesel to Diesel Engine Repower Option, Eligibility Criteria and Application Guidelines, Revised October 5, 2006*.

[155] SJVAPCD, 2006b. *Heavy Duty Engine Program, SJVAPCD Agricultural Pump Engine Component, Diesel to Diesel Engine Repower Option, Eligibility Criteria and Application Guidelines, Revised October 5, 2006*.

[156] SJVAPCD, 2006. SJVAPCD, 2006. *Heavy Duty Engine Program, SJVAPCD Off-Road Vehicle Component, Engine Repower Option, Eligibility Criteria and Application Guidelines, Revised October 5, 2006*.

[157] SJVAPCD, 2007. *Heavy Duty Engine Program, SJVAPCD Off-Road Fork Lift Component, Engine Repower and Retrofit Option, Eligibility Criteria and Application Guidelines, Revised November 5, 2007*.

Other potential hazards associated with the permitting of new wells subject to the County's discretionary well permitting program were found to result in less than significant impacts or no impacts in the Initial Study.

4.7.2 Impact Analysis

Approach and Methodology. The only hazardous materials associated with the drilling and operation of water wells are those that may be contained in well rehabilitation chemicals, disinfectants that have a strong pH, and fuels and lubricants used in drilling operations and pump operation and maintenance. This section evaluates the effects of the proposed program from the use of these materials. Because the use of hazardous materials is generally minimized and tightly controlled in the water well industry, drilling mud additives are typically non-hazardous and degradable, and acutely hazardous substances are not used. In the Initial Study, only one significance threshold question from Appendix G of the CEQA Guidelines was found to be associated with the potential for significant impacts and to warrant further consideration in this PEIR. Specifically, the Notice of Preparation and Initial Study determined that only the threshold related to proximity to a school was applicable to the proposed program.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one quarter mile of an existing or proposed school?			X	

Impact HAZ-1: Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one quarter mile of an existing or proposed school. (Less than Significant Impact)

The County well permit application form requires information related to distance from residences and adjacent properties, but does not preclude wells within one quarter mile of schools, so there is the potential for the use of hazardous materials within one quarter mile of a school during well construction and operation and indirectly from new cultivation activities made possible by a new irrigation well that would not otherwise be possible. Because the areas that are the subject of the discretionary well permitting program are primarily rural in nature, however, proximity of a well permitted under the program to a school or planned school is considered unlikely.

<u>Impacts During Construction.</u> The drilling of water wells is regulated, and the drilling contractor is required to provide adequate work space, safe working conditions, and sufficient containment and storage of drilling cuttings, fluids and additives. Hazardous materials are usually avoided as much as possible to minimize affecting the water quality of the new well. Mud and water used for drilling operations are required by California Well Standards to be free from sewage contamination. Drilling rig lubricants and fuel may be stored

and used in accordance with applicable regulations and Material Safety Data Sheets, during a relatively limited construction period usually not exceeding one month. The exact locations of future wells that may be permitted under the County's discretionary well permitting program are currently unknown. The vast majority of well permit applications are likely to be received for construction new irrigation wells in rural areas of the County, away from schools. Based on this information, the potential for emission or off-site release of hazardous materials is judged to be small, would be possible only for a relatively short period of time, and is unlikely to occur in close proximity to a school. For these reasons, impacts during construction would be less than significant.

Impacts During Operation. Hazardous materials associated with the operation and maintenance of wells and well pumps would be handled near the wellheads. Oil and water for lubrication of the pump and pump bearing are required to be free from contamination. Diesel fuel may be used and stored at some locations where electrical service for pumps is unavailable or impractical. Water wells subjected to chemicals during development, redevelopment, or reconditioning operations are required by California Well Standards to be thoroughly pumped, immediately after the completion of operations, to remove the agents and residues. Chemicals, water, and other wastes removed from the well would be limited in quantity and are required to be handled and disposed of in accordance with applicable local, State, and federal requirements. Drill cuttings and drilling muds from water well drilling operations are not anticipated to be hazardous. Given that new wells permitted under the County's discretionary well permitting program are not likely to be located near schools, the limited quantities of hazardous materials that may be handled, and the implementation regulatory handling requirements, the potential for impacts from hazardous materials to a school from water well operation would be very low. Impacts would be less than significant.

4.8 Hydrology and Water Quality

4.8.1 Introduction

This section discusses the approach and methodology used to assess the impacts of the program to hydrology and water quality, discusses the individual impacts relative to the thresholds of significance, and identifies mitigation measures.

4.8.2 Impact Analysis

Construction of new wells for which discretionary permits are issued would include establishment of temporary drilling areas, below-ground drilling and well construction, and construction of appurtenant access routes and electrical service lines. These activities have the potential to cause changes to surface drainage patterns or water bodies (streams and lakes) that could result in substantial changes in on- or off-site erosion, sedimentation, and flood potential. The discharge of pollutants from drilling operations could affect surface water quality. Operation of new wells has the potential to cause groundwater hydrologic effects including local and regional drawdown and changes in groundwater storage. Operation of new wells could also induce migration of low quality or contaminated groundwater, or could interfere with ongoing remediation or other water quality management programs. The conversion of rangeland to cultivated agricultural use has the potential to cause changes to surface drainage patterns or water bodies that could result in substantial changes in on or off-site erosion, sedimentation and flood potential, or the discharge of pollutants from agricultural operations.

Approach and Methodology. No specific level of future well permitting was forecast for this analysis because the actual number of applications that will be received are not known. The hydrologic effects analysis discussed in Appendix D was completed based on the assumption that 10 wells would be permitted and constructed per year between 2018 and 2022. The locations, completion depths and pumping rates of these wells are not known. Consequently, this PEIR qualitatively assesses potential impacts on hydrology and water quality from implementation of the permitting program and subsequent well development and operation on a general, programmatic level. This assessment is not site-specific, and no site-specific hydrogeologic studies were done for this analysis. Desktop analysis, literature review, and environmental and planning documentation review were conducted as referenced below and in Section 3.0. In addition, as the program being evaluated in this PEIR is a well permitting program that would directly affect groundwater resources, substantial background study and groundwater resources effects analysis was done to support the impact analysis. The SCHM was constructed to evaluate the potential groundwater impacts associated with this program, and to document the potential effects of planned and foreseeable projects and trends to inform the understanding of the environmental setting and the analysis of cumulative impacts. The data and approach used to construct and calibrate the SCHM, and the results of the forecast modeling are in the Technical Memorandum, Appendix D.

As stated previously in Sections 1.0 and 2.0, this analysis takes into consideration that the Ordinance and discretionary well permitting program are intended to minimize or prevent adverse environmental effects associated with the unsustainable development of groundwater resources, and that implementation of the permitting program is expected to decrease potential impacts related to groundwater withdrawal by permitted wells. The Ordinance has been deliberately aligned with the requirements of the SGMA, including the avoidance and amelioration of "undesirable results," which are in turn directly related to the threshold question for impact significance examined in this impact analysis. The discretionary well permitting program adopted by the county to implement the Ordinance includes triggers, requirements, and permit conditions that are specifically designed to prevent potential "undesirable results," recognizing that in 2020 or 2022 (depending on the groundwater subbasin), GSPs are required to be adopted that will further refine and potentially replace this framework, and provide the basis for long-term sustainable groundwater management by GSAs in compliance with the SGMA. As such, the well permitting program that is being evaluated herein is intended to bridge the gap between the present and 2020 or 2022, when GSPs will be adopted.

The relationship between the "undesirable results" defined in the Ordinance and SGMA and the management objectives and thresholds in the County's discretionary well permitting program is summarized in Appendix B. In most cases, the well permitting program already includes provisions that would result in the impacts of program implementation being less than significant. In the case of well interference drawdown, however, the program requires implementation of mitigation measures if specified interference drawdown thresholds are met.

The terms of groundwater extraction permits issued under the county's discretionary well permitting program are initially limited to the dates that GSPs must be adopted, and thereafter are renewed for 5-year terms that coincide with the regulatory cycle for GSP updates. It is recognized that in order to prepare and update the required GSPs, detailed studies will be conducted throughout each of the subbasins in the county in order to establish management thresholds, measurable objectives, milestones and monitoring programs that meet state requirements for sustainable groundwater management under the SGMA. These studies are expected to provide information and insight beyond that available at this time, and refine, update, and potentially replace the thresholds and requirements currently embodied in the county's discretionary well permitting program. After GSPs are adopted, GSAs will be responsible for their implementation and enforcement, with specific requirements for future "undesirable results" to be avoided, and any existing "undesirable results" to be ameliorated by 2042 in accordance with identified milestones. If GSAs fail to adopt adequate GSPs, or fail to adequately implement them, the SGMA requires that the state intervene to assure that the required sustainability goals are met. The Ordinance allows the county to intervene and regulate unsustainable extraction prior to state intervention, thus providing an additional safeguard against unsustainable groundwater extraction; however, as explained previously, this is considered unlikely to be needed.

Potential impacts to hydrology and water resources were evaluated using the following stepwise approach:

- The nature of the potential impacts and the processes or root causes leading to their occurrence was identified and discussed.
- The potential for groundwater extraction from wells permitted under the county's discretionary well permitting program to cause or contribute to hydrologic or water quality impacts was evaluated primarily for the time period before GSPs are adopted (prior to 2020 or 2022). The analysis considers the effectiveness of the applicable triggers, requirements and permit conditions in the county's discretionary well permitting program to prevent or ameliorate potential significant impacts. After GSPs are adopted, it is assumed that implementation of the GSPs, and adoption of updated permit conditions when groundwater extraction permits are renewed, will be sufficient to prevent potential adverse hydrologic or water quality impacts.
- The potential effects of regulating unsustainable wells, although unlikely to be implemented (unless GSAs fail to adopt adequate GSPs or fail to adequately implement them), is assumed to result in a net benefit to the environment and to result in less than significant impacts related to hydrology and water quality.
- The results of the hydrogeologic effects analysis in Appendix D and other pertinent data were considered and compared to a baseline reflecting WY 2015 conditions.

For this PEIR, the General Plan Conservation/Open Space Element for Stanislaus County, adopted in 2016, was reviewed to determine if goals and implementation policies in that document would apply to hydrology and water quality and future projects in the county. Where the implementation policies apply to this PEIR, they are included in the impacts analysis. Stanislaus County plans and policies related to hydrology and water resources include Stanislaus County General Plan Conservation/Open Space Element, Goal 2, Policy 5 ("protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers"), Policy 7 ("new development that does not derive domestic water from pre-existing domestic and public water supply systems shall be required to have a documented water supply that does not adversely impact Stanislaus County water resources"), and Policy 8 ("the county shall support efforts to develop and implement water management strategies"). Other applicable parts of the Stanislaus County General Plan include Agricultural Element, Goal 3, Objective 3.2, Policy 3.4 ("the county shall encourage the conservation of water for both agricultural, rural domestic, and urban uses"); Policy 3.5 ("the county will continue to protect the quality of water necessary for crop production and marketing"); and Policy 3.6 ("the county will continue to protect local groundwater for agricultural, rural domestic, and urban use in Stanislaus County").

Impacts and Mitigation Measures

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
Violate any water quality standards or waste discharge requirements, or cause the degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the California Regional Water Quality Control Board's Water Quality Control Plan?			**X**	
Cause interference drawdown to existing wells that substantially interferes with their ability to support existing land uses, or land uses for which permits have been granted?		**X**		
Cause groundwater drawdown or storage depletion that does not recover over a period of years that includes both wet and dry periods, and that will interfere with the ability of other well operators to support existing or permitted land uses, or that will substantially increase the cost to pump groundwater in the area?		**X**		
Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?		**X**		
Substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?		**X**		

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Otherwise substantially degrade water quality?			X	

Impact WAT-1: Violate any water quality standards or waste discharge requirements, or cause the degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the California Regional Water Quality Control Board's Water Quality Control Plan (Less than Significant Impact)

<u>Direct Impacts During Well Construction.</u> The construction of a new groundwater well under the county's discretionary well permitting program does not include the construction of any facilities that would generate wastewater or other waste requiring disposal. Mud-rotary drilling operations would use relatively inert National Sanitation Foundation Baroid-type products and biodegradable additives. Drill cuttings would be handled in a temporary mud pit and would be dried out and mixed into surface soils in upland areas after the completion of drilling operations, or removed from the site for disposal at a properly licensed facility. Hazardous materials handled during well construction include fuels and drill rig lubricants. Because these materials will be handled in accordance with their labeling, Safety Data Sheets, and other applicable requirements to prevent accidental discharge, direct impacts during well construction would be less than significant.

<u>Direct Impacts During Well Operation.</u> The operation of new wells permitted under the county's discretionary well permitting program could cause the migration of impaired groundwater in violation of applicable water quality objectives and the state's anti-degradation policy. Such impacts, if they occurred, could be significant if not mitigated. The county's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts. These requirements and the rationale for them are:

- The County designates Groundwater Quality Protection Zones under its well permitting implementation program where special well design requirements are warranted to protect the existing quality of groundwater from being degraded in excess of Water Quality Objectives for applicable beneficial uses in the RWQCB's Water Quality Control Plan. Such a zone has been designated to prevent the cross connection of the shallow and deeper aquifer systems in the area underlain by the Corcoran Clay as determined by the USGS.[158] If an application is received to construct a new well in this area, the County prescribes well design requirements (such as the installation of well seals) to prevent potential cross connection. Other Groundwater Quality Protection Zones may be established in the future areas where pockets or strata of lower quality groundwater are found. This could include strata with elevated concentrations of nitrate, arsenic or uranium; areas near known groundwater contamination plumes; or areas where wells are completed to depths near the base of freshwater. In such areas, the County will designate well design

[158] USGS, 2012. *Extent of Corcoran Clay modified from Page (1986) for the Central Valley Hydrologic Model (CVHM):* https://water.usgs.gov/GIS/metadata/usgswrd/XML/pp1766_corcoran_clay_extent.xml

requirements, depth limitations, or setback requirements to prevent water quality degradation. Pending the establishment of formal Groundwater Quality Protection Zones, the need for such actions is determined by the County on a case-by-case basis during the well permitting process.

- The County designates Groundwater Quality Study Zones under its well permitting implementation program where special study requirements are warranted to help assure that wells are constructed and operated in a way that prevents the existing quality of groundwater from being degraded in excess of Water Quality Objectives for applicable beneficial uses in the RWQCB's Water Quality Control Plan. Applicants are required to provide information about reported contamination incidents within 1 mile of their proposed well location, and if reported contamination incidents are identified, to provide substantial evidence that the well will be constructed and operated in a way that will not result in capture and additional migration of a contamination plume. The County will require Water Quality Investigations, if needed, to assure a proposed well will not mobilize groundwater contamination or interfere with ongoing cleanup efforts. Formal Groundwater Quality Study Zones may be established in areas surrounding known and reported contamination incidents in the future. Pending the establishment of formal Groundwater Quality Study Zones, the need for such actions is determined by the County on a case-by-case basis during the well permitting process.

With these measures as part of the County's discretionary well permitting program, impacts will be less than significant.

Indirect Impacts. Some wells permitted under the County's discretionary well permitting program would provide water to irrigate crops in areas that were not previously cultivated, such as in portions of the County where uncultivated rangeland is being converted to irrigated agricultural use. In many cases, this use would not be possible were it not for installation of a new discretionary well, so the impacts associated with this change in use are considered an indirect effect of the project. The grower's responsible for these operations must obtain regulatory coverage under the RWQCB's Irrigated Lands Regulatory Program (ILRP), either by joining a coalition, obtaining coverage as an individual grower under general Waste Discharge Requirements (WDRs), or obtaining an Individual Permit. Compliance with the ILRP would assure that water quality standards and waste discharge requirements are not exceeded, so indirect impacts would be less than significant.

Impact WAT-2: Cause interference drawdown to existing wells that substantially interferes with their ability to support existing land uses, or land uses for which permits have been granted (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Well Construction. There would be no impact to groundwater levels during construction of a well because only limited groundwater extraction would occur.

Direct Impacts During Well Operation. Groundwater extraction from a well results in the formation of a "cone of depression" in groundwater levels around the well. Groundwater drawdown is greatest at the well and decreases in the surrounding area. The cone of depression will continue to grow and get deeper until the well intercepts recharge sources that are of an equivalent volume as the water being extracted. The rate of growth of the depression cone slows exponentially over time, reaching a state of quasi-equilibrium even if no recharge occurs. When a cone of depression reaches another well, the depth that well must pump water from increases. This is called interference drawdown, and can lead to decreased well productivity, increased pumping costs, or in severe cases, a well going dry. If water levels drop below the top of a well's screen interval, the rate of bacterial growth and encrustation of the well screen can increase, increasing the need for well maintenance. When a well is no longer able to support existing land uses or land uses for which permits have been granted, well interference impacts would be considered significant unless mitigated.

The County's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts. These requirements are:

- Applications for the installation of new discretionary wells are required to include a distance-drawdown analysis that analyzes the potential effect of the proposed well on nearby receptors, including domestic and other supply wells. Drawdown must be evaluated at the time that GSPs are required to be adopted in the subbasin in which the well is proposed, and at the end of the wells useful life, usually considered to be 20 years. Predicted drawdowns are validated by the County during processing of the permit applications.
- If the predicted drawdown at an existing domestic well is reasonably expected to be greater than 5 feet, or 10 percent of the available drawdown if the well extends more than 50 feet below standing water levels, during the projected lifetime of the well then the applicant must either alter their proposal to keep this threshold from being exceeded, or must accept an interference drawdown monitoring and mitigation program that mitigates interference drawdown impacts to less than significant levels. The drawdown threshold of 5 feet was adopted because domestic wells are generally shallower than higher capacity production wells, and are more vulnerable to effects from interference drawdown. A reasonable minimum completion depth of domestic wells below the water table is generally about 50 feet in Stanislaus County, and decreasing the available drawdown of a well by 10 percent is not likely to significantly decrease well yield or result in other adverse effects. This threshold has been used to assess interference drawdown for numerous groundwater resources impact assessments across the state under CEQA.
- If the predicted drawdown at an existing municipal, industrial, or irrigation well is reasonably expected to be greater than 20 feet during the projected lifetime of the well, then the applicant must either alter their proposal to keep this threshold from being exceeded, or must accept an interference drawdown monitoring and mitigation program that mitigates impacts to less than significant levels. Larger production wells generally will have a greater completion depth than domestic wells, and in most cases in the county extend at least about 200 feet below the water table. An increased drawdown of 20 feet for these wells is not likely to significantly decrease well yield or result in other adverse effects. This threshold has been adopted as a threshold of significance in other groundwater resource impact assessments under CEQA at other sites based on local conditions.

Groundwater drawdown relative to a WY 2015 baseline condition was modeled using the SCHM in support of this PEIR to assess the general impacts associated with completion of wells under the County's discretionary well permitting program, and is discussed in Appendix D. The results of Scenarios 4a and 4b (construction of new wells in the shallow and deeper aquifers, respectively during the program) indicate that areas of groundwater level depression exceeding 5 feet may be expected to develop in the eastern portion of the county in the shallow and the deeper aquifer system, and in the western and central areas of the county in the deeper aquifer system. These areas are predicted to be about 1 to 2 miles across by 2022, and to increase in number and size to about 1 to 10 miles across by 2042. The maximum predicted depth of drawdown is approximately 5 feet by 2022 and 10 feet by 2042. These SCHM-predicted drawdowns should be considered general indicators of what may be expected at a scale of a mile or more – more highly localized drawdown is beyond the resolution of the SCHM to predict. Thus, localized interference drawdown in excess of 20 feet is possible depending on the aquifer conditions at actual well locations, and the completion details and actual pumping rates of the wells.

Based on the results of the SCHM groundwater modeling, significant interference drawdown impacts to domestic wells are possible, and the potential for significant interference drawdown impacts to municipal, industrial and irrigation wells cannot be ruled out without more site-specific analysis. The County's discretionary well permitting program requires that the potential for these impacts be evaluated on a case-by-case basis for each well application, and that the activities described in Mitigation Measure WAT-2 be implemented if interference drawdown to domestic wells is predicted to exceed 5 feet or interference drawdown to municipal, industrial or irrigation wells is predicted to exceed 20 feet. With the implementation of Mitigation Measure WAT-2, impacts will be less than significant.

<u>Indirect Impacts.</u> There would be no indirect impacts on groundwater levels in nearby wells from the conversion of rangeland to agricultural production.

> **Mitigation Measure WAT-2.** Property owners and water agencies in the area where predicted drawdown exceeds 5 feet will be notified of the existence of the Interference Drawdown Monitoring and Mitigation Program, and will be invited to register any domestic wells in the predicted 5-foot drawdown area and any municipal, industrial, or irrigation wells in the predicted 20-foot drawdown area to participate in the program. To register for the program, well owners will be required to complete a Well Information Questionnaire regarding the construction, use, history and performance of their well, and to allow access for periodic measurement of water levels and assessment of well condition and performance by the county or a neutral third party. If well performance is found to be diminished by more than 20 percent or to be inadequate to meet pre-existing water demand due to interference drawdown, registered participants will be eligible to receive reimbursement for reasonable and customary costs for well replacement, deepening or rehabilitation, or pump lowering as needed to restore adequate well function. The cost of reimbursement shall be borne by the operator of the well causing the interference in proportion to the degree of their contribution to the drawdown that caused the diminished yield.

Impact WAT-3: Cause groundwater drawdown or storage depletion that does not recover over a period of years that includes wet and dry periods, and that will interfere with the ability of other well operators to support existing or permitted land uses, or that will substantially increase the cost to pump groundwater in the area (Less than Significant Impact with Mitigation Incorporated)

<u>Direct Impacts During Well Construction.</u> There would be no impact to groundwater levels or storage during construction of a well because groundwater extraction during construction is limited.

Direct Impacts During Well Operation. The Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the county, have been designated as critically overdrafted by the DWR, and all four subbasins in the county experienced storage depletion and other stresses from recent, unprecedented, drought conditions between 2011 and 2015. Particular concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to drought conditions and changing surface water allocations. Some areas in the eastern portion of the county, where aquifers are productive but recharge is limited, have experienced long-term declining groundwater level trends for several decades.[159]

The construction and operation of new groundwater wells for which discretionary permits are issued could further deplete groundwater supplies and storage or cause a chronic lowering of groundwater levels. The county's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts. These requirements are:

- The county designates Groundwater Level Management Zones under its well permitting implementation program where installation of new wells would contribute to, or, in the absence of direct data can be reasonably inferred to contribute to, a condition of Critical Overdraft, which is "*... when present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts*."[160] This includes areas where existing groundwater level trends constitute "*chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon*" as defined in Section 9.37.030(9)(a) of the Ordinance. In such areas, an applicant proposing installation of a new well that is not exempt from the Ordinance is required to submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be offset, resulting in no net additional groundwater demand. Alternatively, the applicant must do a Groundwater Resources Investigation and implement a Groundwater Level Monitoring Program that demonstrates the proposed extraction will not result in, or contribute to, Undesirable Results as defined in the Ordinance. Such a zone has been designated in one area of the northern triangle region of the County (Grid Element 568 of the California Central Valley Groundwater-Surface Water Simulation Model [C2VSim], which is located near the community of Valley Springs), but areas of the County outside the northern triangle have yet to be evaluated for potential designation. Other Groundwater Level Management Zones may be established in the future in areas where forward extrapolation of historical groundwater level trends over the SGMA Planning and Implementation Horizon (50 years) indicates that drawdown exceeding 10 percent of the aquifer system thickness may occur if current conditions persist. Pending the establishment of additional Groundwater Level Management Zones, the need for Groundwater Offset Plans, Groundwater Resource Investigations, and Groundwater

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[159] Jacobson James & Associates, Inc., 2017. Technical Memorandum, Stanislaus County Hydrologic Model: Development and Forecast Modeling, Stanislaus County. Draft: December 20.

[160] DWR, 1980. *Groundwater Basins in California, A Report to the Legislature in Response to Water Code Section 12924*: Bulletin 118-80.

Level Monitoring Programs is determined by the County on a case-by-case basis during the well permitting process.

- Applications for the installation of new discretionary wells are required to include an assessment of the water demand to be met by the proposed well compared to available storage space in the aquifer beneath the contiguous parcels to be served by the well. Submittal and implementation of a Groundwater Level Monitoring Program is required if the total water volume to be pumped from the proposed well during the permit term is projected to exceed 10 percent of the available static aquifer storage volume beneath the contiguous property to be served by the well. Because this calculation is done under static conditions, it is a relatively conservative trigger for implementation of groundwater level monitoring. Promoting collection of adequate groundwater monitoring data to inform future groundwater management decisions is a key objective of the Ordinance.
- If groundwater level monitoring indicates that the total available aquifer storage beneath the area served by the well has decreased by more than 5 percent under pumping conditions, a well operator is required to submit and implement a Pumping Management Plan that will prevent storage depletion in excess of 10 percent or alternately, to submit a Groundwater Resources Investigation that demonstrates a higher threshold is adequate to prevent Undesirable Results.
- If groundwater level monitoring indicates that the total available aquifer storage volume beneath the area served by the well has been decreased by 10 percent under pumping conditions, a well operator is required to curtail pumping until storage recovers to a level exceeding the threshold, or alternatively, to submit a Groundwater Resources Investigation that demonstrates a higher threshold is adequate to prevent Undesirable Results. Ultimately, the maximum, sustainable drawdown will be determined by the most drawdown-sensitive, undesirable result or impact. In the absence of other undesirable results, the loss of 10 percent of available aquifer thickness or storage space is not likely to significantly interfere with a groundwater pumper's ability to meet the water demand for existing or permitted land uses, significantly increase pumping costs, or significantly decrease dry year storage.

The above thresholds will limit groundwater extraction based on a storage volume threshold that depends on the aquifer response to pumping and the local groundwater balance. As such, it incorporates a range of key technical factors that are expected to be investigated as part of groundwater basin management under SGMA, but are not yet known. It is expected that as more rigorous evaluations of sustainable yield is conducted for the preparation of GSPs, the GSAs in the County will address this issue with more rigor, which may lead to a revision of this threshold when GSPs are adopted and/or during future GSP updates.

Groundwater modeling was done using the SCHM in support of this PEIR to assess the general impacts associated with completion of wells under the County's discretionary well permitting program relative to a WY 2015 baseline, and is discussed in Appendix D. The results of Scenarios 4a and 4b indicate that areas of groundwater level depression ranging from 1 to 10 feet may be expected to develop in the eastern portion of the County in the shallow and the deeper aquifer systems, and in the western and central areas of the County in the deeper aquifer system. The thickness of the aquifer system that would be pumped in these areas is estimated to be between approximately 200 and 500 feet. If the predicted drawdowns are less than

10 percent of the aquifer thickness, the impacts from implementing the discretionary well permitting program are predicted to be less than significant as long as any Groundwater Level Management Zones are identified and managed as indicated above. To date only the northern triangle area of the county has been evaluated to determine if Groundwater Level Management Zones should be established there. Mitigation Measure WAT-3 will require evaluation of the remaining areas of the county to which the discretionary well permitting program applies to determine whether additional groundwater management zones should be established.

Indirect Impacts. There would be no indirect impacts on groundwater levels and storage from the conversion of rangeland to irrigated cultivation.

> **Mitigation Measure WAT-3.** The County will identify additional Groundwater Level Management Zones in the unincorporated, non-district portions of the County where existing groundwater level trends constitute "*chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon*" as defined in Section 9.37.030(9)(a) of the Ordinance. In such areas, an applicant proposing installation of a new discretionary well is required to submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be offset, resulting in no net additional groundwater demand to the pumped aquifer system. Alternatively, the applicant must do a Groundwater Resources Investigation and implement a Groundwater Level Monitoring Program that demonstrates the proposed extraction will not result in, or contribute to, Undesirable Results as defined in the Ordinance.

Impact WAT-4: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. The project involves construction of groundwater wells and appurtenant access routes and electrical service. The wells and their appurtenances will not be permitted to be in surface water bodies or drainages where they could alter the course of a stream or river and cause substantial erosion or siltation. Because it is currently not known where new discretionary wells will be located and it is possible that construction of well pads and access routes could encroach on surface water bodies or drainages, the actual construction impacts associated with these wells cannot be adequately evaluated. At a program level, it is concluded that constructing new wells permitted under the Ordinance in undeveloped rangeland portions of the county has a significant potential to cause substantial erosion or sedimentation, and that the potential for such impacts must be evaluated on a site-specific basis as specified in Mitigation Measure WAT-4. With the implementation of this mitigation measure, impacts would be less than significant.

Direct Impacts During Operation. The project involves operation of groundwater wells. The wells and their appurtenances will not be permitted in surface water bodies or drainages where they could alter the course of a stream or river and result in substantial erosion or siltation. Occasional maintenance will be conducted during well operation and will occur in the immediate vicinity of wellheads and not involve ground disturbing activities. Direct impacts during operation will be less than significant.

Indirect Impacts. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land may cause some alteration of drainage patterns. Deep ripping of slopes could make them more vulnerable to erosion. As with any agricultural operation, impacts to surface drainages that cause erosion or siltation would be minimized as part of standard soil conservation practices employed in farming operations. Because it is not currently known where new discretionary wells will be located that will make agricultural conversion of rangeland possible, and some alteration of drainages and streams cannot be ruled out, the actual indirect impacts associated with these wells cannot be adequately evaluated. At a program level, it is concluded that indirect impacts of new wells that are permitted under the ordinance in undeveloped rangeland portions of the County include a significant potential for substantial erosion or sedimentation, and that the potential for such impacts must be evaluated on a site-specific basis as specified in Mitigation Measure WAT-4. With the implementation of this mitigation measure, impacts would be less than significant.

> **Mitigation Measure WAT-4.** Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in significant on- or off-site erosion or sedimentation. If the potential for significant erosion or sedimentation is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.

Impact WAT-5: Substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. The project involves construction groundwater wells and appurtenant access routes and electrical service. The wells and their appurtenances will not be permitted in surface water bodies or drainages where they could alter the course of a stream or river and cause substantial flooding. Because it is not currently known where new discretionary wells will be located and it is possible that construction of well pads and access routes could encroach on surface water bodies or drainages, the actual construction impacts associated with these wells cannot be adequately evaluated. At a program level, it is concluded that constructing new wells that are permitted under the Ordinance in undeveloped rangeland portions of the County has a potential to cause flooding, and that the potential for such impacts must be evaluated on a site-specific basis as specified in Mitigation Measure WAT-5. With the implementation of this mitigation measure, impacts would be less than significant.

Direct Impacts During Operation. The project involves operation of groundwater wells. The wells and their appurtenances will not be permitted in surface water bodies or drainages where they could alter the course of a stream or river and cause a substantial increase in runoff that results in a greater potential for on- or off-site flooding. Occasional maintenance will be conducted during well operation and will occur in the immediate vicinity of wellheads and not involve activities that would affect drainage. Direct impacts during operation will be less than significant.

Indirect Impacts. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land may cause some alteration of drainage patterns. As with any agricultural operation with good management practices, impacts to drainage patterns and streams would be minimized. Because, it is not currently known where new discretionary wells will be located that will make agricultural conversion of rangeland possible, and some alteration of drainages and streams cannot be ruled out, the actual indirect impacts associated with these wells cannot be adequately evaluated. At a program level, it is concluded that indirect impacts of new wells that are permitted under the ordinance in undeveloped rangeland portions of the County include a potential for flooding, and that the potential for such impacts must be evaluated on a site-specific basis as specified in Mitigation Measure WAT-5. With the implementation of this mitigation measure, impacts would be less than significant.

Mitigation Measure WAT-5. Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in an increase in runoff and significant on- or off-site flooding. If the potential for significant flooding is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.

Impact WAT-6: Otherwise substantially degrade water quality (Less than Significant Impact)

The operation of new wells permitted under the county's discretionary well permitting program could cause a general degradation in water quality when multiple aquifer zones of varying water quality are cross-connected. This is of particular concern in the area underlain by the Corcoran Clay, which forms a relatively robust, regional barrier between the upper and lower aquifer systems underlying much of the central and western portions of the County. Head differences between the shallow and deeper aquifer systems in this area have the potential to drive vertical flow through boreholes and wells that penetrate this layer. The county's discretionary well permitting program includes application requirements and thresholds to help prevent such impacts. These requirements are:

- The County designates Groundwater Quality Protection Zones under its well permitting implementation program where special well design requirements are warranted to protect the existing quality of groundwater from being degraded in excess of Water Quality Objectives for applicable beneficial uses in the RWQCB's Water Quality Control Plan. Such a zone has been designated to prevent the cross connection of the shallow and deeper aquifer systems in the area underlain by the Corcoran Clay as determined by the USGS.[161] The County prescribes permit conditions for all new discretionary wells constructed in this area that prohibit construction of composite wells that are screened in both the shallow and deeper aquifer system, and requires annular seals that will prevent vertical flow through the well annulus for all wells that penetrate the Corcoran Clay.

[161] USGS, 2012. *Extent of Corcoran Clay modified from Page (1986) for the Central Valley Hydrologic Model (CVHM):* https://water.usgs.gov/GIS/metadata/usgswrd/XML/pp1766_corcoran_clay_extent.xml

With these measures as a part of the County's discretionary well permitting program, impacts will be less than significant.

4.9 Land Use and Planning

4.9.1 Introduction

This section presents the approach and methodology, impacts, and mitigation measures associated with the land use and planning environmental impact analysis for the proposed program.

4.9.2 Impact Analysis

The study area for land use and planning is composed of the unincorporated areas of Stanislaus County. The existing conditions of October 2016 are the baseline against which the impacts of the proposed program are evaluated. The evaluation includes the direct, indirect, short-term, and long-term adverse effects of the proposed program.

Approach and Methodology. The land use and planning impacts relative to the subject threshold questions were determined by evaluating the program against the applicable elements, goals, policies, and implementation measures of the Stanislaus County General Plan (see Section 3.2). Because the Initial Study for the Notice of Preparation determined that issuing well permits under the County's discretionary well permitting program will not physically divide any communities or conflict with any applicable habitat conservation plan or natural community conservation plan, these threshold questions were eliminated from further consideration in this PEIR.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?		X		

Impact LAN-1: Conflicts with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect (Less than Significant Impact with Mitigation Incorporated)

While issuing permits for new wells under the County's discretionary well permitting program would generally be consistent with the General Plan's goals, policies, and implementation measures protecting environmental resources and avoiding adverse environmental effects, it is possible that the direct and indirect effects of issuing individual well permits could conflict with those tenets. The locations or specific circumstances of individual well permit applications are not yet known. At a program level, the potential for significant impacts cannot be ruled out, and the potential for significant impacts is presumed to exist. Because the Initial Study for the Notice of Preparation determined that no significant impacts would occur to Aesthetics and Mineral Resources, the program would not conflict with Goals One and Nine of the Conservation/Open Space Element. Because the analysis in Section 4.2.2 determined that no significant impacts would occur to Air Quality, the program would not conflict with Goal Six of the Conservation/Open Space Element. With implementation of Mitigation Measures BIO-4, CUL-1a, CUL-1b, CUL-1c, WAT-2, WAT-3, and NOI-1, this impact will be reduced to less than significant.

4.10 Noise

4.10.1 Introduction

This section discusses the approach and methodology used to assess the noise impacts that could result from issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance. The following sections describe the thresholds of significance; mitigation measures to minimize, avoid, reduce, eliminate, or compensate for significant impacts; and the overall significance of the impact with mitigation incorporated.

4.10.2 Impact Analysis

Approach and Methodology. Noise impacts associated with issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance are discussed at a programmatic level because the uses and locations of wells for which discretionary permits will be issued are not known. The analysis is focused on evaluating impacts from temporary, construction-related noise, and long-term noise associated with pump operations and conversion of rangeland to irrigated agricultural use.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Exposure of persons to or generation of noise level in excess of standards established in the local general plan or		X		

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
noise ordinance, or applicable standards of other agencies?				
A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?		X		

Impact NOI-1: Expose persons to, or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies (Less than Significant Impact with Mitigation Incorporated)

Direct Impacts During Construction. Construction of wells for which discretionary permits are issued could increase noise levels through operation of construction vehicles and construction equipment, such as drilling rigs, portable generators, compressors, and power tools. These construction activities may occur 24 hours per day. The Stanislaus County Noise Ordinance limits noise generated from construction equipment to 75 dBA between 7:00 p.m. and 7:00 a.m. at the property line. A study of drilling rig noise levels done for the oil and gas well industry reported measurable noise at 700 feet from the drilling rig and audible noise at 1,000 feet from the drilling rig. The maximum noise levels were produced by running casing and were measured at an average of 102 dBA at a distance of 10 feet from the drill rig engine. Average noise levels of 71 to 79 dBA were found at a distance of 200 feet from the drilling rig. Noise levels typically attenuate at approximately 6 dB for each doubling of distance from the noise source. Typically, new wells would be installed in rural areas at a sufficient distance from sensitive receptors (greater than 200 feet, based on this example). It is unlikely that a well would be drilled closer than 200 feet to a sensitive receptor that is located on a parcel not zoned for agricultural use, nevertheless, Mitigation Measure NOI-1 would mitigate noise impacts if this were the case. With the implementation of Mitigation Measure NOI-1, impacts would be less than significant.

Direct Impacts During Operation. While operation of newly permitted wells could result in long-term noise increases, agricultural activity is exempt under the Stanislaus County Noise Ordinance. According to the Federal Highway Administration Noise Handbook, pumps are rated at a noise level of 77 dBA at a distance of 50 feet. At an attenuation of 6 dB for every doubling of distance from the noise source, well operations would have a less than significant effect at approximately 70 feet from the nearest sensitive receptor. Generally, these wells are not expected to operate 24 hours per day, but only when irrigation is taking place during daytime hours, which coincides with the time when receptors are least sensitive to noise exposure. It is unlikely that a well would be located closer than 70 feet to a sensitive receptor that is located on a parcel not zoned for agricultural use, nevertheless, Mitigation Measure NOI-1 would mitigate noise impacts if this were the case. With the implementation of Mitigation Measure NOI-1, impacts would be less than significant.

Indirect Impacts. Conversion of rangeland to irrigated agricultural use could result in long-term noise increases; however, agricultural activity is exempt under the Stanislaus County Noise Ordinance. As such, no impact would occur.

Mitigation Measure NOI-1. If well construction activities will take place closer than 200-feet from a nearby sensitive receptor on non-agriculturally zoned parcels, the project shall employ noise attenuating measures and/or work schedules such that the project would comply with the Stanislaus County Noise Ordinance and General Plan Noise Element. Noise mitigation shall include a combination of the measures to achieve construction noise at or below the maximum allowable noise level of 75 A-weighted decibels from 7:00 p.m. to 7:00 a.m.

If a well is located closer than 70 feet to sensitive receptors on non-agriculturally zoned parcels, operating noise mitigation measures shall be implemented such that the project will comply with the Stanislaus County Noise Ordinance.

Impact NOI-2: Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project (Less than Significant Impact with Mitigation Incorporated)

Issuing permits for new wells under the county's discretionary well permitting program could increase ambient noise levels as a result of temporary construction-related noise, and long-term noise associated with pump operations and conversion of rangeland to irrigated agricultural use. Agricultural activity, including the drilling and operation of wells, is exempt under the Stanislaus County Noise Ordinance. Construction noise would be temporary, and the wells developed under the program would operate intermittently during the irrigation season, primarily during daytime hours when ambient noise levels are higher. Typically, new wells would be installed in rural areas at a sufficient distance from sensitive receptors (greater than 200 feet, as discussed under Impact NOI-1) for noise to attenuate to less than significant levels before reaching nearby receptors. With the implementation of Mitigation Measure NOI-1 noise impacts would be limited to less than significant levels.

4.11 Utilities and Service Systems

4.11.1 Introduction

This section discusses the impacts of the program on utilities and service systems for both the exempt areas and unincorporated areas of Stanislaus County.

Exempt Areas. Public water agencies supply groundwater in exempt areas in compliance with a GMP or a GSP. Before GSPs are adopted under SGMA, the County's groundwater management authority in exempt areas is limited to issuing ministerial well permits exempt from the prohibition against unsustainable extraction. After GSPs are adopted, the Ordinance prohibition against unsustainable groundwater extraction will apply to any well (including existing wells) from which the County reasonably concludes that groundwater is being unsustainably withdrawn. Issuing permits for new wells for which such a determination is made would therefore become discretionary. The County also would determine whether continued groundwater extraction from existing wells, for which such a determination is made, is unsustainable and therefore prohibited.

Unincorporated Non-District Areas. The county is responsible for issuing discretionary permits for new wells in unincorporated areas that are not in the jurisdictional boundaries of a public water agency covered by a GMP or GSP. After the adoption of GSPs by 2020 or 2022 (required under SGMA) applications for new well permits will be exempt from the Ordinance prohibition and would be issued on a ministerial basis if the GSA determines they comply with the applicable GSP, unless the county reasonably concludes that groundwater extraction from the proposed well will be unsustainable. Existing wells, for which the county reasonably concludes groundwater extraction is unsustainable, would be subject to the prohibition.

4.11.2 Impact Analysis

Approach and Methodology. This analysis addresses the program's short- and long-term impacts on water utilities, specifically whether the permitting of new wells under the program would impact, directly or indirectly, the sufficiency of water supplies available to serve the region from existing entitlements and resources.

Existing conditions as of October 2016 are the baseline against which the significance of the program's potential impacts on existing entitlements and resources are evaluated. So, the reasonably foreseeable impacts of the plan updates are compared with the existing environment. Because the project does not propose any site-specific development activities, this analysis focuses on general impacts on existing water supplies that could occur as a result of the program.

Impacts and Mitigation Measures

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			X	

Impact UTL-1: Sufficient water supplies available to serve the project from existing entitlements and resources or need for new or expanded entitlements (Less than Significant Impact)

<u>Issuing discretionary well permits for proposed new wells subject to the Ordinance prohibition against unsustainable extraction.</u> The County would continue to implement a discretionary well permitting program for new wells that are subject to the Ordinance prohibition against unsustainable extraction. The applicant must provide substantial evidence that the proposed groundwater extraction will be sustainable, as defined under the Ordinance, for new wells to be constructed before the GSP is adopted. The well permitting guidelines developed under the Ordinance outline the requirements for substantial evidence that must accompany non-exempt well permit applications and the criteria for their evaluation (Appendix B). They prescribe well permit conditions for new wells, as needed, to assure they are operated sustainably as defined under the Ordinance. This could potentially include limitations on pumping, or, in some cases, denial of

permits; however, the permit conditions imposed by an agency to comply with regulatory requirements to protect the environment are not considered project impacts under CEQA. So, there would be no impact to existing entitlements or resources with the continued issuance of discretionary well permits before a GSP is adopted.

There could be indirect effects on existing water supplies and utilities because applicants who receive permits with conditions that restrict pumping volumes to less water than their proposed uses require, or are denied a permit, may seek to obtain water by procuring other entitlements or developing other surface water resources. However, such actions would be subject to the existing application procedures and review requirements of the water purveyors from whom water service is sought, or the water rights application procedures of the SWRCB. There is no obligation for water purveyors to provide water service or for the SWRCB to grant a water right permit in response to an application or request, if such applications are outside the scope of currently permitted entitlements, require construction of new facilities, or would otherwise result in adverse impacts. For these reasons, indirect impacts would be less than significant.

<u>Regulating groundwater extraction after adoption of GSPs from an existing well that the County reasonably concludes is not in compliance with a GSP.</u> After GSPs have been adopted, the prohibition against unsustainable extraction will apply to any existing well in the unincorporated areas of the county from which the county reasonably concludes groundwater is being unsustainably withdrawn. As discussed in Section 2, it is unlikely that such a finding will ever be made because GSAs are responsible to regulate groundwater extraction within their jurisdictions to assure compliance with SGMA, and the State is expected to intervene in cases where a GSA does not uphold its responsibility. Nevertheless, because the county has the authority to implement such an action, it is evaluated here. In essence, these are existing wells that do not appear to be operated in compliance with a GSP. In the event that such a determination is made, the affected holder of a Well Construction Permit for the well will be notified and required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in the Ordinance. If the county determines that continued groundwater extraction from such a well is not sustainable, it will be subject to the prohibition in the Ordinance. This could include potential limitations on pumping, or, in some cases, denials of permits; however, the permit conditions imposed by an agency to comply with regulatory requirements to protect the environment are not considered project impacts under CEQA. There would be no direct impacts to existing entitlements or resources.

There could be an indirect effect to existing water supplies and utilities from this program because well operators who are required to restrict pumping volumes to less water than their uses require, or are required to curtail pumping, may seek to obtain water by procuring other entitlements or developing other resources. However, such actions would be subject to the existing application procedures and review requirements of the water purveyors from whom water service is sought, or the water rights application procedures of the SWRCB. There is no obligation for water purveyors to provide water service, or for the SWRCB to grant a water right permit, if such applications are outside the scope of currently permitted entitlements, require construction of new facilities or would otherwise result in adverse impacts. For these reasons, and because such an action by the county is unlikely, indirect impacts would be less than significant.

5.0 ALTERNATIVES

CEQA requires an EIR to include sufficient information about each alternative to allow meaningful analysis and comparison with the proposed project, and discussion of the effects of the alternatives, but in less detail than for the proposed project. The description of the alternatives and the discussion of their impacts focus on their similarities and differences compared to those of the proposed project.

The alternatives for this EIR were developed in accordance with CEQA Guidelines, Section 15126.6, and provide a reasonable range of alternatives that feasibly attain most of the basic project objectives but would avoid or substantially lessen the significant impacts of the proposed project. The key provisions of Section 15126.6 that address the analysis of alternatives are:

- The discussion of alternatives shall focus on alternatives to the project or project location that are feasible, would meet most or all of the project objectives, and would substantially reduce one or more of its significant impacts.
- The range of alternatives must include the No Project Alternative. The no project analysis will discuss the existing conditions at the time the Notice of Preparation was published, and conditions that would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services. The No Project Alternative is not required to be feasible, meet any of the project objectives, or reduce the project's expected impacts to any degree.
- The range of alternatives required is governed by a "rule of reason." The EIR must evaluate only those alternatives necessary to permit a reasoned choice. An EIR is not required to analyze every conceivable alternative to a project.
- An EIR does not need to consider an alternative that would not achieve the basic project objectives, whose effects cannot be reasonably ascertained, and whose implementation is remote and speculative.

The purpose of the alternatives analysis under CEQA is to consider potentially feasible alternatives to the proposed project that are capable of avoiding or substantially lessening the significant effects of the project and that will foster informed decision making and public participation. Because this Program EIR focuses on evaluating potential impacts associated with issuing discretionary well permits for theoretical projects that have not yet been defined, the alternatives analysis focuses on key well permitting program alternatives that were considered.

Throughout this chapter, the term "proposed project" is used synonymously with Well Permitting Program and the term "program" used in other parts of this PEIR.

5.1 Program Objectives

The essential goal of the program evaluated in the PEIR is to prevent the unsustainable extraction of groundwater from new wells subject to the Stanislaus County Groundwater Ordinance. This is represented by these objectives:

- Avoid or minimize potential adverse environmental impacts from the unsustainable extraction of groundwater resources, including, but not limited to, increased groundwater overdraft, land subsidence, uncontrolled movement of inferior quality groundwater, the lowering of groundwater levels, and increased groundwater degradation (Stanislaus County Code § 9.37.020 (4)); and
- Avoid or minimize potential adverse economic impacts from the unsustainable extraction of groundwater resources, including, but not limited to, loss of arable land, a decline in property values, increased pumping costs due to the lowering of groundwater levels, increased groundwater quality treatment costs, and replacement of wells due to declining groundwater levels, replacement of damaged wells, conveyance infrastructure, roads, bridges and other appurtenances, structures, or facilities due to land subsidence (Stanislaus County Code § 9.37.020 (5)).

5.2 Methodology and Screening Criteria

Potential alternatives were developed and subjected to these screening criteria:

- Does the alternative meet most or all of the project objectives?
- Is the alternative potentially feasible?
- Would the alternative substantially reduce one or more of the significant impacts associated with the project?

Based on the CEQA Guidelines, "feasible" is defined as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" (Section 15364). CEQA does not require that an EIR determine the ultimate feasibility of a selected alternative, but rather that an alternative is potentially feasible. Accordingly, no economic studies were prepared regarding the economic feasibility of the selected alternatives.

The significant effects of the program may include those that are significant and unavoidable or that are less than significant with mitigation. The alternative should provide a means of reducing the level of impact that would otherwise result from implementation of the program.

Those alternatives that meet the project objectives, that are potentially feasible, and that would reduce one or more project impacts are discussed.

5.3 Alternatives Considered but Rejected

None of the developed alternatives were considered but rejected from detailed environmental analysis.

5.4 Alternatives Analyzed in this EIR

In addition to the No Project Alternative, those alternatives that meet the project objectives, that are potentially feasible, and that would reduce one or more project impacts are discussed. Other than the No Project Alternative, they are variations of the discretionary well permitting program envisioned to implement the requirements of the Ordinance to prevent unsustainable extraction from new wells. As summarized in Table 5-1, specific, conditional actions associated with the current discretionary well permitting program (the proposed project in this analysis) include:

TABLE 5-1 ALTERNATIVES CONSIDERED FOR MANAGEMENT OF OVERDRAFT

Alternative and Associated Management Thresholds and Actions	Technical Basis	Rationale and Precedent	Protectiveness	Reasonableness
PROPOSED PROJECT APPROACH: MANAGE LOCAL STORAGE DEPLETION Threshold 1: The well is in a Groundwater Level Management Zone. Action 1: Submit a Groundwater Extraction Offset Plan that describes how groundwater extraction will be 100% offset, or a Groundwater Resources Investigation that demonstrates the extraction is sustainable. Threshold 2: The total water volume pumped from the proposed well during the permit term is projected to exceed 10% of the available aquifer storage volume beneath the contiguous property served by the well. Action 2: Implement a Groundwater Level Monitoring Program. Threshold 3: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 5%. Action 3: Submit and implement a pumping management program to keep storage depletion from exceeding 10% of the available aquifer storage beneath the contiguous property served by the well, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable. Threshold 4: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 10%. Action 4: Curtail pumping until storage recovers to a level exceeding the threshold, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable.	The action threshold for implementation of monitoring is based on comparing the projected extraction volume to the calculated aquifer storage volume beneath the property. Subsequent action thresholds relate actual depletion in storage beneath the property based on water level monitoring. The monitoring program would be based on a key monitoring well (or wells) at a location considered representative of groundwater levels beneath the property. The measured drawdown would include drawdown induced by the proposed well, regional trends and off-site pumping. Storage depletion thresholds limit ground-water extraction in proportion to property size, aquifer conditions, and local groundwater balance. As such, it incorporates key technical factors expected to be investigated as part of groundwater basin management under SGMA, but which are not currently known.	In groundwater resources planning (i.e., under the Ordinance, CEQA and SGMA), storage depletion is acceptable as long as it is not chronic and does lead to an inability to meet water demand for existing and permitted land uses during dry or critically dry periods. This concept is consistent with the California Water Action Plan, which embraces the concept of groundwater as a storage buffer against periods of drought. Groundwater level monitoring is typically used to assess change and trends in groundwater storage. Storage depletion beneath a property is consistent with the concept of a correlative groundwater right.	An aquifer storage depletion of less than 10% relative to pre-pumping baseline conditions is not, by itself, expected to result in significant and unreasonable impacts, as long as other, potentially more drawdown-sensitive undesirable results are not occurring. As such, this threshold may be considered protective when it comes to storage depletion. The Proposed Project may be more protective than Alternatives 1 and 2, depending on the approach taken to drawdown prediction for Threshold C1. Use of a carefully selected key monitoring well can be better indicator of aquifer performance than measurement of drawdown at the nearest property line or in each square mile section. In addition, this option allows for monitoring of drawdown closer to the proposed well than Alternatives 1 and 2, leading to a lower likelihood of interference drawdown and GDE impacts.	Relating groundwater extraction volumes to storage depletion seems more logical than using drawdown predictions for the initial action threshold. Use of monitoring thresholds at an indicator well or wells described in terms of aquifer storage depletion also seems more logical than use of groundwater level objectives at the property line. This option may be the most logical and easiest to implement.
ALTERNATIVE 1: MANAGE LOCAL DRAWDOWN Threshold 1: The well is in a Groundwater Level Management Zone. Action 1: Submit a Groundwater Extraction Offset Plan that describes how groundwater extraction will be 100% offset, or a Groundwater Resources Investigation that demonstrates the extraction is sustainable. Threshold 2: Maximum predicted drawdown, considering all existing and proposed wells, is greater than 10% of the available aquifer thickness at the nearest property boundary. Action 2: Implement a Groundwater Level Monitoring Program. Threshold 3: Measured drawdown at the property boundary is greater than 5% of the available aquifer thickness. Action 3: Implement a pumping management program to keep drawdown below 10% of available aquifer thickness, or submit a Groundwater Resources Investigation that indicates a higher threshold is sustainable. Threshold 4: Measured drawdown at the property boundary is greater than 10% of the available aquifer thickness. Action 4: Curtail pumping until groundwater elevations recover to levels greater than Threshold C3, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable.	The action threshold for implementation of monitoring is based on a cumulative drawdown prediction relative to the pre-pumping condition. Available aquifer thickness is the saturated thickness. Subsequent thresholds are based on groundwater level monitoring and are drawdown related. Property line drawdown thresholds can be used to limit ground-water extraction in proportion to property size (depending on well location), aquifer conditions, and local groundwater balance. As such, this approach indirectly incorporates several key technical factors expected to be investigated as part of groundwater basin management under SGMA, but which are not currently known. The pre-pumping baseline may be difficult to establish in some areas where historical data are not available.	The rationale and precedents for Alternative 1 are similar to the Proposed Project. Groundwater extraction that is proportional to property size (i.e., measurements taken at the property line) would be indirectly consistent with the concept of a correlative groundwater right; however, the correlation between water levels and storage assumes the well is located near the center of the property.	A drawdown of less than 10% of the aquifer thickness relative to pre-pumping baseline conditions is not, by itself, expected to result in significant and unreasonable impacts, as long as other, potentially more drawdown-sensitive undesirable results are not occurring. As such, this threshold may be considered protective, especially areas of the County that are remote from Surface Water Protection Zones, Subsidence Special Study Zones, and concentrations of domestic wells.	Storage depletion and groundwater levels are closely related, so it is reasonable to utilize groundwater level thresholds to address storage-related management objectives.

TABLE 5-1 ALTERNATIVES CONSIDERED FOR MANAGEMENT OF OVERDRAFT

County Management Thresholds and Actions	Technical Basis	Precedent	Protectiveness	Reasonableness
ALTERNATIVE 2: MANAGE REGIONAL STORAGE DEPLETION Threshold 1: The well is in a Groundwater Level Management Zone. Action 1: Submit a Groundwater Extraction Offset Plan that describes how groundwater extraction will be 100% offset, or a Groundwater Resources Investigation that demonstrates the extraction is sustainable. Threshold 2: The total groundwater demand in the square mile section in which the proposed well is located (including existing uses and the proposed new well) during the permit term is projected to exceed 10% of the available aquifer storage volume beneath the section. Action 2: Implement a Groundwater Level Monitoring Program. Threshold 3: Measured drawdown indicates total available aquifer storage volume beneath the section where the well is located has been decreased by 5%. Action 3: Submit and implement a pumping management program to keep storage depletion from exceeding 10% of the available aquifer storage beneath the section, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable. Threshold C4: Measured drawdown indicates total available aquifer storage volume beneath the section where the proposed well is located has been decreased by 10%. Action C4: Curtail pumping until storage recovers to a level exceeding the threshold, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable .	Alternative 2 is similar to Alternative 1, except that the action thresholds are normalized to 1 square mile section areas rather than being based on property dimensions. The total groundwater demand in the section in which the proposed well is located is considered prior to triggering implementation of groundwater monitoring, and groundwater level trend and drawdown analysis is based on a key well identified in each section. Total groundwater demand can be derived from groundwater extraction data (if reported) or estimated based on typical irrigation demand based on existing cropping patterns. The Groundwater Level Monitoring Program and resulting actions take a regional management approach, incorporating areas potentially outside an applicant's property.	The underlying rationale and precedents are similar to Proposed Project and Alternative 1. Use of a system of key indicator wells to provide data for regional groundwater management is a common practice for irrigation districts in California and has been adopted in many Groundwater Management Plans. This approach is not consistent with the concept of correlative groundwater rights, in that new pumping would be managed on a section by section basis, regardless of property size.	Alternative 2 takes a more regional approach to groundwater management that does not consider property lines and thus is more reflective of natural conditions, and may be better suited to management of regional aquifer sustainability. However, since action thresholds are potentially based on measurements a more distant location than under the Proposed Project or Alternative 1, there may be greater possibility of adverse nearfield effects such as interference drawdown or effects to GDEs. In addition, the ability to regulate pumping from wells that pre-date the County Groundwater Ordinance does not yet exist, and data in many areas are not yet sufficient to support management of regional pumping density, so the effectiveness of this type of regional management may not be superior to the Proposed Project or Alternative 1 until a Groundwater Sustainability Plan is adopted. Once more data and GSP-level models are available, an area-based program may be a more robust management strategy and allows focusing on areas that need the attention.	This approach may the most reasonable from a resource management perspective; however, the authority to manage pumping from wells that predate the County Groundwater Ordinance does not exist at this time. In addition, the data for effective management of pumping density at this scale is sparse in many areas. As such, implementation of such an approach may not be reasonable until a Groundwater Sustainability Plan is adopted.

- A requirement that new groundwater demand in areas the county designates as Groundwater Level Management Zones[162] be 100 percent offset, or that a Groundwater Resources Investigation be done that demonstrates the new extraction will not contribute to any existing adverse impacts;
- A requirement for groundwater level monitoring if the total water volume to be pumped from the proposed well during the permit term is projected to exceed 10 percent of the available static aquifer storage volume beneath the contiguous property to be served by the well;
- If groundwater level monitoring indicates that the total available aquifer storage beneath the area served by the well has decreased by more than 5 percent under pumping conditions, a requirement to implement a Pumping Management Plan that will prevent storage depletion in excess of 10 percent, or alternately, submittal of a Groundwater Resources Investigation (GRI) that demonstrates a higher threshold is safe; and
- If groundwater level monitoring indicates that the total available aquifer storage volume beneath the area served by the well has been decreased by 10 percent under pumping conditions, a requirement that pumping be curtailed until storage recovers to a level exceeding the threshold, or alternatively, submittal of a Groundwater Resources Investigation that demonstrates a higher threshold is safe.

5.4.1 No Project Alternative

Under the No Project Alternative, the county would not issue discretionary well permits. Development and property uses in the county would continue to be guided by the existing adopted plans and their policies; installation of new groundwater supply wells in the unincorporated, non-district areas of the county would not occur. There would be no site-specific changes in existing land use designations or zoning, but new groundwater extraction would not occur, so expansion of property uses requiring groundwater (such as irrigated agriculture) could not occur, even though such uses would be otherwise permitted. The level and pattern of development would therefore differ between the project and the No Project Alternative. Expansion of irrigated crop production, or development of other uses relying on water, could not occur in unincorporated, non-district areas of the county where surface water is not available. Alternatively, future projects in such areas may seek to procure water from other sources, or to obtain additional entitlements to water.

Typically, when the project under CEQA review is a site-specific well development project, the No Project Alternative has fewer impacts than the proposed project. In this case, there may be fewer impacts to some resource areas and more to others.

Agriculture and Forestry Resources. Unincorporated, non-district land zoned for agricultural use could not be used for new or additional irrigated cultivation in areas where surface water is not available. Some parcels currently cultivated may not be able to procure sufficient water to meet additional crop water demand, potentially resulting in the loss of productive use of Prime Farmland and farmland of statewide or local importance. Any planned changes to crops grown on agricultural land in these areas (e.g., changing rangeland

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[162] Defined as an area where the County determines that adverse environmental or economic impacts as a result of groundwater overdraft are either existing, imminent, or cannot be ruled out based on existing data.

to nut orchard) would not be able to be implemented if these changes required additional use of groundwater. Impacts to agricultural resources would be greater than under the proposed project.

Air Quality. Under the No Project Alternative, there would be no additional development of wells in unincorporated, non-district areas of the county and no associated air pollutant emissions. Air quality conditions would be similar to those under existing conditions. Impacts to air quality would be less than under the proposed project.

Biological Resources. Implementation of the No Project Alternative would result in no changes to biological resources, as no wells would be installed in unincorporated areas of the county outside the jurisdiction of water agencies. This would result in no ground disturbance from well installation and no associated impacts to special-status species and sensitive natural communities. Conversion of rangeland to irrigated farmland would not occur where surface water is not available. Impacts to species and natural communities would be less than under the proposed project.

Cultural Resources. Because there would be no additional development of wells in unincorporated, non-district areas of the county, there would be no changes to cultural resources conditions from current conditions. The potential for impacts to cultural resources would be less than under the proposed project.

Geology and Soils. Because there would be no additional groundwater extraction or drawdown, the potential for subsidence would decrease. The potential for impacts from subsidence would be less than under the proposed project.

Greenhouse Gas Emissions. Because there would be no additional development of wells in unincorporated, non-district areas of the county, there would be no associated GHG emissions, and conditions would be similar to those under existing conditions. Impacts from GHG emissions be less than under the proposed project.

Hazards and Hazardous Materials. With no new wells permitted in the unincorporated, non-district areas of the county, there would be no use of hazardous materials related to drilling or operation of water wells near schools. Impacts from related to hazards and hazardous materials would be less than under the proposed project.

Hydrology and Water Quality. Because there would be no additional groundwater extraction, there would be no impacts related to drawdown, groundwater storage depletion, or water quality. There would be no direct or indirect impacts related to erosion, sedimentation or flooding because no new wells would be constructed under the program. The potential for impacts related to hydrology and water quality would be less than under the proposed project.

Land Use and Planning. Because there would be no additional development of wells in unincorporated, non-district areas of the county, there would be no conversion of undeveloped rangeland to irrigated cultivation and no associated potential effects on environmental mitigation plans and policies. The potential for impacts to land use and planning would be less than under the proposed project.

Noise. Because there would be no additional development of wells in unincorporated, non-district areas of the county, noise levels would be similar to those under existing conditions. The potential for impacts related to noise would be less than under the proposed project.

Utilities and Service Systems. Because there would be no additional development of wells in unincorporated, non-district areas of the county, it may not be possible to meet proposed or existing water demands without additional surface water entitlements or development of other water sources. This could have significant impacts to water supplies available from existing entitlements. The potential for impacts to utilities and service systems would remain less than significant, but would be greater than under the proposed project.

5.4.2 Alternative 1

This alternative is similar to the proposed project, but differs in how sustainable groundwater extraction would be defined and measured, and in criteria for management actions (Table 5-1). Specific conditional actions associated with Alternative 1 are:

- Identical to the proposed project, a requirement that new groundwater demand in areas that the County designates as Groundwater Level Management Zones be 100 percent offset, or that a Groundwater Resources Investigation be done that demonstrates the new extraction will not contribute to any existing adverse impacts;
- A requirement for groundwater level monitoring if the maximum predicted drawdown, considering all existing and proposed wells, is greater than 10 percent of the available aquifer thickness at the nearest property boundary;
- If groundwater level monitoring indicates the total measured drawdown at the property boundary is greater than 5 percent of the available aquifer thickness, a requirement to implement a Pumping Management Plan that will prevent drawdown from exceeding 10 percent of the available aquifer thickness, or alternatively, submittal of a Groundwater Resources Investigation that justifies a higher safe threshold; and
- If groundwater level monitoring indicates the total measured drawdown at the property boundary is greater than 10 percent of the available aquifer thickness, a requirement to curtail pumping until groundwater elevations at the property boundary recover to levels greater than 5 percent of the available aquifer thickness, or alternatively, submittal of a Groundwater Resources Investigation that justifies a higher safe threshold.

Agriculture and Forestry Resources. The impacts and effects on agriculture would likely be the same as those discussed for the proposed project.

Air Quality. The impacts and effects on air would be essentially the same as those discussed in Chapter 4 for the proposed project. Similar to the proposed project, construction and operation of discretionary wells and the subsequent conversion of rangeland to irrigated farmland would result in less-than-significant air quality impacts with mitigation incorporated.

Biological Resources. The impacts and effects on biological resources would be similar to those discussed in Chapter 4 for the proposed project. While there is no difference in the evaluated level of significance, the degree of impacts during operation may be slightly more due to a potential for greater local groundwater drawdown than would occur under the proposed project.

Cultural Resources. Similar to the proposed project, construction and operation of discretionary wells would result in less-than-significant direct and indirect impacts with mitigation incorporated. Impacts are likely to be the same as those under the proposed project.

Geology and Soils. The impacts and effects on geology and soils would be similar to those discussed in Chapter 4 for the proposed project. While there is no difference in the evaluated level of significance, the degree of direct impacts related to local subsidence during operation may be slightly more due to a potential for greater local groundwater drawdown than would occur under the proposed project.

Greenhouse Gas Emissions. The impacts and effects on air would be essentially the same as those discussed in Chapter 4 for the proposed project. Similar to the proposed project, construction and operation of discretionary wells and the conversion of rangeland to irrigated farmland would result in less-than-significant GHG emissions impacts with mitigation incorporated.

Hazards and Hazardous Materials. The impacts and effects on hazards and hazardous materials would be the same as those discussed for the proposed project.

Hydrology and Water Quality. The impacts and effects on hydrology and water quality would be similar to those discussed in Chapter 4 for the proposed project. While there is no difference in the evaluated level of significance, the degree of direct impacts related to drawdown during operation may be slightly more due to a potential for greater local groundwater drawdown than would occur under the proposed project.

Land Use and Planning. Alternative 1 is expected to have the same less-than-significant impacts as the proposed project.

Noise. Similar to the proposed project, construction and operation of discretionary wells and the conversion of rangeland to irrigated farmland would result in the same less-than-significant noise impacts with mitigation incorporated.

Utilities and Service Systems. The impacts and effects on utilities and service systems would likely be the same as those discussed for the proposed project.

5.4.3 Alternative 2

This alternative is also similar to the proposed project. Specific conditional actions associated with Alternative 2 are:

- Identical to the proposed project, a requirement that new groundwater demand in areas that the County designates as Groundwater Level Management Zones be 100 percent offset, or that a Groundwater Resources Investigation be done that demonstrates the new extraction will not contribute to any existing adverse impacts;
- A requirement for groundwater level monitoring if the total groundwater demand in the square mile section where the proposed well is located (including existing uses and the proposed new well) during

the permit term is projected to exceed 10 percent of the available aquifer storage volume beneath the section;

- If groundwater level monitoring indicates that the total available aquifer storage volume beneath the square mile section where the well is located has been decreased by 5 percent, a requirement to implement a Pumping Management Plan that that will prevent storage depletion from exceeding 10 percent of the available aquifer storage beneath the section where the proposed well is located, or alternatively, submittal of a Groundwater Resources Investigation that justifies a higher safe threshold; and
- If groundwater level monitoring indicates that the total available aquifer storage volume beneath the square mile section where the proposed well is located has been decreased by 10 percent, a requirement to curtail pumping until storage recovers to a level exceeding the threshold, or alternatively, submittal of a Groundwater Resources Investigation that justifies a higher safe threshold.

Agriculture and Forestry Resources. The impacts and effects on agriculture would likely be the same as discussed for the proposed project.

Air Quality. The impacts and effects on air quality would be essentially the same as those discussed in Chapter 4 for the proposed project. Similar to the proposed project and Alternative 1, construction and operation of discretionary wells and the conversion of rangeland to irrigated farmland would result in the same less-than-significant air quality impacts with mitigation incorporated.

Biological Resources. The impacts and effects on biological resources would be similar to those discussed for the proposed project and Alternative 1. While there is no difference in the evaluated level of significance, the degree of impact locally would be slightly greater due to potential greater local groundwater drawdown than would occur under the proposed project. Greater groundwater drawdown could occur locally under Alternative 2 compared to Alternative 1 due to thresholds for mitigation and monitoring set at a farther distance under Alternative 2. The scope of groundwater monitoring that would occur would be regional rather than project-specific, potentially supporting a more regionalized approach to groundwater resource management and less potential for cumulatively considerable effects in the region.

Cultural Resources. Similar to the proposed project, construction and operation of discretionary wells would result in less-than-significant direct and indirect impacts with mitigation incorporated. Impacts are likely to be the same as those for the proposed project.

Geology and Soils. The impacts and effects on geology and soils would be similar to those discussed for the proposed project and Alternative 1. While there is no difference in the evaluated level of significance, the degree of impact locally would be slightly greater due to potential greater local groundwater drawdown than would occur under the proposed project. Greater groundwater drawdown could occur locally under compared to Alternative 1 due to thresholds for mitigation and monitoring set at a farther distance under Alternative 2. The scope of groundwater monitoring that would occur would be regional rather than project-specific, potentially supporting a more regionalized approach to groundwater resource management and less potential for cumulatively considerable effects in the region. This leads to a lower potential for subsidence due to cumulative drawdown in an area.

Greenhouse Gas Emissions. The impacts and effects on air quality would be essentially the same as those discussed in Chapter 4 for the proposed project. Similar to the proposed project, construction and operation of discretionary wells and the subsequent conversion of rangeland to irrigated farmland would result in the same less-than-significant GHG emissions impacts with mitigation incorporated.

Hazards and Hazardous Materials. The impacts and effects on Hazards and Hazardous Materials would be the same as those discussed for the proposed project.

Hydrology and Water Quality. The impacts and effects on hydrology and water quality would be similar to those discussed for the proposed project and Alternative 1. While there is no difference in the evaluated level of significance, the degree of impact locally, and the potential for such impacts as well interference, would be slightly greater due to potential greater local groundwater drawdown than would occur under the proposed project. In addition, greater groundwater drawdown could occur locally under Alternative 2 compared to Alternative 1 due to thresholds for mitigation and monitoring set at a farther distance under Alternative 2. The scope of groundwater monitoring that would occur would be regional rather than project-specific, potentially supporting a more regionalized approach to groundwater resource management and less potential for cumulatively considerable effects, such as storage depletion, in the region.

Land Use and Planning. Alternative 2 is expected to have the same less-than-significant impacts as the proposed project.

Noise. Similar to the proposed project, construction and operation of discretionary wells and the conversion of rangeland to irrigated farmland would result in the same less-than-significant noise impacts with mitigation incorporated.

Utilities and Service Systems. The impacts and effects on utilities and service systems would likely be the same as those discussed for the proposed project.

5.5 Environmentally Superior Alternative

The No Project Alternative would result in significant economic impacts, impacts to agricultural resources and impacts to utilities and service systems. In addition, the no project alternative would be the equivalent of an emergency moratorium, and could only be applied for a limited amount of time and if there is concurrence that an emergency exists to which it is the most appropriate solution.

Alternative 1 would have similar impacts to agricultural resources, air quality, cultural resources, GHG emissions, hazards and hazardous materials, land use and planning, noise, and utilities and service systems as the proposed project. Under Alternative 1, there is a slightly increased possibility of impacts related to localized drawdown, including interference drawdown to nearby wells, impacts to local GDEs, and local subsidence.

Alternative 2 would have similar impacts to agricultural resources, air quality, cultural resources, GHG emissions, hazards and hazardous materials, land use and planning, noise, and utilities and service systems as the proposed project and Alternative 1. Under Alternative 2, there is a slightly increased possibility of impacts related to localized drawdown, including interference drawdown to nearby wells, impacts to local GDEs, and local subsidence. This difference would be relative to the proposed project and Alternative 1. Although Alternative 2 would incorporate a more regionalized resource management approach that would lead to a lower likelihood of cumulatively considerable impacts such as regional subsidence or storage depletion, the data are currently lacking to make the implementation of such a program feasible. It is possible that such an approach could be adopted in the future, once GSPs are adopted.

Based on this information, the proposed project is the environmentally superior alternative.

6.0 OTHER CEQA CONSIDERATIONS

6.1 Overview

The other CEQA considerations addressed in this chapter are cumulative impacts, growth-inducing impacts, significant and unavoidable impacts, significant irreversible environmental changes, and effects found not to be significant.

6.2 Cumulative Impacts

6.2.1 Approach and Requirements

Cumulative impacts result from individually minor, but collectively significant, impacts occurring over a period of time. In other words, a cumulative impact results from the collective effects on a resource by numerous activities over time.

CEQA Guidelines Section 15130 requires that an EIR include a discussion of the potential cumulative impacts of a proposed project. The cumulative impact is the change in the environment resulting from the incremental impact of the proposed project when added to the incremental impacts of other closely related past, present, and reasonably foreseeable, or probable future activities.

As defined in CEQA Guidelines Section 15355, "…a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. An EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable and thus is not significant. A project's contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact."

Consistent with CEQA Guidelines Section 15130, an adequate discussion of significant cumulative impacts is based on either:

- A list of past, present, and probable future projects producing related or cumulative impacts, including those projects outside the control of the agency, or
- A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document that has been adopted or certified and described or evaluated regional or area wide conditions contributing to the cumulative impact.

For this PEIR, the cumulative impact analysis is based on the projections approach.

The determination of a project's cumulative effects involves identifying:

- Significant impacts resulting from the cumulative contributions of past, present, and reasonably probable future activities. CEQA does not require analysis of cumulative effects that are less than significant.

- Whether the project would contribute to any of those cumulative impacts. The EIR is not required to analyze a cumulative impact to which the project would not contribute.
- Whether, in the context of the cumulative impact, the project's contribution would be considerable – that is, significant, in cumulative terms. A project impact that is less than significant by itself may nonetheless make a considerable contribution in the context of a cumulative impact.

6.2.2 Cumulative Projects Considered

The cumulative projects considered in this analysis include planned and reasonably foreseeable changes, trends, projects and regulatory requirements that could affect groundwater resources in the County.

Reasonably Anticipated Groundwater Demand Changes

Urban Population and Water Demand Increase. Population growth in Stanislaus County may be expected to result in an increase in urban and rural domestic groundwater demand. The Stanislaus County 2015-2023 Housing Element Update (April 2016) projects the population of unincorporated Stanislaus County to grow from 110,238 in 2010 to 117,807 in 2020 (average annual growth of 0.7 percent) and by 31,391 between 2010 and 2040 (average annual growth of 0.9 percent). For the nine incorporated cities, the population is projected to grow from 404,217 in 2010 to 622,433 in 2040 (average annual growth of 1.8 percent).

As summarized in Table 6-2 in Appendix D, Urban Water Management Plans (UWMP) prepared for the incorporated cities in the region project an average annual increase in urban groundwater demand ranging from approximately 0.08 to 6.3 percent between 2015 and 2040, with a median average projected demand increase of 2.7 percent per year. Studies indicate that urban water demand forecasts in UWMPs often overestimate the actual amount of demand growth by incorporating conservative assumptions regarding population growth, demographic changes and the effectiveness of water conservation.[163] As such, it may be anticipated that actual urban demand growth will be less than forecast in UWMPs prepared for the region. Construction of new residential, industrial and commercial developments in the urban limits of the cities in the county will result in offsetting some currently existing agricultural and landscape groundwater demand, resulting in less net increase in groundwater demand due to urban growth. For this analysis, we have assumed a reasonable upper bound (worst case) increase in urban groundwater demand of 2.7 percent per year (the median average forecast demand in UWMPs in the region), and a reasonable lower bound increase of 0.7 percent (approximately one third of the forecast demand to account for return flows and the effectiveness of future conservation efforts). For Modesto, a reasonable upper bound demand increase of 0.4 percent was evaluated. Modesto has the lowest forecast demand increase (average of 0.08 percent per year), but the forecast includes a substantial decrease from 2015 to 2020 of 4.61 percent that is dependent on its participation in the Stanislaus Regional Water Authority project that is not currently expected to occur. Water conservation efforts in Modesto have continued since the drought, and in the summer of 2017 have continued to be about twice as effective as in 2014.[164] Based on this trend, it was considered reasonable to

[163] Woodard, Gary, 2015. *The Surprising Slide in Domestic Demand: Be Careful What You Wish For.* Presentation at the Water Resources Research Center (WRRC), University of Arizona. March.

[164] Stanford Water in the West, 2017. Visualizing California's Dynamic Urban Water Use, Water Conservation in the San Joaquin River Region: https://ca-drought.herokuapp.com/sanjoaquin.html. Accessed November 2017.

assume that the upper bound demand increase would be 0.4 percent per year. The lower bound demand increase evaluated for Modesto is 0.1 percent

Rural Population and Water Demand Increase. Rural population growth in unincorporated Stanislaus County may be expected to result in an increase in rural domestic groundwater demand. Although this component of groundwater demand is much more limited than urban demand, across the county it represents a significant demand. The Stanislaus County 2015-2023 Housing Element Update (April 2016) projects the population of unincorporated Stanislaus County to grow from 110,238 in 2010 to 117,807 in 2020 (average annual growth of 0.7 percent) and by 31,391 between 2010 and 2040 (average annual growth of 0.9 percent).

Population growth in the unincorporated regions of the County will likely occur primarily in unincorporated communities, such as Westley, Crows Landing, Monterey Park and Keyes. This will add to the groundwater demand of community service districts serving these communities. In these areas, the groundwater demand growth is assumed to fall into a similar range as that calculated from the UWMPs in the region. Rural domestic populations are generally served by domestic wells. This includes residential housing associated with farmsteads and smaller ranchettes. The General Plan Housing Element includes Objective Number 2.2 and Policy Number 2.15 that limit the extent of new subdivision in agricultural areas and discourage the development of new ranchettes to promote the preservation of agricultural resources in the County. Based on this information, a reasonable upper bound (worst case) groundwater demand growth rate for rural residential use would be 1 percent per year (the population growth rate unincorporated Stanislaus County), and a reasonable lower bound demand increase of 0 percent, indicating no, or very limited new residential subdivision outside of the incorporated and unincorporated communities in the County. This latter scenario is reasonable because subdivision and ranchette development would likely offset some existing agricultural groundwater demand, resulting less net groundwater demand increase, and current policies discourage such development.

Agricultural Groundwater Demand Increase. In general, agricultural groundwater demand in district areas of the County is not expected to increase. In non-district, unincorporated areas subject to the Ordinance, and in Eastside Water District and Ballico-Cortez Water District, there has been an ongoing trend to convert uncultivated rangeland to permanent crops, primarily orchards and vineyards, that are irrigated almost exclusively using groundwater. This put considerable stress on existing groundwater supplies, especially in the eastern foothills area of the county. Data provided by the Stanislaus County Agricultural Commissioner shows that between 2000 and 2015, an average of approximately 3,100 acres of orchards and vineyards were planted in unincorporated, non-district lands in eastern Stanislaus County (see Appendix C). This trend appears to have slowed considerably with the adoption of the Ordinance in late 2014, and with less favorable tree nut market prices. A reasonable upper bound groundwater demand increase based on the continued conversion of 3,100 acres per year of range land to orchard in unincorporated areas of eastern Stanislaus County (Appendix C) was evaluated. A reasonable lower bound case of approximately 20 percent of the upper bound case was also evaluated, taking into consideration that agricultural conversion appears to have slowed considerably and that historical conversion rates may not be sustainable. Ultimately, future rates of agricultural conversion will depend on economic factors, the availability of irrigation water, and the requirements of GSPs and the Ordinance to limit unsustainable groundwater extraction.

<u>Stanislaus Regional Water Authority Project.</u> The Stanislaus Regional Water Authority project proposes to deliver up to 5,700 AFY of Tuolumne River water to the City of Ceres, and up to 11,100 AFY to the City of Turlock, beginning in 2022.[165] The point of diversion will be on the Tuolumne River just downstream of the Greer Road bridge, and will allocate a portion of Turlock Irrigation District's water right on the Tuolumne River for municipal use. An infiltration gallery was recently installed to facilitate the diversion. These cities currently rely completely on groundwater for their water supply, so this proposed conjunctive use project will result in substantial offset of current and projected future groundwater demand. During the winter (assumed to be December through March), as much of the demand as possible will be supplied from surface water and groundwater pumping will be decreased to minimum levels. During the rest of the year, groundwater pumping may be increased above minimum levels, if needed to meet peak demands. The minimum groundwater extraction rates assumed to be needed to maintain the water quality and functionality of existing supply wells is assumed to be 2 million gallons per day (MGD) in Ceres and 6.6 MGD in Turlock.[166]

<u>Computer Modeling of Demand Increase Effects.</u> Based on the information summarized above, the cumulative effects associated with an upper and lower bound reasonable groundwater demand were simulated using the Stanislaus County Hydrological Model as further discussed in the Technical Memorandum in Appendix D.

Drawdowns predicted in 2022 and 2042 under the Reasonable Upper Bound Potential Demand Increase are shown graphically in Figures 6-2 and 6-3 of the Technical Memorandum in Appendix D, and key water budget changes are summarized in Table 6-3 of Appendix D. Changes induced by increasing municipal and agricultural groundwater demand under this scenario include:

- Under this scenario, drawdown in the shallow aquifer system in the eastern foothills area of the county is predicted to range from approximately 1 to 3 feet by 2022 and approximately 5 to 30 feet by 2042. The lateral propagation of drawdown is limited by the major groundwater-connected streams draining the foothills, including the Stanislaus, Tuolumne and Merced Rivers. Drawdown in the deeper aquifer system in the eastern portion of the SCHM is predicted to range from approximately 1 to 5 feet in 2022 and approximately 10 to 40 feet in 2042.
- Groundwater levels in the shallow aquifer system beneath Turlock and Patterson are predicted to rise less than 1 foot by 2022 and between 1 and 2 feet by 2042. The rise in groundwater levels occurs because municipal pumping in these areas occurs primarily from the deeper aquifer system; whereas deep percolation[167] from urban water use will be a source of recharge to the shallow aquifer. An even greater amount of net recharge to the shallow aquifer system may occur than predicted, as a result of the conversion of agricultural land to urban land, and the retirement of agricultural water demand. This was not simulated.

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[165] West Yost, 2017. *Surface Water Supply Project, Initial Project Capacity, Estimated Cost and Rate Impacts. Presentation to Stanislaus Regional Water Authority.* August 3.

[166] West Yost, 2016. *Preliminary Phasing and Water Treatment Plant Sizing for the SRWA Surface Water Supply Project.* June 16.

[167] Deep percolation is the term used to describe infiltration of water from the land surface past the root zone and the reach of near surface processes, where it will ultimately recharge the underlying groundwater aquifer.

- Cones of depression are predicted to form in Layer 1 beneath urban areas that rely more extensively on groundwater from the shallow aquifer system (e.g., Modesto, Riverbank, Hughson and Oakdale). Shallow aquifer groundwater levels are predicted remain unchanged in 2022 and to fall by approximately 1 to 3 feet beneath these cities by 2042.
- A broad cone of depression is predicted to form in the deeper aquifer, centered approximately on the Cities of Turlock and Patterson. Drawdowns beneath Turlock are predicted to range from 1 to 4 feet by 2022, and 10 to 20 feet by 2042. Drawdowns beneath Patterson are predicted to exceed 1 foot by 2022, and to range from 5 to 10 feet by 2042.
- Forecast water budget data (Table 6-3 of Appendix D) indicates net groundwater discharge to streams from the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease several thousand AFY by 2022 and several tens of thousands AFY by 2042. Groundwater discharge from the Delta Mendota Subbasin to streams is not predicted to change significantly.
- As summarized in Table 6-3 of Appendix D, groundwater storage in the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease several thousand AFY by 2022 and several tens of thousands AFY by 2042. Groundwater storage in the Delta Mendota Subbasin is not predicted to change significantly.

Drawdowns predicted in 2022 and 2042 under Reasonable Lower Bound Potential Demand Increase are shown graphically in Figures 6-4 and 6-5 of Appendix D, and key water budget changes are summarized in Table 6-3 of Appendix D. Changes induced by increasing municipal and agricultural groundwater demand under this scenario include:

- Under this scenario, drawdown in the shallow aquifer system in the eastern foothills area of the SCHM is predicted to be less than 1 foot in 2022, and to range from approximately 1 to 5 feet by 2042. Groundwater mounding or drawdown in other areas of the model is not predicted to exceed 1 foot.
- The lateral propagation of drawdown is limited by the major groundwater-connected streams draining the foothills, including the Stanislaus, Tuolumne and Merced Rivers. The amount of stream flow depletion is predicted to be much less than for the upper bound scenario (Table 6-3 of Appendix D).
- A broad cone of depression is predicted to form beneath Turlock in the deeper aquifer system between 2022, when no drawdown is predicted, and 2042, when drawdown is predicted to reach approximately 1 to 4 feet.
- Forecast water budget data (Table 6-3 of Appendix D) indicates net groundwater discharge to streams from the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 1,000 AFY each by 2022 and several thousand AFY by 2042. Groundwater discharge from the Delta Mendota Subbasin to streams is not predicted to change significantly.
- Groundwater storage in the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 1,000 AFY each by 2022 and several thousand AFY by 2042. Groundwater storage in the Delta Mendota Subbasin is not predicted to change significantly.

Other Projects. The Crows Landing Industrial Business Park is proposed to be developed in unincorporated Stanislaus County on old airfield southwest of the community of Crows Landing, and will use groundwater for its water supply.[168] A Specific Plan document is currently being prepared. The project is planned to result in no net increase in groundwater extraction from the shallow aquifer, but will ultimately require up to 1,496 AFY of groundwater from the deeper, confined aquifer system by 2037, resulting in some drawdown in the area surrounding the project.

Other projects that convert existing agricultural land around urban communities in the county to residential, commercial or industrial uses will result in new groundwater demand that is offset by retiring existing demand. Such projects are not considered in this PEIR, except under the urban demand increase scenario discussed above.

Pending Plans and Regulations. Significant regulatory changes that will have a profound effect on both surface water and groundwater supplies in the county are expected to be implemented in the coming years.

GSPs, are required to be developed and implemented by GSAs for the Delta-Mendota and Eastern San Joaquin Subbasins by 2020, and for the Modesto and Turlock subbasins by 2022, to comply with the SGMA. These plans will define the sustainable yield of the subbasins, identify any special management areas, define management objectives, criteria and thresholds, and establish monitoring networks. The local and regional groundwater resources impacts of all existing and planned groundwater extraction within the county will be much more closely evaluated in the near future, and measures are required to be put in place to mitigate the adverse environmental economic and societal impacts associated with ongoing and potential future groundwater extraction. Although the precise nature of the measures and their effects cannot yet be known, their effect on environmental impacts to groundwater levels, storage, subsidence, water quality, surface water resources and groundwater-dependent ecosystems is a regulatory certainty that will be enforced by the SWRRCB. Actual groundwater drawdown, streamflow depletion and storage depletion may be much less than forecast by the computer modeling described, which does not consider the effects of SGMA implementation. The actions required to be implemented by GSAs to comply with SGMA are expected to mitigate cumulatively considerable impacts to GDEs, surface water, subsidence and groundwater resources resulting from groundwater extraction. In addition, as discussed in Section 4.0, the terms of groundwater extraction permits issued by the county under the discretionary well permitting program will be limited to the period until GSPs are adopted, with five-year renewal terms thereafter to coincide with the GSP update schedule required under SGMA. This is to allow permit conditions to be updated so that they are consistent with the GSPs that are in force at those times.

The second major anticipated regulatory change is the ongoing process by the SWRCB to amend the Bay-Delta Water Quality Control Plan. As currently proposed, this plan includes requirements to meet minimum unimpaired flow requirements on the Stanislaus and Tuolumne Rivers. The Draft Substitute Environmental Document prepared by the SWRCB is currently under review, and concludes that the impacts on groundwater

[168] Jacobson James & Associates, Inc., 2017. Technical Memorandum, Stanislaus County Hydrologic Model: Development and Forecast Modeling, Stanislaus County. Draft: December 20.

resources will be significant and unavoidable; however, this document does not quantify the locations of these impacts or evaluate where they will occur.[169] The proposal presents an as-yet-to-be-defined challenge to sustainable groundwater management in the county. Because the nature of the final proposal remains to be determined, effects associated with this pending regulatory change are considered speculative and are not evaluated in this PEIR.

6.2.3 Agriculture and Forestry Resources

The FMMP documented a steady trend of farmland conversion throughout the San Joaquin Valley over the past three decades. Between 1984 and 2012, approximately 42,308 acres of prime farmland were converted to other uses.

In Stanislaus County, this has largely affected areas adjoining the cities of Modesto, Ceres, and Patterson, including unincorporated Salida. Between 1984 and 2012, FMMP data indicates that a substantial amount of prime farmland was converted to other non-agricultural uses each year. This trend is expected to continue into the future as the cities grow pursuant to their general plans and development occurs in the Salida community that is on prime farmland. Salida's development is based on a 2007 voter-enacted initiative that adopted the Salida Community Plan and related development entitlements that are not subject to the Stanislaus County General Plan. The 2014 Regional Transportation Plan/Sustainable Communities Strategy estimates that by 2040 development in the county, including the incorporated cities, will consume approximately 13,550 acres of prime farmland.[170]

While the Williamson Act, County General Plan, and the Stanislaus County Local Agency Formation Commission (LAFCO) include policies and procedures intended to minimize the conversion of agricultural land and to encourage continued agricultural activity, future development in the community of Salida alone will result in the conversion of substantial amounts of prime farmland.

The less-than-significant impacts of the program may contribute negligibly to this ongoing impact to farmland conversion.

6.2.4 Air Quality

The impact analysis for the program examines the potential air quality effects throughout the SJVAB of an anticipated increase in the number of wells that would receive discretionary permits and a potential increase in conversion of rangeland to irrigated agriculture that may be supported by some of these new wells. As discussed in Section 5.2.2, an increase in stationary agriculture-related emissions sources and vehicle traffic does not necessarily result in a significant impact on air quality. The potential air quality emissions from an increase in the number of wells and irrigated agriculture can be mitigated to less-than-significant levels and are anticipated to decrease over time with technological improvements in well pumping and farming

[169] SWRCB, 2016. *Draft Revised Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the Bay-Delta: San Joaquin River Flows and Southern Delta Water Quality.* September 15.

[170] Stanislaus Council of Governments, 2014. 2014 Regional Transportation Plan/Sustainable Communities Strategy. June 2014. Available: http://www.stancog.org/rtp.shtm.

equipment. These less-than-significant effects are not expected to contribute considerably to anticipated air quality issues that could be generated by projected cumulative actions. The projected increase in population would likely generate additional vehicle traffic on existing roads that are a much greater and more consistent contributor to the air quality issues in the SJVAB.

6.2.5 Biological Resources

Increased demand for groundwater resources from population growth and agricultural conversion would place greater demand on groundwater resources, and the resultant increased groundwater drawdown could have potentially significant impacts to GDEs and the species that inhabit them. Groundwater drawdown would be exacerbated by climate trends toward higher temperatures, lower snowpack, earlier runoff, and variable precipitation. Normal patterns of aquifer recharge from precipitation and melting snowpack may be variable across years, resulting in difficulty predicting impacts of groundwater withdrawal on GDEs. There is uncertainty about the ecological response of the various GDEs to changes in groundwater levels. Ecological water requirements of GDEs likely differ and have varying thresholds of response to groundwater basin activities. Additional wells and groundwater extraction could have adverse effects on GDEs in the study area including riparian habitats, wetlands, and oak woodlands.

Development and implementation of GSPs under SGMA is intended and required to mitigate adverse impacts to GDEs. If GSAs do not adequately implement the measures specified in a GSP to assure sustainable groundwater management, the County has the authority to investigate and regulate groundwater extraction from any well it determines is being operated unsustainably.

Based on the projections for urban, rural, and agricultural groundwater demand, and the offsets that will occur due to the Stanislaus Regional Water Authority project, retiring of agricultural land use around urban centers, water conservation efforts, and the pending development and implementation of GSPs under SGMA that would have a beneficial effect on both surface water and groundwater supplies in the county, the program would make a less-than-significant contribution to cumulative effects on groundwater drawdown in the region.

6.2.6 Cultural Resources

Among the cumulative trends, projects and regulatory requirements considered in this analysis, the conversion of rangeland to cultivated agricultural use in the eastern portion of the county has the greatest potential to result in significant impacts to cultural and historical resources, if not mitigated. This agricultural conversion requires an available water source, and the primary (and in many cases the only) water source available in the eastern portion of the county is groundwater. Implementation of the county’s discretionary well permitting program has greatly slowed the number of applications for new wells in the portions of the County where it applies, and is capable of mitigating most impacts resulting from the approval or new well permits. For these reasons, the less-than-significant impacts with proposed mitigation of the program would contribute negligibly to cumulative impacts to cultural resources.

6.2.7 Geology and Soils

As described in Section 4, subsidence occurs primarily when groundwater levels are drawn down below historical low levels and compressible clays are depressurized causing water to flow from the clays into the surrounding aquifer, and leaving them vulnerable to compression under pressure from the overlying sediments. In Stanislaus County, the confined aquifers below the Corcoran Clay are considered the most susceptible to subsidence. As demonstrated during the recent drought, when groundwater levels in many monitored wells fell to new historical low levels, increases in groundwater demand in the Stanislaus County region would have the potential to draw down groundwater levels to new historical lows. At present, long-term demand increases are subject to uncertainty due to the impending development and implementation of GSPs under SGMA and other pending regulatory requirements. The long-term groundwater demand trends simulated in Appendix D indicate a theoretical potential to induce groundwater level declines of tens of feet in the confined aquifer beneath the Corcoran Clay, depending on whether and how much groundwater extraction increases regionally. Under such a scenario, inelastic subsidence would be likely in the central and western portions of the County, and the permitting of new wells under the county's discretionary well permitting program could contribute incrementally to a significant adverse impact. Development and implementation of GSPs under SGMA is intended and required to mitigate such trends and to prevent subsidence that substantially interferes with surface uses. If GSAs do not adequately implement the measures specified in a GSP to assure sustainable groundwater management, the County has the authority to investigate and regulate groundwater extraction from any well it determines is being operated unsustainably. However, under SGMA, GSAs will be required to regulate groundwater extraction within their jurisdictions to assure that the sustainability goals in their GSPs are being met, and the State is expected to intervene if a GSA fails to fulfill this obligation. Therefore, it is unlikely that the County will be required to step in to regulate wells found to be operating unsustainably. Regardless, the effect of the program is expected to be a net benefit to sustainable groundwater management and to have a less than cumulatively considerable impact.

6.2.8 Greenhouse Gas Emissions

The contribution from the program to cumulative GHG emissions resulting from a potential increase in the number of discretionary wells and conversion of rangeland to irrigated farmland would be reduced to less than cumulatively considerable by implementing BPSs for new wells and new farmland equipment, reducing GHG emissions by 29 percent as compared to normal operations of the equipment BAU, ensuring that construction equipment produces less than or equal to 230 metric tons-CO_2e/year per SJAVPCD policy, using available financial incentives to reduce diesel PM and NOx emissions from existing off-road heavy-duty diesel vehicles, and complying with the goals in AB 32 and the SJVAPCD's guidance and policy for addressing GHG emissions.

6.2.9 Hazards and Hazardous Materials

The presence of potentially toxic or hazardous substances on or near a prospective school site is a concern relating to the safety of students, staff, and the public. Hazardous emissions and accidental release or combustion of hazardous materials near existing schools could result in health risks or other dangers to students.

While some of the materials (e.g., lubricants, fuels and drilling fluids) may be considered hazardous due to the pH or chemical content, they are regulated and their control is essential to keep the water from the new water well uncontaminated. As the drilling is a temporary activity, the use and storage of any hazardous material in a specific location would also be temporary. The program's contribution to any cumulative impact of hazardous materials near schools would be considered less than cumulatively considerable.

6.2.10 Hydrology and Water Quality

As demonstrated during the recent drought, when groundwater levels in many monitored wells fell to new historical low levels, increases in groundwater demand in the Stanislaus County region would have the potential to draw down groundwater levels, substantially decreasing groundwater storage and well yield, while increasing well construction and operating expenses. At present, long-term demand increases are subject to uncertainty due to the impending development and implementation of GSPs under SGMA and other pending regulatory requirements. The long-term groundwater demand trends simulated in Appendix D indicate a theoretical potential to induce groundwater level declines of tens of feet in some areas, depending on whether and how much groundwater extraction increases regionally. Under such a scenario, groundwater supplies would become less economical, supplies of a critical buffer against dry year demand would be reduced, water quality issues may be exacerbated, and other adverse economic and societal effects may occur. Development and implementation of GSPs under SGMA is intended and required to mitigate such trends, and to prevent Undesirable Results as defined in SGMA and in the Groundwater Ordinance. If GSAs do not adequately implement the measures specified in a GSP to assure sustainable groundwater management, the County has the authority to investigate and regulate groundwater extraction from any well it determines is being operated unsustainably. However, under SGMA, GSAs will be required to regulate groundwater extraction within their jurisdictions to assure that the sustainability goals in their GSPs are being met, and the State is expected to intervene if a GSA fails to fulfill this obligation. Therefore, it is unlikely that the County will be required to step in to regulate wells found to be operating unsustainably. Regardless, the effect of the program is expected to be a net benefit to sustainable groundwater management and to have a less than cumulatively considerable impact.

6.2.11 Land Use and Planning

It is expected that other cumulative projects (recent past, present, and reasonably foreseeable) would have undergone the necessary CEQA analyses and reviews and approvals under the General Plan and other County policies. Those reviews would be expected to resolve any conflicts with the General Plan's goals, policies, and implementation measures protecting environmental resources and avoiding adverse environmental effects. Because it would comply with those General Plan tenets, the program would make a less-than-significant contribution to the overall cumulative impact, regardless of magnitude.

6.2.12 Noise

The anticipated increase in the rural population in unincorporated Stanislaus County is likely to increase the number of sensitive noise receptors that could abut newly irrigated agricultural lands, resulting both from the program and the measures protecting agricultural land (agricultural activities are subject to the County's Right to Farm Ordinance and are exempt from the County's Noise Ordinance). The increased population is likely to generate increased road noise. Incremental increases in noise from new well construction and operation, and from farmland equipment, would make a less-than-significant contribution to cumulative effects on adjacent populations by installing wells at a sufficient distance from sensitive receptors that noise impacts would be less than significant, sizing equipment for the project appropriately for the location and the type of setting in which the receptors would be located, using construction equipment and methods that incorporate appropriate noise-dampening measures, locating well operations approximately 70 feet from the nearest sensitive receptor, and using operational efficiency measures (such as properly matching the pump to the well conditions and water demand that would minimize the horsepower required by a pump and the noise generated by the pump). It is anticipated that new wells would generate less noise and contribute even less to potential cumulative increases in noise effects on sensitive receptors through the use of electric and potentially solar-powered pumps in place of diesel pumps.

6.2.13 Utilities and Service Systems

Issuing discretionary well permits before GSPs are adopted would be done by the County and would require any applicant to provide substantial evidence that the proposed groundwater extraction would be sustainable, as defined under the Ordinance, for new wells to be constructed in the unincorporated areas. Planned future regulatory changes would ensure that the groundwater resources impacts of all existing and planned groundwater extraction in the county would be much more closely evaluated in the near future and that measures would be put in place to mitigate potential adverse impacts related to groundwater extraction. The program would not contribute to any cumulative impact on existing entitlements and resources.

6.3 Growth-Inducing Impacts

CEQA Guidelines Section 15126.2(d) requires that an EIR include a discussion of the potential to induce "economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." The proposed program would not directly authorize new development or indirectly remove barriers to or create a demand for new development. In the Notice of Preparation and Initial Study, the Population and Housing analysis noted that well development could indirectly induce population growth if new workers are drawn into the local economy to support changes in agricultural operations. The amount of induced growth, if any, would more likely depend are more direct factors, such as agricultural economics, demographic changes, and government policies.

6.4 Significant and Unavoidable Impacts

CEQA Guidelines Section 15126.2(a) requires that an EIR describe any significant impacts that cannot be avoided, including those that can be mitigated, but not below the level of significance. No significant and unavoidable impacts have been identified for implementation of the proposed program.

6.5 Significant Irreversible Environmental Changes

CEQA Guidelines Section 15126.2(c) requires that an EIR evaluate irretrievable commitments of resources be evaluated to determine whether such consumption is justified. Generally, a project would result in irreversible environmental changes if:

- The primary and secondary impacts would generally commit future generations to similar uses, such as when a project extends transportation or other infrastructure to an area previously without those services;
- The project would involve a large commitment of nonrenewable resources; or
- The project involves uses in which irreversible damage could result from any potential environmental accidents associated with the project.

None of the anticipated effects from implementing the proposed program were found to be significant irreversible changes to the environment.

6.6 Effects Found not to be Significant

CEQA Guidelines Section 15128 requires that an EIR briefly present the effects that were not discussed in detail in the EIR because they were determined not to be significant. Impacts related to these topic areas were determined in the Notice of Preparation and Initial Study, and this PEIR to require no further analysis:

- Substantial adverse effects on a scenic vista (Aesthetics)
- Substantial damage to scenic resources, including, but not limited to, trees, outcroppings, and historic buildings within a state scenic highway (Aesthetics)
- Substantial degradation of the existing visual character or quality of the site and its surroundings (Aesthetics)
- New sources of substantial light or glare which would adversely affect day or nighttime views in the area (Aesthetics)
- Conflicts with existing zoning for agricultural use or a Williamson Act contract (Agriculture and Forestry Resources)
- Conflicts with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Codes section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)) (Agriculture and Forestry Resources)
- Loss of forest land or conversion of forest land to non-forest use (Agriculture and Forestry Resources)
- Exposure of sensitive receptors to substantial pollutant concentrations (Air Quality)
- Objectionable odors affecting a substantial number of people (Air Quality)

- Substantial interference with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites (Biological Resources)
- Conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan (Biological Resources)
- Exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving 1) rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area, or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42; 2) strong seismic shaking; 3) seismic-related ground failure, including liquefaction; and 4) landslides (Geology and Soils)
- Substantial soil erosion or the loss of topsoil (Geology and Soils)
- Location on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off site landslide, lateral spreading, liquefaction, or collapse (Geology and Soils)
- Location on expansive soil, as defined in Table 18-1 B of the Uniform Building Code (1994), creating substantial risks to life or property (Geology and Soils)
- Soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water (Geology and Soils)
- Significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials (Hazards and Hazardous Materials)
- Significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment (Hazards and Hazardous Materials)
- Location on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 or a list of hazardous substance release sites identified by the state Department of Health Services pursuant to § 25356 of the Health & Safety Code and, as a result, would create a significant hazard to the public or the environment (Hazards and Hazardous Materials)
- For a project in an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, safety hazards for people residing or working in the project area (Hazards and Hazardous Materials)
- For a project near a private airstrip, safety hazards for people residing or working in the project area (Hazards and Hazardous Materials)
- Impairment of implementation or physical interference with an adopted emergency response plan or emergency evacuation plan (Hazards and Hazardous Materials)
- Runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff (Hydrology and Water Quality)

- Housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map (Hydrology and Water Quality)
- Structures within a 100-year flood hazard area which would impede or redirect flood flows (Hydrology and Water Quality)
- Exposure of people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, or dam inundation (Hydrology and Water Quality)
- Creation of inundation by seiche, tsunami, or mudflow (Hydrology and Water Quality)
- Physical division of an established community (Land Use and Planning)
- Conflicts with any applicable habitat conservation plan or natural community conservation plan (Land Use and Planning)
- Loss of availability of a known mineral resource that would be of value to the region and the residents of the state (Mineral Resources)
- Loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan (Mineral Resources)
- Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels (Noise)
- Substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project (Noise)
- For a project in an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels (Noise)
- For a project near a private airstrip, exposure of people residing or working in the project area to excessive noise levels (Noise)
- Create substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure) (Population and Housing)
- Displacement of substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere (Population and Housing)
- Displacement of substantial numbers of people, necessitating the construction of replacement housing elsewhere (Population and Housing)
- Substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the need for new or physically altered governmental facilities, construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services: fire protection, police protection, schools, parks, and other public facilities (Public Services)
- Promotion of the joint use of parks, libraries, museums, and other public services (Public Services)
- Increased use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated (Recreation)

- Inclusion of recreational facilities or requirement for the construction or expansion of recreational facilities which might have an adverse physical effect on the environment (Recreation)
- Conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit (Transportation and Traffic)
- Conflicts with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways (Transportation and Traffic)
- Changes in air traffic patterns, including either an increase in traffic levels or a change in location, which results in substantial safety risks (Transportation and Traffic)
- Substantial increase in hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment) (Transportation and Traffic)
- Inadequate emergency access (Transportation and Traffic)
- Conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities (Transportation and Traffic)
- Exceedance of wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB) (Utilities and Service Systems)
- Construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects (Utilities and Service Systems)
- Construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects (Utilities and Service Systems)
- Determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments (Utilities and Service Systems)
- Service by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs (Utilities and Service Systems)
- Compliance with federal, state, and local statutes and regulations related to solid waste (Utilities and Service Systems)

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8.0 LIST OF PREPARERS

Mike Tietze, Contribution: Project Manager, Geology and Soils, Hydrology and Water Quality

John Bock, Contribution: Assistant Project Manager, Land Use and Planning

Juliet Hutchins, Contribution: Geology and Soils, Hydrology and Water Quality

Cliff Jarman, Contribution: Agriculture and Forestry Resources, Hazards and Hazardous Materials

Genevieve Kaiser, Contribution: Air Quality, Greenhouse Gas Emissions, Noise

Angela Lortie, Contribution: Biological Resources

Julia Mates, Contribution: Cultural Resources, Utilities and Service Systems

Ann Zoidis, Contribution: Biological Resources

APPENDIX A

STANISLAUS COUNTY GROUNDWATER ORDINANCE

Chapter 9.37 GROUNDWATER

9.37.010 Title.

The ordinance codified in this chapter may be cited as the Stanislaus County Groundwater Ordinance. (Ord. CS 1155 §2, 2014; Ord. CS 1138 §1, 2013).

9.37.020 Findings.

The Stanislaus County Board of Supervisors hereby finds:

1. The protection of the health, welfare, and safety of the residents of the county require that the groundwater resources of Stanislaus County be protected from adverse impacts resulting from the specific acts of unsustainable groundwater extraction within the county and the export of water outside of the county; and

2. Groundwater is an essential resource for continued agricultural production within the county which production includes, but is not limited to, field crops, nut and fruit crops, vegetable crops, seed crops, poultry and livestock and products which significantly contribute to the gross value of the total agricultural production of the county; and

3. Groundwater is an essential resource for municipal, industrial and domestic uses within the county; and

4. The unsustainable extraction of groundwater resources within the county and the export of water outside of the county each could have adverse environmental impacts on the county, including, but not limited to, increased groundwater overdraft, land subsidence, uncontrolled movement of inferior quality groundwater, the lowering of groundwater levels, and increased groundwater degradation; and

5. The unsustainable extraction of groundwater resources within the county and the export of water outside of the county each could have adverse economic impacts on the county, including, but not limited to, loss of arable land, a decline in property values, increased pumping costs due to the lowering of groundwater levels, increased groundwater quality treatment costs, and replacement of wells due to declining groundwater levels, replacement of damaged wells, conveyance infrastructure, roads, bridges and other appurtenances, structures, or facilities due to land subsidence; and

6. California Constitution, Article X, Section 2, as well as Water Code Section 100 prohibit the waste, unreasonable use, unreasonable method of use, and unreasonable method of diversion of water. The county finds that the unsustainable extraction of groundwater and the export of water outside of the county are presumptively inconsistent with the California Constitution and the California Water Code; and

7. Nothing in this chapter determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water rights; and

8. There is a critical need for water well extraction data to analyze and understand the degree of groundwater depletion or recharge, to establish water budgets, and to balance conjunctive use of groundwater resources. The county finds and determines that

such data is critical to the implementation of groundwater regulation under this chapter. The county finds and determines that such data from persons is presumptively confidential and proprietary information, including geological and geophysical data, plant production data, or trade secrets. The county further finds and determines that the need to receive or obtain such data, and to maintain its confidentiality, outweighs the public need for site specific private information and that the public will have access to the aggregate of such information which is a better measure of the cumulative status of groundwater resources. (Ord. CS 1155 §3, 2014; Ord. CS 1138 §1, 2013).

9.37.030 Definitions.

The following words and phrases shall have the following meanings when used in this chapter:

1. "County" means the county of Stanislaus.

2. "Board" means the board of supervisors of Stanislaus County.

3. "Person" means and includes natural persons, corporations, firms, partnerships, joint stock companies, associations and other organizations of persons, and public entities.

4. "Groundwater" means water that occurs beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

5. "Public water agency" means any local public agency, mutual water company, or nonprofit tax-exempt unincorporated association within, or partially within, Stanislaus County that has authority to undertake water-related activities.

6. "Unsustainable extraction of groundwater" means the extraction of groundwater in a manner that is not sustainable groundwater management as defined in this chapter or state law.

7. "Export of water" means the act of conveying groundwater, or surface water for which groundwater has been substituted, out of the county.

8. “Sustainable groundwater management” means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon as defined in subdivision (q) of Water Code Section 10721 without causing or substantially contributing to undesirable results.

9. “Undesirable result” means one or more of the following:

a. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

b. Significant and unreasonable reduction of groundwater storage.

c. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

d. Significant and unreasonable land subsidence that substantially interferes with surface land uses.

e. Surface water depletions that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

10. “De minimis extractor” means a person who extracts two acre-feet or less per year.

11. “Groundwater sustainability plan” means a plan adopted pursuant to Water Code Section 10727 et seq. (Ord. CS 1155 §4, 2014; Ord. CS 1138 §1, 2013).

9.37.040 Prohibition.

Except as otherwise provided in this chapter, the following actions are prohibited:

A. The unsustainable extraction of groundwater within the unincorporated areas of the county.

B. The export of water. (Ord. CS 1155 §5, 2014; Ord. CS 1138 §1, 2013).

9.37.045 Application.

A. The prohibition set forth in subsection A of Section 9.37.040 is applicable to the extraction from any groundwater well for which an application for a new well construction permit pursuant to Chapter 9.36 is filed after November 25, 2014. Applications for a well construction permit submitted after that date shall demonstrate, based on substantial evidence, that either: (1) one or more of the exemptions set forth in Section 9.37.050 apply; or (2) that extraction of groundwater from the proposed well will not constitute unsustainable extraction of groundwater. This subsection shall not apply to a well designed to replace an existing well that has been permitted under Chapter 9.36 prior to November 25, 2014 if the replacement well has no greater capacity than the well it is replacing.

B. Effective upon adoption of an applicable groundwater sustainability plan, the prohibition set forth in subsection A of Section 9.37.040 shall be applicable to the extraction from any groundwater well for which the county reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In the event of such determination by the county, the affected holder or holders of a well construction permit issued pursuant to Chapter 9.36 for such well shall be notified and shall be required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in subsection 6 of Section 9.37.030.

C. This section does not limit the application of subsection B of Section 9.37.040.

D. The regulations and prohibitions set forth in this chapter apply only to the unincorporated areas of Stanislaus County. (Ord. CS 1155 §6, 2014).

9.37.050 Exemptions.

A. The following water management practices are exempt from the prohibitions in Section 9.37.040:

1. Water resources management practices of public water agencies that have jurisdictional authority within the county, and their water rate payers, that are in compliance with and included in groundwater management plans and policies adopted by that agency in accordance with applicable state law and regulations, as may be amended, including, but not limited to, the California Groundwater Management Act (Water Code Sections 10750 et seq.), or that are in compliance with an approved groundwater sustainability plan.

2. De minimis extractions as set forth in Section 9.37.030(10) of this chapter.

3. Groundwater extraction or the export of water in compliance with a permit issued by the Stanislaus County department of environmental resources pursuant to this chapter.

B. The following water management practices are exempt from the prohibition against export of water in this chapter:

1. De-watering of shallow water tables where the net benefits of the removal of subsurface water substantially outweighs the loss of water because of damage the high water table reasonably may cause to agriculture, industry, commerce and other property uses. The groundwater in some areas of the county is very near the surface and if not removed by interceptor ditches or subsurface tile drains, the water can seriously impact crop root zones for agricultural production or destroy foundations, equipment, materials, buildings and infrastructure used for residences, industry, utilities or commerce. This groundwater may or may not be reused for other purposes and at times may leave the county and its groundwater system.

2. Reasonable use of groundwater resources to supplement or replace surface water released for other reasonable and beneficial purposes, including, but not limited to, fisheries, ecosystem habitat or downstream water quality or quantity needs, when required pursuant to federal and state law, regulations, licenses or permit conditions.

3. Conservation of water in compliance with applicable state law that authorizes public water agencies to transfer water outside its usual place of use. Conservation investments may include, but are not limited to, irrigation practices in agricultural areas where the crops grown use less water, or communities that produce recycled water, fix leaks or promote other water saving devices and methods to conserve water on a temporary or permanent basis.

4. Recharge of groundwater in locations in the county that are capable of improving groundwater conditions in order to meet total water demands of beneficial uses in the hydrologic and groundwater basin area including, but not limited to, the following sources: surface water, treated municipal drinking water, recycled water and stormwater. The amount of recaptured groundwater transferred out of the area should not exceed the amount of water used to recharge the aquifer. The transfer can be accomplished by either direct or indirect transfer, that is, a public water agency can leave the water in the ground and transfer other supplies in lieu of pumping out the recharge water.

5. Remediation of contaminated groundwater that is pumped and treated to remove contaminants that are in violation of standards for beneficial uses. The extracted and treated water may be released out of the county, resulting in a net loss to the groundwater basin, if the release complies with discharge permits issued by the federal, state or state resource agencies.

6. Export of water that reasonably supports agricultural operations on property outside the county that is contiguous with property within the county and is under common ownership.

7. Export of water from a private water source that is bottled in compliance with a private water source operator license issued by the state pursuant to Health and Safety Code Section 111120.

C. The exemptions set forth in subsections A and B above do not exempt the activities described in those subsections from subsection B of Section 9.37.045. (Ord. CS 1155 §7, 2014; Ord. CS 1138 §1, 2013).

9.37.060 Implementation.

A. The Stanislaus County department of environmental resources shall have the primary responsibility for implementation of this chapter and regulations adopted by the board of supervisors. That responsibility shall include any preparation, approval, and/or certification of any environmental document pursuant to the California Environmental Quality Act (CEQA) for issuance of any permit for a groundwater well, to the extent required by CEQA, or a determination that such permit is not subject to, or is exempt from, CEQA.

B. The department of environmental resources shall establish a system of permits to authorize water management practices otherwise prohibited by this chapter. The department may issue a permit for a water management practice to the extent that such practice is consistent with the statements of county policy set forth in Section 9.37.020 of this chapter, and provided that such practice is for a reasonable and beneficial use of groundwater resources, supports sustainable groundwater management, and promotes the public interest. The term of a groundwater extraction permit issued by the department pursuant to this subsection shall not exceed the remaining term of any applicable groundwater sustainability plan.

C. The department of environmental resources shall have authority to investigate any activity subject to this chapter. Compliance with this chapter will be determined based on the submission of a technical report to the department of environmental resources on a form provided by the county. The department is authorized to enforce the prohibition of any activity that is determined to be in violation of this chapter or regulations adopted by the board of supervisors.

D. Any interested person or entity may appeal an administrative determination made by the department under this chapter which: (1) finds that an application is complete or incomplete; (2) establishes or modifies operating conditions; (3) grants or denies a permit; or (4) suspends or revokes a permit. Administrative appeals under this section must be made in writing, must clearly set forth the reasons why the appeal ought to be granted, and must be received by the chief executive officer within fifteen days of the postmark date on the envelope that transmits the administrative determination. Any appeal that is not timely filed, or that is not accompanied by the required fee, will be deemed ineffective and the administrative determination that is being appealed will become final. The chief executive officer shall fix a reasonable time for the hearing of an appeal of an administrative determination, and shall provide written notice of the appeal hearing to the appellant and all interested parties, and to all landowners within one-quarter mile of the parcel where operations will occur. An appeal review committee comprised of the chief executive officer or designee, the chair and vice chair of the board of supervisors shall hear the appeal and issue a decision within thirty days after the hearing. The appeal review committee may take any appropriate action upon the original administrative action that was appealed, including granting or denying the appeal in whole or in part, or imposing, deleting or modifying operating conditions of the permit. The decision of the appeal review committee shall be final.

E. Any interested person or entity may appeal to the board of supervisors the following decisions and determinations of the department regarding a groundwater well permit: (1) a decision to approve or deny a negative declaration; (2) a decision to certify or refuse to certify an environmental impact report; or (3) a determination that a permit is not subject to, or is exempt from, CEQA. (Ord. CS 1155 §8, 2014; Ord. CS 1138 §1, 2013).

9.37.065 Groundwater monitoring.

A. All persons, including public water agencies that extract groundwater within the county shall cause to be prepared and submitted to the county department of environmental resources periodic reports of groundwater information that are reasonably necessary to monitor the existing condition of groundwater resources within the county, to determine trends, or to develop effective sustainable groundwater management plans and policies. A de minimis extractor shall not be required to submit such information.

B. The department shall develop and recommend regulations to be adopted by the board that establish the frequency and timing of required reports, and the required information to be monitored, including, without limitation, water level and pumping data, or other data necessary for any other method to determine groundwater production.

C. The county presumes that information submitted pursuant to this section will be exempt from disclosure under the California Public Records Act. The regulations developed under subsection B of this section shall include a process for submitters to confirm that their information is exempt from disclosure. Any

document that aggregates information submitted under this section shall not be treated as exempt from disclosure if such document neither identifies the sources of that information nor permits the reader to otherwise determine the sources of that information. (Ord. CS 1155 §9, 2014).

9.37.070 Penalty for violation.

A. Any person violating any of the provisions of this chapter shall be guilty of a misdemeanor and upon conviction thereof shall be punished as set forth in Stanislaus County Code Section 1.36.010. Each person shall be guilty of a separate offense for each and every day during any portion of which any violation of any provision of this chapter is committed, continued or allowed and shall be punishable accordingly.

B. In addition to or in lieu of the penalty provisions or remedies set forth in this chapter, any violation may be abated in any manner set forth in Chapter 2.92 of the Stanislaus County Code, including, but not limited to, abatement or issuance of administrative citations.

C. In addition to or in lieu of the penalty provisions or remedies set forth in this chapter, any violation of any of the provisions of this chapter, and any condition caused or allowed to exist in violation of any of the provisions of this chapter, shall be deemed a public nuisance and shall, at the discretion of county, create a cause of action for injunctive relief, including but not limited to any remedy under Chapter 5 (commencing with Section 17200) of Part 2 of Division 7 of the Business and Professions Code. (Ord. CS 1138 §1, 2013).

9.37.080 Severability and effect.

A. The provisions of this chapter are hereby declared to be severable. If any provision, clause, word, sentence or paragraph of this chapter or the application thereof to any person, establishment or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this chapter.

B. The prohibitions of this chapter shall not be applicable to the extent that their application would result in a violation of the Constitution or other laws of the United States or the state of California. The department of environmental resources shall issue a permit to authorize conduct otherwise prohibited under this chapter if the applicant demonstrates that such permit is necessary to avoid such a violation of state or federal law. (Ord. CS 1138 §1, 2013).

APPENDIX B

DISCRETIONARY WELL PERMITTING IMPLEMENTATION GUIDELINES AND DOCUMENTS

DEPARTMENT OF ENVIRONMENTAL RESOURCES

3800 Cornucopia Way, Suite C, Modesto, CA 95358-9592
Phone: 209.525.6770 Fax: 209.525.6773

COUNTY GROUNDWATER ORDINANCE

WELL PERMIT APPLICATION REVIEW PROCESS

The following process has been adopted by the Stanislaus County Department of Environmental Resources (DER) to review and process well permit applications under the County Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code) after the effective date of November 26, 2014. The process is also illustrated graphically on the attached flow chart.

1. The Applicant submits a Well Permit Application using the Application Packet available at http://www.stancounty.com/ER/pdf/water-well-construction-and-destruction-application.pdf, or from the DER office, and provides a check for the appropriate permit fees.
2. After receipt of a Permit Application, it is reviewed by the DER to determine whether it is subject to, or exempt from, the prohibitions in the Groundwater Ordinance against unsustainable groundwater extraction and the export of water using the following criteria:
   a. Section 9.37.030 (4): If the Permit Application is for a well that will pump water from a known and definite channel, it is not pumping groundwater as defined by the Groundwater Ordinance, and the prohibitions of the Ordinance do not apply. (A copy of the "Application to Appropriate Water" submitted to the California State Water Resources Control Board (SWRCB) is required.)
   b. Section 9.37.045 (A): The prohibition against unsustainable groundwater extraction does not apply to an application for a well designed to replace an existing well permitted prior to November 25, 2014, provided the replacement well has no greater capacity than the well it is replacing. (Construction details and groundwater extraction capacities for the original and replacement well are required to confirm the well has a similar location, depth and capacity.)
   c. Section 9.37.045 (D): The prohibitions and requirements of the Groundwater Ordinance do not apply to Permit Applications for wells located in an incorporated city of the County.
   d. Section 9.37.050 (A1) Permit Applications for wells on property served by a public water agency that is in compliance with an adopted Groundwater Management

Plan or Groundwater Sustainability Plan are not subject to the prohibitions in the Groundwater Ordinance. (Current proof that water delivery charges are being paid by the parcel in question is required.)

e. Section 9.37.050 (A2): Permit Applications for wells intended to extract 2 acre-feet/year of groundwater or less are exempt from the prohibitions in the Groundwater Ordinance. (Construction and pump details are required.)

f. Section 9.37.050 (A3): Groundwater extraction or water export in compliance with a permit previously granted by the DER is exempt from the prohibitions in the Groundwater Ordinance. (A copy of the permit is required.)

Based on this review, if the Permit Application is exempt, it is processed and a permit is issued by DER for construction of the well after receipt of the required permit fees.[1]

3. If the Permit Application is not exempt, the Applicant must submit a Supplemental Application for Non-Exempt Wells with information to demonstrate that groundwater pumped from the well is being sustainably extracted and will not cause any of the "Undesirable Results" listed in Section 97.030 (9) the Ordinance. This Supplemental Application is reviewed to determine whether the information provided is complete and adequate to demonstrate that the Permit Application complies with the Groundwater Ordinance. The review is completed over an approximately 30-day period and is conducted at the expense of the Applicant. Additional permit application fees may be due at the time the supplemental information is provided and/or prior to issuance of the permit.

   a. A copy of the Supplemental Application for Non-Exempt Wells is attached. The DER will contact the Applicant to review what is required, which may vary depending on location and well depth.

   b. After the Applicant submits the supplemental information, an Completeness Review is done to verify that all of the required information has been provided. The Applicant will be notified if any additional information is required before review of the Permit Application for compliance with the Groundwater Ordinance can begin. This may include requirements for special studies that are triggered under some circumstances.

   c. Next, the Permit Application and supplemental information provided by the applicant is subjected to a Compliance Review to determine whether the Applicant has met the requirement to demonstrate by "Substantial Evidence" (Section 97.045 (A)) that the proposed groundwater extraction will not result in "Unsustainable Groundwater Extraction" as defined in Sections 97.030 (6) and 97.030 (8) of the Groundwater Ordinance. To do this, a technical review is conducted to verify whether the information submitted by the Applicant demonstrates that groundwater

[1] After adoption of a Groundwater Sustainability Plan (GSP), the prohibition against unsustainable groundwater extraction will be applicable to any well for which the County reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. This would include applications for wells that are found not to be in compliance with a GSP. In addition, if a proposed well is intended to be used for the export of water as defined in the Groundwater Ordinance, a separate review is conducted to determine whether such export is exempt from the Ordinance prohibition against export.

extraction from the well will not cause, or substantially contribute to, any of the "Undesirable Results" listed in Section 97.030 (9) of the Groundwater Ordinance. These Undesirable Results may include the following:

i. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

ii. Significant and unreasonable reduction of groundwater storage.

iii. Significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water quality.

iv. Significant and unreasonable land subsidence that substantially interferes with surface land uses.

v. Surface water depletions that have significant and unreasonable adverse impacts on the beneficial uses of the surface water.

d. If the review finds the proposed new well may cause or substantially contribute to any of the above-listed Undesirable Results, the application is discussed with the Applicant, and they are given the opportunity to submit additional data, prepare special studies, accept permit conditions that will lessen the Undesirable Results to an insignificant level, or amend their application. Note that the Applicant is not required to submit additional data, perform special studies, amend their application or accept the permit conditions in such a situation; however, it they do not do so, an Environmental Impact Report (EIR) will be required.

4. After completion of the Groundwater Ordinance Completeness and Compliance Reviews, the application is reviewed as required under the California Environmental Quality Act (CEQA) to determine whether construction and use of the proposed well could result in potentially significant environmental impacts, and to determine what type of environmental document is appropriate for evaluation of the project and compliance with the CEQA. This is called a CEQA Initial Study, and is completed during an approximately 30-day period. If the Initial Study finds that construction and operation of the proposed well will not result in potentially significant environmental impacts, or that the impacts will be mitigated to a less-than-significant level, then the application qualifies for processing under a Negative Declaration (ND) or a Mitigated Negative Declaration (MND). If the Initial Study finds that there are potentially significant environmental impacts, then an EIR is required.

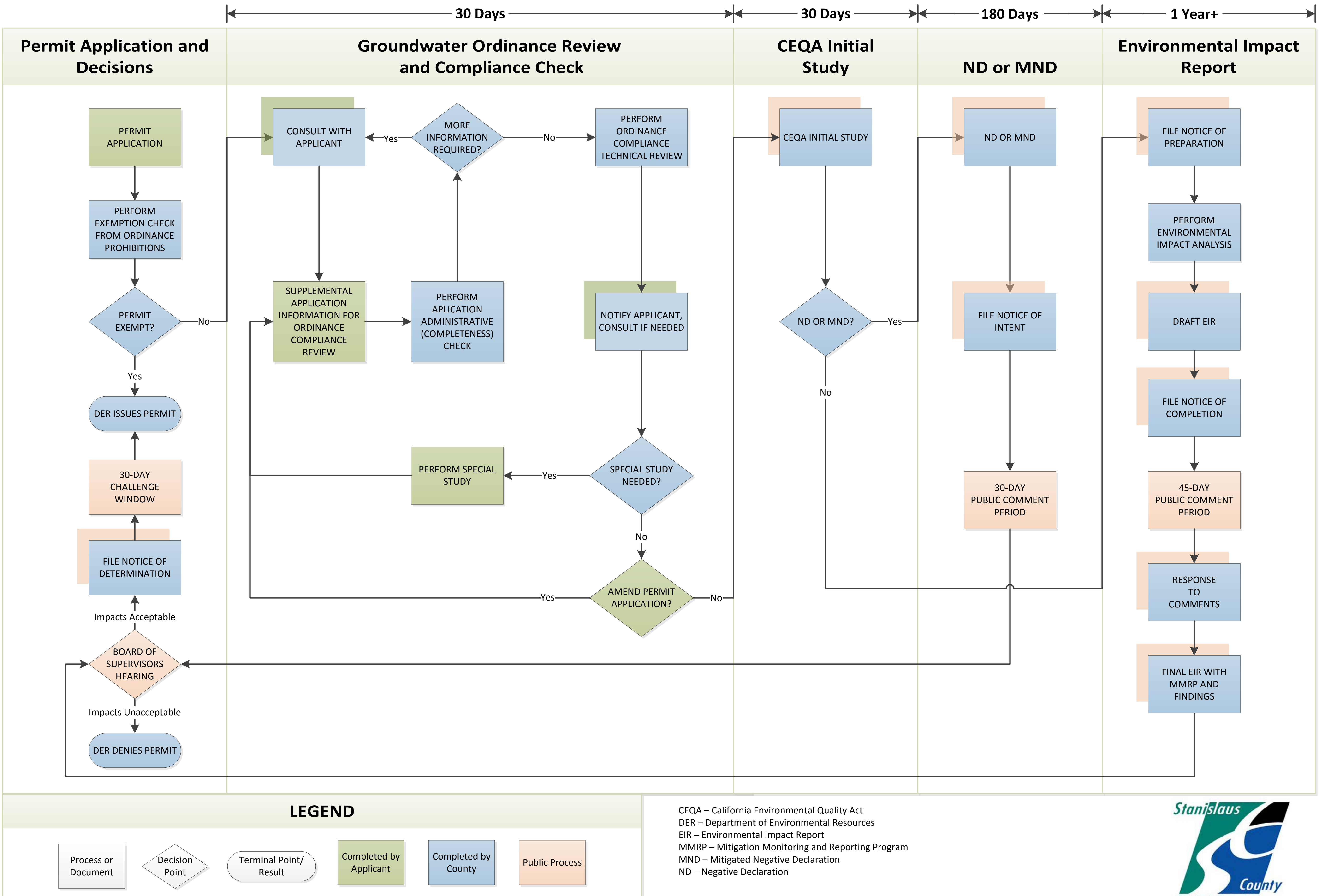
5. If the application qualifies for a ND or MND, then the appropriate CEQA document is prepared and processed. Under the State CEQA Guidelines, the County has 180 days to complete this process. First, the DER prepares the draft document (either a ND or MND) and files a Notice of Intent with the County Clerk; then, a 30-day public comment period is opened.

6. If the application requires preparation of an EIR, the DER will meet with the applicant to review the requirements. EIR's will usually require more in depth studies to evaluate specific impacts and determine whether or not they are significant. Under the CEQA Guidelines, the County has one year to complete an EIR, but this period may be extended depending on the circumstances.
7. After conclusion of the public comment period for the ND, MND or EIR, and preparation of responses to any public or agency comments that are received, the well permit application is approved by the DER. In some cases, if a well permit application is considered controversial, the application may be reviewed for acceptance in a public hearing during a regularly-schedule Board of Supervisors meeting, at which the application would be voted upon. After the application is accepted by the DER or Board of Supervisors, a Notice of Determination is filed with the County Clerk. After the Notice of Determination is filed, there is a 30-day period during which the County's decision can be legally challenged under CEQA. After this period is over, if no challenges are received, the DER will issue a Well Construction Permit and a Groundwater Extraction Permit, pending receipt of any fees that are due for review and processing of the permit application. The term of the Groundwater Extraction Permit will extend until the time that a GSP is adopted in the area in which the well is located, and can be renewed for additional periods coinciding with required updates to the GSP every five years.

Attachments:

1. Stanislaus County Groundwater Ordinance Well Permitting Process Flow Chart
2. Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance
3. Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance
4. Supplemental Application for Non-Exempt Wells

STANISLAUS COUNTY GROUNDWATER ORDINANCE WELL PERMITTING PROCESS



CEQA – California Environmental Quality Act
DER – Department of Environmental Resources
EIR – Environmental Impact Report
MMRP – Mitigation Monitoring and Reporting Program
MND – Mitigated Negative Declaration
ND – Negative Declaration

Stanislaus County
Striving to be the Best

Jacobson James & Associates, Rev C August 7, 2015

Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance

Undesirable Result [1]	CEQA Initial Study Checklist Questions [2]	County Management Objectives	County Management Thresholds and Actions	Items Required to be Included in the Applicant's Well Permit Application	Potential Well Permit Conditions
Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon.	Question IX(b): Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	Objective A: Prevent interference draw-down to existing wells that substan-tially interferes with the ability to support existing land uses, or land uses for which permits have been granted.	Threshold A1: Predicted interference drawdown is greater than 5 feet at existing domestic wells, or greater than 10% of the available drawdown if the well extends more than 50 feet below the standing water level. Action A1: If interference drawdown cannot be decreased by moving the well, changing the extraction interval, limiting extraction, or pumping from multiple wells, the Applicant shall implement a Well Interference Drawdown Monitoring and Mitigation Program. Threshold A2: Predicted interference drawdown is greater than 20 feet at existing irrigation, industrial or municipal wells. Action A2: If drawdown cannot be reduced by moving the well, changing the extraction interval, limiting extraction, or pumping from multiple wells, the Applicant shall implement a Well Interference Drawdown Monitoring and Mitigation Program.	1. Proposed well design, use, pumping rate, schedule and total extraction volume. 2. Distance-drawdown calculations for drawdown at the end of the permit term and the wells usable lifetime (20 years). Calculated using standard equations for confined/unconfined aquifers, spreadsheets, or computer models. Aquifer parameters must be substantiated from available data or based on conservative assumptions inferred from the literature. 3. Locations of existing wells within the predicted 5-foot drawdown radius of the proposed well.	If required by the County, implementation of a Well Interference Drawdown Monitoring and Mitigation Program.
	Question XVII(d): Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? Question XVIII(b): Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.) Question XVIII(c): Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	Objective B: Prevent contribution to regional drawdown that does not recover over a period of years that includes both wet and dry periods, and that, if continued, will interfere with the ability of well operators to support existing or permitted land uses, or sub-stantially increases the cost to extract groundwater.	Threshold B1: The proposed well is within an Groundwater Level Management Zone designated by the County, where installation of new wells would contribute to, or, in the absence of direct data can be reasonably inferred to contribute to, a condition of Critical Overdraft, which is *"... when present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts*" (DWR Bulletin 118-80). Action B1: Submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be 100% offset. Alternatively, the Applicant shall complete a Groundwater Resources Investigation that demonstrate the proposed extraction will not result in, or contribute to, undesirable results. Threshold B2: The total water volume pumped from the proposed well during the permit term is projected to exceed 10% of the available aquifer storage volume beneath the contiguous property served by the well. Action B2: Implement a Groundwater Level Monitoring Program. Threshold B3: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 5%. Action B3: Submit and implement a Pumping Management Plan to keep storage depletion from exceeding 10% of the available aquifer storage beneath the contiguous property served by the well, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable. Threshold B4: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 10%. Action B4: Curtail pumping until storage recovers to a level exceeding the threshold, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable.	4. Well location and boundaries of the property to be served by the well. 5. Proposed water use. 6. For wells located in an Groundwater Level Management Zone, a Groundwater Extraction Offset Plan or Groundwater Resources Investigation acceptable to the County. 7. The total volume of groundwater in storage in the aquifer system beneath the contiguous property to be served by the well, calculated by multiplying the aquifer thickness by the specific yield and the area of the property. 8. For wells located in a Groundwater Level Management Zone or wells projected to extract more than 10% of the available aquifer storage volume beneath the contiguous parcels to be served, a Groundwater Level Monitoring Program acceptable to the County.	Water Use Accounting of groundwater withdrawals from the proposed well. If required by the County, implementation of a Groundwater Extraction Offset Program If required by the County, implementation of a Groundwater Level Monitoring Program with triggers and response actions. If required by the County, design requirements or pumping restrictions.

Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance

Undesirable Result [1]	CEQA Initial Study Checklist Questions [2]	County Management Objectives	County Management Thresholds and Actions	Items Required to be Included in the Well Permit Application	Potential Well Permit Conditions
Significant and unreasonable reduction of groundwater storage.	Question IX(b): Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)? Question XVII(d): Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? Question XVIII(b): Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.) Question XVIII(c): Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	Objective C: Prevent depletion of ground-water storage to levels that are insufficient to support existing or permitted land uses during dry and critically dry years without potentially causing other undesirable results as defined under the Ordinance.	Thresholds and Actions B1 through B4 apply to Objective C as written.	Application requirements are identical to Objective B.	Potential permit conditions are identical to Objective B.

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Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance

Undesirable Result [1]	CEQA Initial Study Checklist Questions [2]	County Management Objectives	County Management Thresholds and Actions	Items Required to be Included in the Applicant's Well Permit Application	Potential Well Permit Conditions
Significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water quality.	Question VIII(b): Would the project create a significant hazard to the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? Question IX(a): Would the project violate any water quality standards or waste discharge requirements? Question IX(f): Would the project otherwise substantially degrade water quality?	Objective D: Prevent degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan).	Threshold D1: Installation of a well within a Groundwater Quality Protection Zone (an area where the County has determined special well design requirements are warranted to protect the existing quality of a ground-water resource) or within 1 mile of a reported contamination or spill incident. Action D1: Implementation of well design requirements prescribed by the County, such as prohibitions against cross screening wells between different aquifer systems, or completion of wells to depths near saline groundwater. Threshold D2: Installation of a well within a Groundwater Quality Study Zone (an area where the County has determined special studies are warranted to protect the existing quality of a groundwater resource) or within 1 mile of a reported contamination incident or known area of relatively poor water quality. Action D2: The Applicant shall complete a Groundwater Quality Investigation sufficient to demonstrate that the proposed well, as designed, constructed and operated, will not result in, or contribute to, significant water quality degradation, significant migration of contamination, or interference with ongoing or planned groundwater remediation or quality protection programs. Threshold D3: A Groundwater Quality Investigation determines pumping from a well has the potential to result in, or contribute to, significant water quality degradation, significant migration of contamination, or interference with ongoing or planned groundwater remediation or quality protection programs. Action D3: The Applicant shall propose well construction and design specifications, monitoring and/or operating restrictions that prevent the identified water quality degradation, contaminant migration, or interference with groundwater remediation or protection programs.	9. A map showing location of potential sources of contamination near the well (e.g., sewers, septic systems, animal enclosures, CAFOs, etc.). 10. The results of a search of public databases of hazardous materials sites and contamination incidents within 1 mile of the proposed well location. 11. For wells located inside a Groundwater Quality Protection Zone, or if reported hazardous materials or contamination incidents are identified within 1 mile, a Groundwater Quality Investigation acceptable to the County. 12. If recommended in the Groundwater Quality Investigation, proposed well construction and design specifications, setbacks, and/or pumping restrictions.	If required by the County, compliance with well construction requirements for a Groundwater Quality Protection Zone. If required by the County, well construction and design specifications, setbacks, and/or operating restrictions to prevent the capture or spread of groundwater contamina-tion or poor quality groundwater. If required by the County, implementation of a Groundwater Quality Monitoring Program with triggers and response actions.

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Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance

Undesirable Result [1]	CEQA Initial Study Checklist Questions [2]	Management Objectives	Management Thresholds and Actions	Application Requirements	Permit Conditions
Significant and unreasonable land subsidence that substantially interferes with surface land uses.	Question VI(c): Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	Objective E: Prevent inelastic subsidence that is cumulatively considerable and interferes with surface land uses or infrastructure or increases the potential for flooding.	Threshold E1: Installation of a well in a Subsidence Study Zone (within 2 miles of the Corcoran Clay subcrop boundary reported by United States Geological Survey (USGS). Action E1: Submit hydrographs for nearby wells and drawdown calculations to determine whether groundwater levels will fall below historical low levels outside the property boundaries or near potentially sensitive infrastructure. Threshold E2: Threshold E1 applies, groundwater levels are projected to fall below historical low levels, and the well will either (a) extract groundwater from the confined aquifer system, or (b) from the shallow aquifer system, if it contains more than 50 feet of clay strata. Action E2: Conduct a Geotechnical Subsidence Investigation that establishes significant subsidence will not occur or provides recommendations to prevent significant subsidence. Threshold E3: If (a) the well is proposed to be completed in the confined aquifer system, and drawdown is projected to exceed 5 feet at the property boundary or beneath sensitive infrastructure; or, (b) the well is completed in the unconfined aquifer system and drawdown is projected to 10 feet beneath the property boundary or at sensitive infrastructure. Action E3: Implement a Groundwater Level and Subsidence Monitoring Program acceptable to the County. Threshold E4: Measured inelastic subsidence near the site exceeds 2 inches. Action E4: Curtail groundwater extraction and perform a Geotechnical Subsidence Investigation to determine the cause of the subsidence and the likelihood of continued subsidence, and that provides recommendations for prevention of subsidence that will significantly damage or interfere with surface land uses and infrastructure.	13. For wells located inside a Subsidence Study Zone, (a) a map showing the locations of infrastructure that may be sensitive to subsidence (canals, ditches, roads, utility lines, floodways, etc.) within 2 miles of the well or within the predicted 5-foot drawdown contour, whichever is greater; (b) drawdown calculations for seasonal maximum drawdown and drawdown at the end of the permit term and after 20 years of operation at the nearest property boundary and at potentially sensitive infrastructure; (c) hydrographs for nearby wells completed in the aquifer the well will extract groundwater from; (d) projection of groundwater level trends; and (e) comparison of predicted groundwater levels to historical lows. 14. If required, a Geotechnical Subsidence Investigation acceptable to the County. 15. If required, a Groundwater Level and Subsidence Monitoring Program acceptable to the County.	If required by the County, well design and/or operating requirements to prevent or minimize potential for subsidence. If required by the County, implementation of a Groundwater Level and Subsidence Monitoring Program with triggers and response actions.

Discretional Well Permitting Framework under the Stanislaus County Groundwater Ordinance

Undesirable Result [1]	CEQA Initial Study Checklist Questions [2]	Management Objectives	Management Thresholds and Actions	Application Requirements	Permit Conditions
Surface water depletions that have significant and unreasonable adverse impacts on the beneficial uses of the surface water.	<u>Question IV(a):</u> Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? <u>Question IV(b):</u> Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS? <u>Question IV(c):</u> Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? <u>Question XVIII(b):</u> Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.) <u>Question XVIII(c):</u> Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	<u>Objective F1:</u> Prevent depletion of surface water resources in excess of depletion thresholds established for the protection of aquatic life, and as necessary to maintain existing surface water uses. <u>Objective F2:</u> Prevent drawdown that has a significant adverse effect on groundwater-dependent ecosystems (GDEs).	<u>Threshold F1:</u> Installation of a well in channel deposits within a stream floodplain. <u>Action F1:</u> Wells meeting the criteria of Threshold F1 are presumed to pump water from the stream unless demonstrated otherwise, unless determined otherwise by the SWRCB Division or Water Rights. These wells are not pumping groundwater as defined under the Groundwater Ordinance, but must be operated within the requirements of an existing surface water right <u>Threshold F2:</u> Installation of a well in a Surface Water Protection Zone: (a) within 2,500 feet of a groundwater-connected stream or reservoir if the well is completed within the upper 200 feet of the aquifer system; or (b) within 1 mile of a groundwater-connected stream or reservoir if the well is completed below the upper 200 feet of the aquifer system. <u>Action F2:</u> The Applicant shall conduct a Surface-Groundwater Interaction Study to evaluate surface water impacts from well operations at the end of the permit term and over the lifetime of the well (assumed 20 years). The study shall include an evaluation of aquifer conditions based on site-specific testing, and a streamflow depletion estimate using analytical or numerical models. The report shall compare streamflow depletion and drawdown to acceptable thresholds that are protective of beneficial surface water uses, and recommend appropriate well construction and or operating requirements such that significant surface water depletion will not occur. In addition, the report shall include recommendations for implementation of a Surface-Groundwater Monitoring and Reporting Program with proposed thresholds and response actions, as appropriate. <u>Threshold F3:</u> Installation of a well within the projected 0.5 foot drawdown at the end of the permit term or 3 miles (whichever is greater) of a seep, spring, wetland, riparian habitat, phreatophyte woodland or other GDE. <u>Action F3:</u> The Applicant shall evaluate whether any of the GDEs may be hydraulically connected to the pumped aquifer and, if so, estimate the drawdown at the GDE as the end of the permit term. <u>Threshold F4:</u> The maximum predicted drawdown beneath a GDE that is hydraulically connected to the pumped aquifer exceeds 0.5 foot at the end of the permit term. <u>Action F4:</u> The Applicant shall conduct a GDE Impact Study that evaluates the proposed well's impacts on groundwater levels, flows and surface discharges, as well as potential impacts on groundwater dependent vegetation, habitat and fauna. If necessary, the impact study shall recommend appropriate well construction and or operating requirements such that significant impacts will not occur, or shall include recommendations for appropriate mitigation measures. In addition, the study shall include recommendations for implementation of a GDE Monitoring Program, as appropriate.	16. For wells completed within channel deposits within a stream floodplain, a copy of the Application to Appropriate Water filed with the SWRCB for extraction from a known and definite channel or determination by the SWRCB Division of Water Rights that the well is not pumping water from a subterranean stream. 17. Location of all surface water bodies and streams within 2 miles of the proposed well. 18. For proposed wells inside a Surface Water Protection Zone, a Surface-Groundwater Interaction Study acceptable to the County. 19. A map showing all springs, seeps, wetlands, riparian habitats and phreatophyte (e.g. blue oak) woodlands and other GDEs within the projected 0.5 foot drawdown contour at the end of the permit term or within 3 miles of the proposed well (whichever is greater), based on the Applicant's knowledge of the area, publically available maps and databases, and aerial photography. 20. An evaluation of GDEs within the above areas to determine if they may be hydraulically connected to the pumped aquifer, and further evaluation of drawdown beneath any such GDEs at the end of the permit term. 21. If the predicted drawdown beneath a GDE that may be hydraulically connected to the pumped aquifer exceeds 0.5 foot at the end of the permit term, a GDE Impact Study acceptable to the County that assesses whether the proposed pumping will have a significant effect on the GDE and provides recommendations for mitigation, if needed.	If required by the County, well construction, setback and/or operating requirements to minimize potential surface water interaction. If required by the County, implementation of a Surface-Groundwater Interaction Monitoring Program, with appropriate thresholds and response actions. If required by the County, well construction, setback and/or operating require-ments to minimize potential GDE impacts. If required by the County, implementation of a GDE Monitoring Program with triggers and response actions. If required by the County, other mitigation measures for potential impacts to surface water resources or GDEs.

Notes:

1. Undesirable results as listed in Section 9.37.030(9) of the Stanislaus County Groundwater Ordinance
2. Applicable questions from the CEQA Initial Study Checklist contained in Appendix G of the CEQA Guidelines.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objective	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective A: Prevent interference drawdown to nearby well operators that substantially interferes with their ability to support existing or permitted land uses.	Threshold A1: Predicted interference drawdown is greater than 5 feet at existing domestic wells, or greater than 10% of the available drawdown if the well extends more than 50 feet below the standing water level.	Adequately functioning domestic wells in Stanislaus County may be assumed to generally have an available drawdown of at least 50 feet. Reduction of the available drawdown in a domestic well by less than 10% is not expected to significantly affect a domestic well's usability.	Use of 5 feet as an interference drawdown threshold is relatively common in adopted CEQA and NEPA documents, and has been adopted as a screening criterion by some jurisdictions (CEC, 2010; San Diego County, 2010). Other jurisdictions have adopted well interference screening thresholds of 10 to 15 feet drawdown (Napa County, 2015).	A threshold of 5 feet is a relatively conservative trigger for implementation of a monitoring and mitigation program. The program would be designed to identify significant undesirable effects to nearby domestic wells and implement appropriate mitigation.	A threshold of 5 feet is protective, but not unduly burdensome as a trigger for implementation of a monitoring and mitigation program. It is reasonable to utilize a lower threshold for domestic wells than for higher capacity wells, because they are more vulnerable to interference drawdown. As a first course of action, Applicants are encouraged to move the location of their wells, change well completion intervals or spread out pumping among multiple wells in order to lessen impacts below the threshold.
	Threshold A2: Predicted interference drawdown is greater than 20 feet at existing irrigation, industrial or municipal wells.	An available drawdown of 200 feet is a reasonable minimum for a production well in Stanislaus County. Reduction of the available drawdown by less than 10% or 20 feet in a production well is not expected to significantly affect such a well's usability.	Use of 20 feet as an interference drawdown threshold has been adopted in some areas in California and is appropriate for wells with significant available drawdown, such as production wells. (San Diego County, 2010). Other jurisdictions have adopted well interference screening thresholds of 10 to 15 feet drawdown (Napa County, 2015).	A 20-foot threshold is a modest amount of additional drawdown in a typical moderate to high capacity production well. It is unlikely that such a well would lose significant capacity prior to reaching this trigger. The monitoring program would be designed to identify significant undesirable effects to nearby production wells and implement appropriate mitigation.	A threshold of 20 feet is protective, but not unduly burdensome as a trigger for implementation of a monitoring and mitigation program. As a first course of action, Applicants are encouraged to move the location of their wells, change well completion intervals or spread out pumping among multiple wells in order to lessen impacts below the threshold. Increased pumping expenses are assumed to be mutually offsetting and are not considered.
	Action A1: If interference drawdown cannot be decreased by moving the well, changing the extraction interval, limiting extraction, or pumping from multiple wells, the Applicant shall implement a Well Interference Drawdown Monitoring and Mitigation Program. Action A2: If drawdown cannot be reduced by moving the well, changing the extraction interval, limiting extraction, or pumping from multiple wells, the Applicant shall implement a Well Interference Drawdown Monitoring and Mitigation Program.	Owners of wells within areas where the drawdown thresholds are exceeded will be notified and invited to register their wells for participation in the Monitoring and Mitigation Program. Baseline condition data will be gathered for these wells and selected wells will be used for groundwater level monitoring. This data will form the basis for determining whether nearby wells are being significantly affected, and for distinguishing the effect of interference drawdown from regional groundwater-level changes and pre-existing well conditions. Mitigation can then be prescribed in an equitable manner in proportion to the contribution of the Applicant's well to the undesirable result.	Similar well interference drawdown monitoring and mitigation programs are relatively common in adopted CEQA and NEPA environmental documents and have been implemented throughout the State (for example, CEC, 2010; Sotoyome RCD, 2012). Other states (for example, Iowa, South Dakota and Minnesota) have adopted well interference mitigation programs (for example Iowa, 2007).	The triggers for implementation well interference monitoring are relatively conservative, assuring that programs are in place to provide mitigation for undesirable results before they are observed.	The program provides a means for affected well owners to be equitably reimbursed for expenses potentially arising from interference drawdown, with the level of mitigation proportional to the contribution of the Applicant's groundwater extraction to the undesirable result. Baseline conditions are documented. If a monitoring and mitigation program is implemented, property owners must agree to provide baseline information regarding their wells and access for future inspections and monitoring in order to be eligible for mitigation.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective B: Prevent contribution to regional drawdown that does not recover over a period of years that includes both wet and dry periods, and that, if continued, will interfere with the ability of well operators to support existing or permitted land uses, or substantially increases the cost to extract groundwater.	Threshold B1: The proposed well is within an Groundwater Level Management Zone designated by the County, where installation of new wells would contribute to, or, in the absence of direct data can be reasonably inferred to contribute to, a condition of Critical Overdraft, which is *"... when present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts*" (DWR Bulletin 118-80). Action B1: Submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be 100% offset. Alternatively, the Applicant shall conduct a Groundwater Resources Investigation that demonstrate the proposed extraction will not result in, or contribute to, undesirable results.	The County uses available data regarding groundwater levels and trends, and reported undesirable results to designate Groundwater Level Management Zones based on an assessment of whether historical groundwater level trends indicate a "*chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon*" (JJ&A, 2017). Additional groundwater extraction in such areas can be reasonably expected to contribute incrementally to existing and future undesirable results as defined under the Ordinance and under the Sustainable Groundwater Management Act (SGMA).	Other jurisdictions in California have adopted thresholds for CEQA Initial Studies in special groundwater management areas that consider any contribution to drawdown as a potentially significant impact that triggers an EIR (Ventura County, 2011; Napa County, 2012). Some jurisdictions have developed zoning overlays that require 100% offset of additional groundwater use (Napa County, 2012; San Diego County, 2007), or require studies to prove adequate water supply prior to issuing a permit (Sonoma County, 2014). Recent CEQA case law indicates *de minimis* contribution to a significant cumulative impact must be considered cumulatively considerable (Kings County Farm Bureau v. City of Hanford [(1990) 221 Cal. App. 3d 692, 270 Cal. Rptr. 650]; Communities for a Better Environment, 103 Cal. App. 4th at 117-118). Groundwater offset plans are a relatively commonly used mitigation method (for example Genesis, 2011).	Designation of Groundwater Level Management Zones that are subject to requirements for more detailed study or groundwater extraction offset is protective against further potential damage and is forward looking to sustainable groundwater management practices that must be implemented under SGMA.	In areas where undesirable results are already occurring or can be reasonably predicted if current groundwater management practices are continued, it is reasonable to place the burden of proof on an applicant that either the proposed groundwater extraction is sustainable, or to require full offset.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective B: Prevent contribution to regional drawdown that does not recover over a period of years that includes both wet and dry periods, and that, if continued, will interfere with the ability of well operators to support existing or permitted land uses, or substantially increases the cost to extract groundwater.	Threshold B2: The total water volume pumped from the proposed well during the permit term is projected to exceed 10% of the available aquifer storage volume beneath the contiguous property served by the well. Action B2: Implement a Groundwater Level Monitoring Program. Threshold B3: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 5%. Action B3: Submit and implement a Pumping Management Plan to keep storage depletion from exceeding 10% of the available aquifer storage beneath the contiguous property served by the well, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable. Threshold B4: The total available aquifer storage volume beneath the contiguous property served by the well has been decreased by 10%. Action B4: Curtail pumping until storage recovers to a level exceeding the threshold, or submit a Groundwater Resources Investigation that demonstrates a higher threshold is sustainable.	Ultimately, the maximum drawdown that is sustainable will be determined by the most drawdown-sensitive undesirable result; however, in the absence of other undesirable results, the loss of 10% of available aquifer storage is not likely to significantly interfere with a groundwater pumper's ability to meet the water demand for existing or permitted land uses. A threshold based on available aquifer storage beneath a property will limit groundwater extraction in proportion to property size, aquifer conditions, and local ground-water balance. As such, it incorporates a range of key technical factors that are expected to be investigated as part of groundwater basin management under SGMA, but which are not yet known.	In groundwater resources planning (i.e., under the Ordinance, CEQA and SGMA), drawdown is acceptable as long as it is not chronic and does lead to undesirable results (San Diego County, 2010; Ventura County 2011; Santa Barbara County, 2009). Groundwater extraction that is proportional to property size would be consistent with the concept of correlative groundwater rights. In groundwater resources planning (i.e., under the Ordinance, CEQA and SGMA), storage depletion is acceptable as long as it is not chronic and does lead to an inability to meet water demand for existing and permitted land uses during dry or critically dry periods. This concept is consistent with the California Water Action Plan, which embraces the concept of groundwater as a storage buffer against periods of drought. Groundwater level monitoring is typically used to assess change and trends in groundwater storage.	A threshold of 10% of the available aquifer volume as a trigger to implement groundwater monitoring is relatively conservative and will help to assure that groundwater management decisions are timely and based on reliable data. A cumulative storage depletion of less than 10% of the thickness in a pumped aquifer system relative to pre-pumping baseline conditions is not, by itself, expected to result in significant and unreasonable impacts, as long as other, potentially more drawdown-sensitive undesirable results are managed and preventive. As such, this threshold may be considered protective as long as the other thresholds and management actions in the well permitting program are being effectively implemented.	Groundwater levels and drawdown are key indicators of the health of an aquifer, and a direct way to demonstrate that groundwater extraction is sustainable under the Ordinance. A threshold of 10% of the pumped aquifer system thickness is probably near the upper range of what can be reasonably accepted prior to the performance of additional studies. An applicant has the opportunity to perform additional studies that establish more site specific management thresholds and actions which may be less restrictive.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
<u>Objective C:</u> Prevent depletion of available groundwater storage to where supplies are insufficient to support existing or permitted land uses during dry and critically dry years without potentially causing other undesirable results.	Thresholds and Actions B1 through B4 apply to Objective C as written.	Same as Thresholds and Actions B1 through B4	Same as Thresholds and Actions B1 through B4	Same as Thresholds and Actions B1 through B4	Same as Thresholds and Actions B1 through B4
<u>Objective D:</u> Prevent degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan).	<u>Threshold D1:</u> Installation of a well within a Groundwater Quality Protection Zone (an area where the County has determined special well design requirements are warranted to protect the existing quality of a ground-water resource) or within 1 mile of a reported contamination or spill incident. <u>Action D1:</u> Implementation of well design requirements prescribed by the County, such as prohibitions against cross screening wells between different aquifer systems, or completion of wells to depths near saline groundwater.	The County designates Groundwater Quality Protection Zones where special well design requirements are warranted to protect the existing quality of groundwater from being. Such a zone has been designated to prevent the cross connection of the shallow and deeper aquifer systems in the area underlain by the Corcoran Clay as determined by the USGS. Other Groundwater Quality Protection Zones may be established in the future areas where pockets or strata of lower quality groundwater are found. This could include strata with elevated concentrations of nitrate, arsenic or uranium; areas near known groundwater contamination plumes; or areas where wells are completed to depths near the base of freshwater. The County will use available data regarding groundwater quality and hydrogeology, to identify Groundwater Quality Protection Zones where key resources may be at risk of degradation if special well design requirements are not implemented.	Special well design/completion requirements have been adopted by other jurisdictions including, for example, a prohibition in Fresno County and Merced County against screening new wells both above and below the Corcoran Clay.	Designation of Groundwater Quality Protection Zones subject to well design standards is a proactive means to prevent degradation of the water quality of key resources.	Well design standards are not unduly burdensome, but would provide a key benefit to the County's groundwater resources, and help to assure the high quality of groundwater is maintained for existing and future uses.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective D: Prevent degradation of water quality in excess of Water Quality Objectives for applicable beneficial uses in the RWQCB Basin Plan.	Threshold D2: Installation of a well within a Groundwater Quality Study Zone (an area where the County has determined special studies are warranted to protect the existing quality of a groundwater resource) or within 1 mile of a reported contamination incident or known area of relatively poor water quality. Action D2: The Applicant shall conduct a Groundwater Quality Investigation sufficient to demonstrate that the proposed well, as designed, constructed and operated, will not result in, or contribute to, significant water quality degradation, significant migration of contamination, or interference with ongoing or planned groundwater remediation or quality protection programs.	One mile is the maximum search radius prescribed in ASTM Standard 1527 for assessing the potential of contamination-related impacts on sites under the EPA's "All Appropriate Inquiry" standard. It is not likely that contamination incidents or groundwater impacts at greater distances will have an impact on a supply well. Groundwater Quality Investigations will identify potential migration pathways for contaminants and natural solutes, and aid in specifying design and operation requirements for supply wells that will avoid inducing capture and migration of contamination or degraded water. Formal Groundwater Quality Study Zones may be established in areas surrounding known and reported contamination incidents in the future. Pending the establishment of formal Groundwater Quality Study Zones, the need for such actions is determined by the County on a case-by-case basis during the well permitting process.	Groundwater protection zones have been designated by other jurisdictions in the San Joaquin Valley to protect key groundwater resources from contamination (e.g., City of Dinuba, 2004). Other jurisdictions in California have adopted guidelines and thresholds for evaluation of water quality impacts associated with groundwater extraction (San Diego County, 2007; Ventura County, 2011), and deed restrictions governing the installation of water supply wells are a common means to prevent potential migration of contamination that are adopted as part of groundwater remedial actions. Groundwater Quality investigations vary in scope depending on the issues at hand. See for example WorleyParsons Komex 2007a and 2007b.	Designation of Groundwater Quality Protection Zones is a proactive means to prevent degradation of key resources, interference with remedial actions, and potential exposure to hazardous chemicals.	Study and well completion requirements would be consistent with the level of potential risk by a proposed well and in most cases would not be unduly burdensome, but would provide a key benefit to the County's groundwater resources. The database search required under the well permitting program is not overly burdensome, and will help to avoid potentially expensive impacts that have occurred at other well sites throughout the region.
	Threshold D3: A Groundwater Quality Investigation determines pumping from a well has the potential to result in, or contribute to, significant water quality degradation, significant migration of contamination, or interference with ongoing or planned groundwater remediation or quality protection programs. Action D3: The Applicant shall propose well construction and design specifications, monitoring and/or operating restrictions that prevent the identified water quality degradation, contaminant migration, or interference with groundwater remediation or protection programs.	Mobilization of contamination can result in groundwater degradation and complicate remediation efforts. To avoid this, reported contamination incidents are identified in proximity to the proposed well. Identified incidents are further evaluated to determine whether well completion requirements, coordination with remedial activities, and/or monitoring should be implemented to protect groundwater resources. The effectiveness of means to avoid entraining contamination by modifying well location, completion intervals or pumping patterns can be evaluated if the local hydrogeology is understood and the contamination incident or area of poor quality water is adequately characterized.	Assessment of contaminant fate and transport in proximity to wells is an established practice in groundwater quality management and remediation.	Proactive identification of reported contamination incidents allows implementation of protective well completion standards, coordination with remediation efforts and, where necessary, monitoring to verify that water quality degradation is not occurring.	A proactive, preventative approach to well design and operation saves considerable cost compared to implementation of remedial actions once contamination or poor quality water have been entrained or captured by a well, and can avoid the need to curtail pumping due to unexpected contamination in the future.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
<u>Objective E:</u> Prevent inelastic subsidence in that is cumulatively considerable. This is assumed to be subsidence in excess 2 inches. Inelastic subsidence less than this amount is not reasonably expected to interfere with surface land uses.	<u>Threshold E1:</u> Installation of a well in a Subsidence Study Zone (within 2 miles of the Corcoran Clay subcrop boundary reported by United States Geological Survey (USGS). <u>Action E1:</u> Submit hydrographs for nearby wells and drawdown calculations to determine if ground-water levels will fall below historical lows outside property boundaries or near sensitive infrastructure. <u>Threshold E2:</u> Threshold E1 applies and groundwater levels are projected to fall below historical low levels and the well will extract groundwater from the confined aquifer system or from the shallow aquifer system, if it contains more than 50 feet of clay strata. <u>Action E2:</u> Conduct a Geotechnical Subsidence Investigation that establishes significant subsidence will not occur or provides recommendations to prevent significant subsidence. <u>Threshold E3:</u> Drawdown beneath the property boundary is projected to exceed 5 feet at the property boundary or beneath sensitive infrastructure in the confined aquifer system, or 10 feet in the shallow, unconfined aquifer system. <u>Action E3:</u> Implement a Groundwater Level and Subsidence Monitoring Program acceptable to the County. <u>Threshold E4:</u> Measured inelastic subsidence near the site exceeds 2 inches. <u>Action E4:</u> Curtail groundwater extraction and perform a Geotechnical Subsidence Investigation to determine the cause of the subsidence and the likelihood of continued subsidence, and that provides recommendations for prevention of subsidence that will significantly damage or interfere with surface land uses and infrastructure.	Reported subsidence in Stanislaus County has been limited to areas underlain by the Corcoran Clay, where groundwater extraction from highly confined aquifers beneath the clay has resulted in the dewatering of compressible clay deposits. The aquifers overlying the Corcoran Clay are not confined, so wells completed in these deposits are at substantially less risk of inducing subsidence, although it remains possible. In the eastern part of the County, most groundwater production is from semi-confined aquifers in the Mehrten Formation that are well consolidated and do not tend contain compressible clay deposits. Similarly, the alluvial fan deposits between the Mehrten Formation outcrops to the east and the Corcoran Clay subcrop area to the west tend to be unconfined to semi-confined, and not to contain significant compressible deposits. Establishement of thresholds	County designation of special study zones is a common way to address geologic hazards such as subsidence either through General Plan elements, other planning documents, implementation guidelines or zoning overlays. A subsidence threshold of 2 inches has been applied in CEQA mitigation monitoring programs at other sites (e.g., Genesis, 2011).	Requiring the performance of subsidence investigations will be protective of groundwater extraction in recognized subsidence hazard areas. In other portions of the County, subsidence has not been documented and is geologically unlikely. Subsidence of 2 inches is unlikely to result in significant interference with surface land uses or damage to infrastructure, and curtailing pumping at this threshold provides an appropriate degree of protection against a well potentially contributing to future significant impacts.	In subsidence hazard areas, investigations are warranted to evaluate the potential for undesirable results and modify the project or scale mitigation as appropriate. Investigations and mitigation can be scaled to the level of hazard involved (e.g., they would be more stringent for high volume pumping at depth in an area underlain by the Corcoran Clay and close to critical infrastructure, and less stringent elsewhere). Subsidence is an irreversible impact, so pumping curtailment is appropriate if monitoring indicates potentially significant subsidence may be in progress.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective F1: Prevent depletion of surface water resources in excess of depletion thresholds established for the protection of aquatic life and as necessary to maintain existing surface water uses.	Threshold F1: Installation of a well in channel deposits within a stream floodplain. Action F1: Wells meeting the criteria of Threshold F1 are presumed to pump water from the stream unless demonstrated otherwise. These wells are not pumping groundwater as defined under the Groundwater Ordinance, but must be operated within the requirements of an existing surface water right.	Wells completed in a "known and definite channel" are regulated by the SWRCB as pumping surface water and are not regulated under the Ordinance. Such wells are typically located in floodplains close to streams.	It is not uncommon for pumping from wells in close proximity to streams to be regulated in this manner.	Shallow wells completed in channel deposits near streams have a strong and near-term effect on streamflow depletion. Regulation of groundwater extraction from such wells within the framework of surface water rights is protective of beneficial surface water uses.	Regulation of groundwater extraction from wells that pump from a known and definite channel under SWRCB's surface water rights program is required by law. SRWQCB typically initiates this determination; however, it is not unreasonable for the County to require an applicant to approach the SWRCB water rights division as a first step to determining whether a new well should be regulated in this fashion.
	Threshold F2: Installation of a well in a Surface Water Protection Zone: within 2,500 feet of a groundwater-connected stream or reservoir if the well is completed within the upper 200 feet of the aquifer system, or within 1 mile of a groundwater-connected stream or reservoir if the well is completed below the upper 200 feet of the aquifer system. Action F2: The Applicant shall conduct a Surface-Groundwater Interaction Study to evaluate surface water impacts from well operations over the lifetime of the well. The study shall include an evaluation of aquifer conditions based on site-specific testing and include streamflow depletion estimated using analytical or numerical models. The report shall compare streamflow depletion and drawdown to acceptable thresholds that are protective of beneficial surface water uses, and recommend appropriate well construction and or operating requirements such that significant surface water depletion will not occur. In addition, the report shall include recommendations for implementation of a Surface-Groundwater Monitoring and Reporting Program with proposed thresholds and response actions, as appropriate.	Surface Water Protection Zones were established based on conservative aquifer models. In the absence of more specific studies, the determination where to set the boundaries of these zones was based on a conservative assessment that streamflow depletion by wells outside these zones would be well below measurable levels, and unlikely to cause significant and unreasonable effects. As such, wells outside these will not be further evaluated. Ten new wells were simulated to be located at the boundary of a Surface Water Projection Zone, and the projected stream flow depletion was found to be less than half of the typical error in stream flow measurements at gaging station. Although a more rigorous threshold is expected to be developed during development of GSPs, this threshold is considered conservative enough to prevent undesirable results in the interim because (1) the number of new wells installed prior to adoption of GSPs is likely to be far less, (2) streamflows are mandated to be maintained at minimum levels for protection of beneficial uses for habitat and species using reservoir releases, and (3) anticipated effects are well below measurable levels.	Surface water protection zones have been established under CEQA and NEPA studies, and proximity screening thresholds have been adopted in California in some jurisdictions (Napa County, 2015) and proposed for others (USGS, 2008).	Until thresholds for acceptable streamflow depletion are established, the use of thresholds developed based on the absence of measurable impacts is conservative and protective, especially since they are based on a level of groundwater development that is unlikely to be realized.	In order for an impact to be significant, it is generally accepted that it must be observable and measurable; however, with streamflow depletion, it is common to use calculated impacts. Establishing an interim threshold that triggers further study for wells with a potentially measurable impact on streamflow is reasonable in order to meet the requirements of the Ordinance, as long as the threshold is conservative enough to be protective in the interim period prior to adoption of GSPs.

Rationale for Management Objectives and Thresholds used in Discretionary Well Permitting Under the Stanislaus County Groundwater Ordinance

Management Objectives	Management Thresholds and Actions	Technical Justification	Precedent (Example References)	Protectiveness	Reasonableness
Objective F2: Prevent drawdown that has a significant effect on groundwater-dependent ecosystems (GDE).	Threshold F3: Installation of a well within 3 miles of a seep, spring, wetland, riparian habitat, phreatophyte woodland or other GDE. Action F3: The Applicant shall conduct drawdown calculations to evaluate the amount of drawdown induced by the proposed well in the pumped aquifer beneath each GDE. Threshold F4: The maximum predicted drawdown in the pumped aquifer beneath a GDE exceeds 0.5 foot at the time GSPs are scheduled to be adopted. Action F4: The Applicant shall conduct a GDE Impact Study that shall evaluate the proposed well's impacts on groundwater levels, flows and surface discharges, as well as potential impacts on groundwater dependent vegetation, habitat and fauna. The impact study shall recommend appropriate well construction and or operating requirements such that significant impacts will not occur, or shall include recommendations for appropriate mitigation measures. In addition, the study shall include recommendations for implementation of a GDE Monitoring Program, as appropriate.	GDE flora and fauna tends to adapt to seasonal/periodic natural fluctuations in groundwater level and discharge. Seasonal groundwater level fluctuation in the shallow aquifer system in Stanislaus County is typically 5 to 10 feet, but may be as low as 2 feet and may exceed 40 feet in some areas, depending on local conditions and pumping patterns. Wells permitted under the program will draw water from the aquifer at depths of at 100 feet or more below ground level, and the actual drawdown experienced by GDEs at the ground surface will attenuate through sediments overlying the pumped aquifer. The ecological water requirements and thresholds of response to changes in groundwater levels differ among GDEs. Obligate phreatophytes, such as oak trees, are not expected to be significantly affected by less than 0.5 foot of drawdown. Similarly, the effect of the predicted amount of drawdown on riparian woodlands and wetlands that have significant surface water inflows from area streams, canals and drains is expected to be less than significant. A compilation of studies by The Nature Conservancy examined plant response of 17 herbaceous wetland indicator species to groundwater drawdown. Gradual loss of indicator species started with as little as 0.66 feet drawdown, with a median of 2.99 feet, and complete loss occurred at 6.23 feet (Gerla, P.A. et al. 2015. *Environmental Flows and Levels for Groundwater-Dependent Swale Wetlands of the Sheyenne National Grasslands, North Dakota*. The Nature Conservancy and the USDA Forest Service. Portland, Oregon).	GDE impacts caused by groundwater extraction are commonly evaluated under CEQA and NEPA and are required to be evaluated in some states (New Jersey, 2012). Screening thresholds for evaluation of groundwater impacts to GDEs have been adopted in California in some jurisdictions (Napa County, 2015). Risk assessment guidelines for GDEs developed by the state of New South Wales in Australia characterize impact risks associated with drawdowns that are less than seasonal fluctuations as low (NSW, 2012).	The drawdown threshold for further study is less than typical seasonal groundwater level fluctuations in the shallow aquifer in the county. Requiring the identification of GDEs within 3 miles of proposed well or the predicted 0.5 foot drawdown contour, and applying a threshold of 0.5 foot of drawdown in the pumped aquifer system to require detailed study and evaluation of mitigation will be protective of most GDEs while more detailed regional studies are undertaken. Impacts to potentially more sensitive wetlands will be evaluated on a case by case basis during the CEQA review process.	GDEs are sensitive to water table drawdown. The application of conservative assumptions to the establishment of zones where additional evaluation will be required in warranted in order to meet the requirements of the Ordinance.

References: The examples referenced may be accessed at the following link: https://www.dropbox.com/sh/36i328f657wlb09/AAAC2CaO3NXklWeYwghd-1U6a?dl=0

DEPARTMENT OF ENVIRONMENTAL RESOURCES

3800 Cornucopia Way, Suite C, Modesto, CA 95358-9592
Phone: 209.525.6770 Fax: 209.525.6773

SUPPLEMENTAL APPLICATION FOR NON-EXEMPT WELLS

The following supplemental information is required for all wells that are determined not to be exempt from the prohibitions and requirements of the County Groundwater Ordinance effective November 25, 2014.

Applicant Information					
Name of Applicant:			Firm (if applicable):		
Address:	City:		State:	Zip Code:	
Daytime Phone Number:		Fax Number		Email:	
Name of Owner (if different from Applicant):			Firm (if applicable):		
Address:	City:		State:	Zip Code:	
Daytime Phone Number:		Fax Number		Email:	
Licensed Professional Information (Professional Engineer or Geologist)					
Name of Licensed Professional:			Firm:		
Address:	City:		State:	Zip Code:	
Daytime Phone Number:		Fax Number		Email:	
License Type and Number:		Sections of Application Completed:			
Name of Licensed Professional:			Firm:		
Address:	City:		State:	Zip Code:	
Daytime Phone Number:		Fax Number		Email:	
License Type and Number:		Sections of Application Completed:			
For County Use Only					

I. Location Map

Provide a map or maps showing the following:

A. Well location

B. Outline of property to be served by the well, and APN number(s)

C. Outline of contiguous owned property surrounding the well location, and APN number(s)

D. Streams and lakes within 2 miles

E. Springs, seeps, wetlands and other Groundwater-Dependent Ecosystems (GDEs) within 3 miles or within the predicted area of 0.5 feet of drawdown on the date that a Groundwater Sustainability Plan will be adopted. (Use the drawdown analysis in Section IV, USGS topographic maps, aerial photo imagery available from the internet or other sources, state and federal wetland and hydrology databases, studies, County resources, or knowledge of the area to identify any areas where groundwater may be discharging to surface water or groundwater-dependent vegetation may exist.)

F. Existing sewer lines, cisterns, septic disposal systems and animal confinements within 250 feet

G. Concentrated Animal Feeding Operations (CAFOs) within 1 mile

H. Reported hazardous materials and hazardous waste sites or release incidents within 1 mile (from Section VI.A.)

I. Existing wells on the property, keyed to a table that provides well use, depth, diameter, screen interval, and pumping rate. If available, attach information regarding any specific capacity or other pumping tests completed.

J. Predicted area of drawdown exceeding 0.5 and 5 feet (from Section IV, below).

K. For proposed wells within 2 miles of areas underlain by the Corcoran Clay and completed below the depth of the Corcoran Clay, the location of any infrastructure within 2 miles that is potentially sensitive to subsidence. This includes, but is not necessarily limited to, canals, ditches, pipelines, utility corridors, and roads.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

II. Pumping and Water Use Data

Provide the following information regarding groundwater extraction from the proposed well.

A. For irrigation wells, use the following table to calculate the water demand to be served by the proposed well.

Crop Type	Irrigated Acres	Irrigation System Type	Irrigation Season Length (days)	Average Annual Demand (AFY)	Maximum Monthly Demand (MGM)	Peak Daily Demand (GPM)

B. Estimated pumping rate of proposed well: _________ gpm

C. Anticipated pumping schedule for proposed well (hours per day, days per week, approximate annual start date and stop date for seasonal pumping):

D. Estimated annual extraction volume: ________ gal

E. Estimated cumulative extraction volume prior to January 1, 2022: ________ gal

F. Estimated cumulative extraction volume in 20 years: ________ gal

G. Planned water use: ☐ Irrigation ☐ Stock ☐ Domestic ☐ Municipal ☐ Industrial ☐ Other (describe): ____________________________________

H. Size of area to be served by the well: __________ acres

I. Size of contiguous owned property on which the well is located: ________ acres

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

III. Water Export

A. Will groundwater extracted from the well be exported from the County, or substituted for surface water that will be exported form the County,

B. If the attach a Groundwater Export Proposal that includes, at a minimum, the following:

1. List the exemptions from Section 9.37.050 of the Groundwater Ordinance that apply and provide any substantiating evidence.
2. Provide specific timeframes and conveyance mechanisms by which the groundwater will be conveyed out of the County.
3. Indicate the purpose and use of such water at the terminal point of delivery.
4. Indicate the methods used to monitor and report the volume of water to be exported.
5. Explain whether the project involves exporting water during periods of emergency. (An emergency includes (1) states of emergency as described in the California Government Code, section 8558; (2) states of water shortage emergency as determined by the California Department of Water Resources; or (3) determination by the Stanislaus County Board of Supervisors that groundwater within the County can assist areas outside the County.)
6. Groundwater extraction for the purpose of emergency relief shall be monitored so that the volume of water exported can be determined.
7. The duration of groundwater extraction for the purpose of emergency relief shall not exceed the time frame of the emergency.
8. Groundwater extraction for the purpose of emergency relief does not set precedents or entitles the exporter to future exports.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

IV. Local Groundwater Level Decline

Provide distance-drawdown calculations for groundwater extraction from the proposed well. The approach taken may include calculations, spreadsheets, analytical computer models or numerical computer models, at the discretion of the Applicant. The DER can provide additional guidance if needed. Evaluation may consist of a simple one dimensional distance-drawdown calculation using the Theiss Equation, or more complex two and three dimensional approaches may be taken when the applicant feels that doing so is warranted and presents a more realistic assessment of potential impacts. Input parameters for aquifer properties (Transmissivity and Storativity) may be derived from local pump and aquifer tests, other site investigation data, the County's well database, literature, or professional judgment based on the materials in which the well is completed. A description of the conceptual approach taken to the analysis must be provided, and justification must be provided for all inputs and assumptions to assure that impacts are not underestimated.

A. Method used: ☐Calculations ☐Spreadsheet ☐Computer Model

B. Describe Approach (attach additional sheets, calculations and results):

C. Provide drawdown estimates for January 1, 2020 or 2022 (depending on subbasin as determined by DER) and after 20 years of pumping:

1. Distance to 0.5 feet drawdown: _______________ feet (2020 or 2022 only)
2. Distance to 5 feet drawdown: _______________ feet
3. Distance to 20 feet drawdown: _______________ feet
4. Drawdown at the nearest property line: _______________ feet
5. If the well is in a Subsidence Study Zone (within 2 miles of an area underlain by the Corcoran Clay) and completed in a confined aquifer system, maximum drawdown at the nearest ditch, canal, utility easement or other sensitive infrastructure: _______________ (feature); _______________ feet
6. Maximum drawdown at each GDE within 3 miles or less of the proposed well: _______________ feet

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

V. Wells in a Groundwater Level Management Zone

If the proposed well is in a County-designated Groundwater Level Management Zone, the Applicant shall provide the following:

A. A Groundwater Extraction Offset Plan that demonstrates that the proposed groundwater extraction will be 100% offset. The scope of the Groundwater Extraction Offset Plan must be discussed with the DER and agreed to prior to implementation. The Plan shall include, at a minimum, the following:

1. The proposed method and location of offset;
2. The proposed timing and duration of offset;
3. Supporting calculations to demonstrate offset volume; and
4. Any assurances and/or agreements with other parties that verify their agreement to support the proposed offset.

OR B. A Groundwater Resources Investigation that demonstrates the proposed groundwater extraction will not cause or contribute to Undesirable Results in the Groundwater Level Management Zone. The scope of the Groundwater Resources investigation must be discussed with the DER and agreed to prior to implementation and, at a minimum, shall include the following:

1. A summary of previous studies and reports;
2. A summary of available information regarding undesirable results in the area;
3. Analysis of local and regional groundwater level trends based on available well hydrographs within no less than 5 miles of the proposed well;
4. Methods and data from any additional site specific hydrogeologic investigation;
5. An analysis of the local groundwater balance;
6. A prediction of future groundwater level drawdown and trends in the area with and without the proposed well;
7. Evaluation whether the proposed well will cause or contribute to undesirable results, and recommendations prevent them as needed; and;
8. Signature by a Registered Professional Geologist or Registered Professional Engineer in California.

AND C. A Groundwater Level Monitoring Plan that includes, at a minimum, the following:

1. A description of the aquifers to be monitored;
2. A description of any existing or new wells to be used, their locations, construction specifications and completion depths; and
3. Water level measurement methods and frequency (minimum spring and fall).

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

VI. Regional Groundwater Level Decline and Storage Reduction

For all proposed well not located within a County-designated Groundwater Level Management Zone, the Applicant shall provide the following:

A. Calculate available aquifer storage beneath the contiguous property owned by the Applicant on which the proposed well is located: _______________ acre-feet

Parameter	**Value**	**Source/Justification** (attach additional information as needed)
Size of Property (acres)		
Aquifer Thickness (feet)		
Specific Yield (assume 0.25 or provide justification for alternate value)		

B. Divide the cumulative groundwater extraction volume prior to January 1, 2020 or 2022 by the available aquifer storage calculated above: ___________ %

C. Divide the cumulative groundwater extraction volume for the first 20 years of well operation by the available aquifer storage calculated above: ___________ %

D. If the cumulative extraction volume after 20 years exceeds 10% of available aquifer storage, submit a Groundwater Level Monitoring Plan that includes, at a minimum, the following:

   a. A description of the aquifers to be monitored;

   b. A description of any existing or new wells to be used, their locations, construction specifications and completion depths; and

   c. Water level measurement methods and frequency (minimum spring and fall).

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

VII. Water Quality Degradation

A. Provide a database search for reported hazardous materials and waste sites and release incidents near the proposed well with search radii that comply with ASTM Standard 1527. (Commercial database search services provide this service.)
B. Provide water quality data available within 1 mile of the proposed well for small water supply systems regulated by the County or the State, and from the State Geotracker website (http://geotracker.waterboards.ca.gov/) and from the USGS NWIS Database (http://maps.waterdata.usgs.gov/mapper/index.html).
C. If the well is located in a County-designated Groundwater Quality Protection Zone (in an area underlain by the Corcoran Clay), the Applicant shall provide data regarding the well seals and construction methods used to prevent communication between the unconfined aquifer system overlying the Corcoran Clay with the confined aquifer system underlying the Corcoran Clay.
D. If the well is located in a County-defined Groundwater Quality Study Zone (within 1 mile of a well that produces water with solute concentrations that exceed primary or secondary MCLs or other applicable Water Quality Objectives), or within 1 mile of a reported contamination incident identified by the database search, the Applicant shall submit a Groundwater Quality Investigation. The scope of the Groundwater Quality investigation must be discussed with the DER and agreed to prior to implementation. At a minimum, the Groundwater Quality Investigation shall include the following:
   1. A summary of relevant data, studies and/or reports regarding the local aquifer system, groundwater quality and contaminant transport;
   2. Analysis of local and regional groundwater quality trends based on available data in the area;
   3. The methods and results of any additional site-specific hydrogeologic and groundwater quality investigation;
   4. Evaluation of the potential effect of the proposed well on future groundwater quality trends and contaminant migration;
   5. Evaluation whether the proposed groundwater extraction will cause or contribute to groundwater quality degradation in excess of applicable standards for beneficial uses, or will interfere with groundwater quality management or remediation efforts overseen by State or Federal agencies; and
   6. Signature by a Registered Professional Geologist or Registered Professional Engineer in California.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

VIII. Land Subsidence

A. If the well is in a Subsidence Study Zone (i.e., it is within 2 miles of an area underlain by the Corcoran Clay), the Applicant shall provide the following:

1. The estimated maximum drawdown on January 1, 2020 and 2022 and after 20 years of pumping at the nearest property line, ditch, canal, utility easement other sensitive infrastructure: _______ ft on January 1, 2022 and ______ feet after 20 years.
2. Attach hydrographs for nearby wells showing lowest historical groundwater levels. (Hydrographs are available from https://www.casgem.water.ca.gov and http://maps.waterdata.usgs.gov/mapper/index.html.)

Well ID	Distance and Direction from Proposed Well	Date Range of Data	Lowest Groundwater Level and Date

3. Attach data relevant to subsidence from the Groundwater Information Center Interactive Map Application (https://gis.water.ca.gov/app/gicima/)
4. If the above information indicates the predicted drawdown will lower groundwater levels below historical lows and the well will be completed in the confined aquifer system, or inelastic subsidence has been measured near the proposed well, the Applicant shall submit a Geotechnical Subsidence Investigation. The scope of the Geotechnical Subsidence Investigation must be discussed with the DER and agreed to prior to implementation. At a minimum, the Geotechnical Subsidence Investigation shall include the following:
   a. A description of the local geology and hydrogeology, especially as it relates to potential compression of fine grained strata;
   b. A summary of data, studies and/or reports regarding subsidence in the area;
   c. Analysis of historical and current local and regional groundwater level trends based on available well hydrographs;
   d. Prediction of future groundwater level drawdown and level trends;
   e. Any additional site specific investigation performed by the Applicant of conditions related to subsidence;
   f. Evaluation of whether, and to what extent, the proposed groundwater extraction will cause, or contribute to, subsidence, with recommendations as appropriate to assure that such subsidence will not be significant; and
   g. Signature by a Registered Professional Civil or Geotechnical Engineer.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

IX. Surface Water Depletion

If the well is in a Surface Water Protection Zone (within 1 mile of groundwater-connected streams, tributaries or reservoirs associated with the Calaveras, Stanislaus or Tuolumne Rivers if the well screen and gravel pack are completed within 200 feet of the streambed elevation, and within 2,500 feet if the well screen and gravel pack are completed at least 200 feet below the streambed elevation) the Applicant shall submit a Surface-Groundwater Interaction Study. The scope of the Surface-Groundwater Interaction Study must be discussed with the DER and agreed to prior to implementation. At a minimum, the Surface-Groundwater Interaction Study shall include the following:

A. A summary of previous data, reports and/or studies relevant to hydrostratigraphy and surface-groundwater interaction;
B. Additional site-specific investigation of conditions related to surface-groundwater interaction as may be required by the County, including but not necessarily limited to well-log interpretation or pumping tests;
C. Evaluation of the predicted surface water depletion by the proposed groundwater extraction using on-line analytical models available from the USGS (http://mi.water.usgs.gov/software/groundwater/strmdepl08/) or other methods approved by the County; and
D. Signature by a Registered Professional Geologist or Engineer in California.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

X. Impacts to Groundwater Dependent Ecosystems (GDEs)

If drawdown at any GDE is projected to exceed 0.5 foot beneath a GDE based on the drawdown analysis in Section IV, the Applicant shall submit a GDE Impact Study. The scope of the GDE Impact Study must be discussed with the DER and agreed to prior to implementation. At a minimum, the GDE Impact Study shall include the following:

A. A summary of applicable previous groundwater resources and GDE studies;
B. A description of the groundwater flow regime and aquifer system, and the nature of the hydraulic connection between the pumped aquifer and the GDE;
C. A description of the GDE based on literature review and site investigation, including species present, presence and condition of habitat, and potential presence of any sensitive, threatened, or endangered species or rare plants;
D. Analysis of local and regional groundwater level trends based on available well hydrographs within no less than 5 miles of the proposed well;
E. Any additional site specific hydrogeologic or biologic investigation performed;
F. An analysis of the local groundwater balance and the impact of the proposed groundwater extraction on surface water discharge, including evapo-transpiration, if applicable;
G. A prediction of future groundwater level drawdown and trends in the area with and without the proposed well;
H. Evaluation and conclusions regarding the impact of the proposed groundwater extraction on the GDE, and recommendations to decrease impacts to a less than significant level; and
I. Signatures by a Registered Professional Geologist or Engineer in California, and a qualified biologist.

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

INDEMNIFICATION

In consideration of the County's processing and consideration of this application for approval of the groundwater project being applied for (the "Project"), and the related CEQA consideration by the County, the Owner and Applicant, jointly and severally, agree to indemnify the County of Stanislaus ("County") from liability or loss connected with the Project approvals as follows:

1. The Owner and Applicant shall defend, indemnify and hold harmless the County and its agents, officers and employees from any claim, action, or proceeding against the County or its agents, officers or employees to attack, set aside, void, or annul the Project or any prior or subsequent development approvals regarding the Project or Project condition imposed by the County or any of its agencies, departments, commissions, agents, officers or employees concerning the said Project, or to impose personal liability against such agents, officers or employees resulting from their involvement in the Project, including any claim for private attorney general fees claimed by or awarded to any party from County. The obligations of the Owner and Applicant under this Indemnification shall apply regardless of whether any permits or entitlements are issued.
2. The County will promptly notify Owner and Applicant of any such claim, action, or proceeding, that is or may be subject to this Indemnification and, will cooperate fully in the defense.
3. The County may, within its unlimited discretion, participate in the defense of any such claim, action, or proceeding if the County defends the claim, actions, or proceeding in good faith. To the extent that County uses any of its resources responding to such claim, action, or proceeding, Owner and Applicant will reimburse County upon demand. Such resources include, but are not limited to, staff time, court costs, County Counsel's time at their regular rate for external or non-County agencies, and any other direct or indirect cost associated with responding to the claim, action, or proceedings.
4. The Owner and Applicant shall not be required to pay or perform any settlement by the County of such claim, action or proceeding unless the settlement is approved in writing by Owner and Applicant, which approval shall not be unreasonably withheld.
5. The Owner and Applicant shall pay all court ordered costs and attorney fees.
6. This Indemnification represents the complete understanding between the Owner and Applicant and the County with respect to matters set forth herein.

The Stanislaus County Department of Environmental Resources (DER) will notify the applicant of the date in which the completed information has been received. This date will trigger the 30-day review period to determine whether the application is complete. If additional information is needed or requested, this will trigger another 30-day review period.

IN WITNESS WHEREOF, by their signature below, the Owner and Applicant hereby acknowledge that they have read, understand and agree to perform their obligations under this Indemnification.

______________________________ ______________________________

Signature of Applicant/Date

Signature of Owner(s)/Power of Attorney/Legal Representative/Date •

Note: Applications are not valid without the property owner's signature.

NOTICE TO ALL APPLICANTS

Pursuant to California Fish and Game Code §711.4, the County of Stanislaus is required to collect filing fees for the California Department of Fish and Wildlife for all projects subject to the California Environmental Quality Act (CEQA) unless a fee exemption is provided in writing from the California Department of Fish and Wildlife. Pursuant to California Fish & Game Code §711.4(d), all applicable fees are required to be paid within 5 DAYS of approval of any project subject to CEQA. These fees are subject to change without County approval required and are expected to increase yearly. Please contact the Department of Environmental Resources or refer to the current fee schedule for information on current fee amounts.

If a required filing fee is not paid for a project, the project will not be operative, vested or final and any local permits issued for the project will be invalid. (Section 711.4(c)(3) of the Fish and Game Code.)

Under the revised statute, a lead agency may no longer exempt a project from the filing fee requirement by determining that the project will have a de minimis effect on fish and wildlife. Instead, a filing fee will have to be paid unless the project will have no effect on fish and wildlife. (Section 711.4 (c)(2) of the Fish and Game Code). If the project will have any effect on fish and wildlife resources, even a minimal or de minimis effect, the fee is required.

A project proponent who believes the project will have no effect on fish and wildlife should contact the California Department of Fish and Wildlife. If the California Department of Fish and Wildlife concurs the project will have no such effect, the Department will provide the project proponent with a form that will exempt the project from the filing fee requirement. Project proponents may contact the Department by phone at (916) 651-0603 or through the Department's website at www.dfg.ca.gov.

Pursuant to California Fish and Game Code §711.4(e)(3) , the department (CDFW) shall assess a penalty of 10 percent of the amount of fees due for any failure to remit the amount payable when due. The department may pursue collection of delinquent fees through the Controller's office pursuant to Section 12419.5 of the Government Code.

Additionally California Fish and Game Code §711.4(f) states the following: Notwithstanding Section 12000, failure to pay the fee under subdivision (d) is not a misdemeanor. All unpaid fees are a statutory assessment subject to collection under procedures as provided in the Revenue and Taxation Code.

Failure to pay the necessary fee will also extend the statute of limitations for challenging the environmental determination made by the County, thus increasing exposure to legal challenge. The type of environmental determination to be made by the County may be discussed with the project reviewer following the environmental review stage of the project and will be outlined in a Board of Supervisor's staff report.

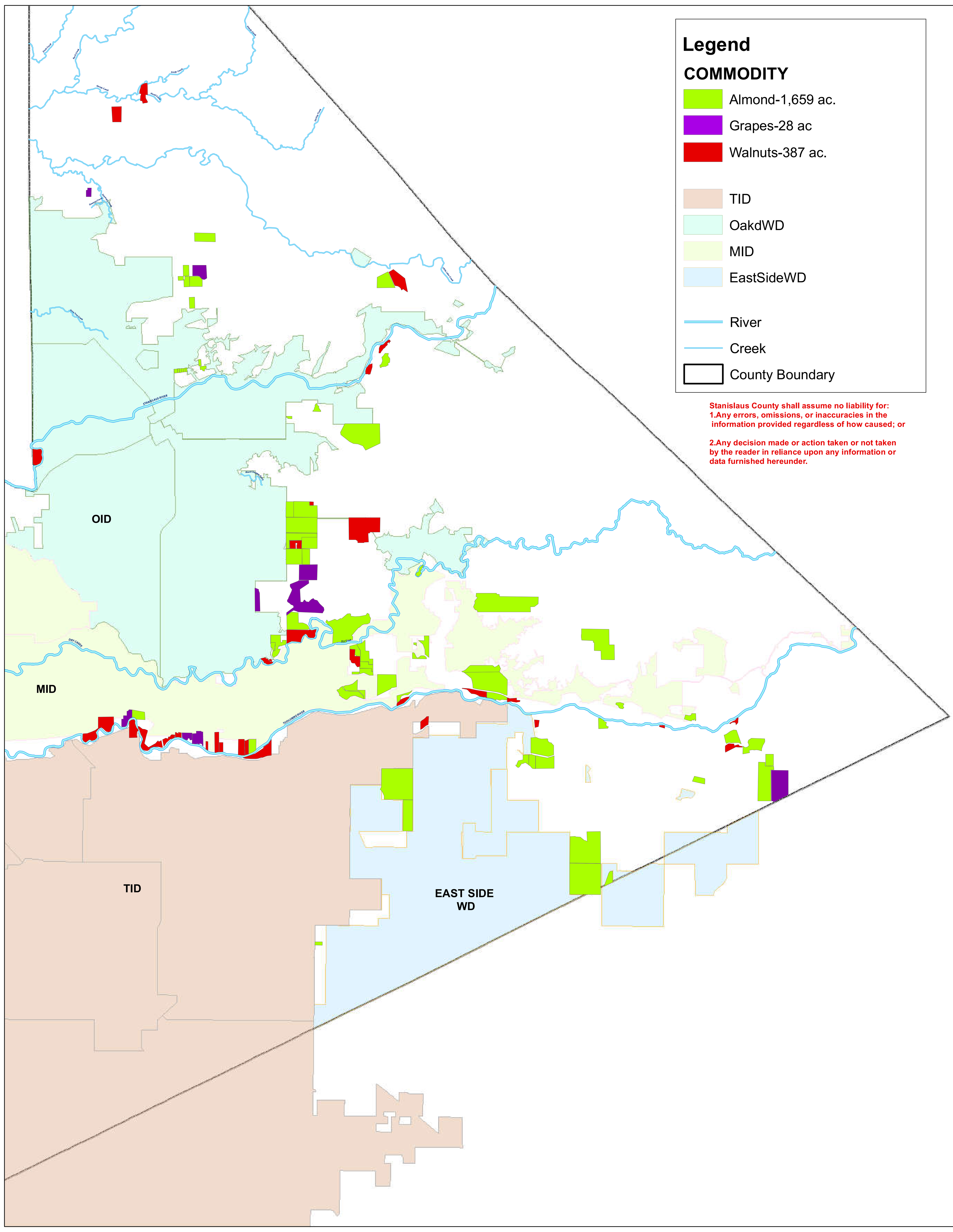
REQUIRED ADDITIONAL FEE: STANISLAUS COUNTY RECORDER

Upon approval of the proposed project, Stanislaus County will record either a “Notice of Exemption” or a “Notice of Determination” pursuant to CEQA Guidelines. The Clerk Recorder charges an additional fee of $57.00 for recording these documents. A separate check made payable to “Stanislaus County” is due and payable within 5 DAYS of approval of the project.

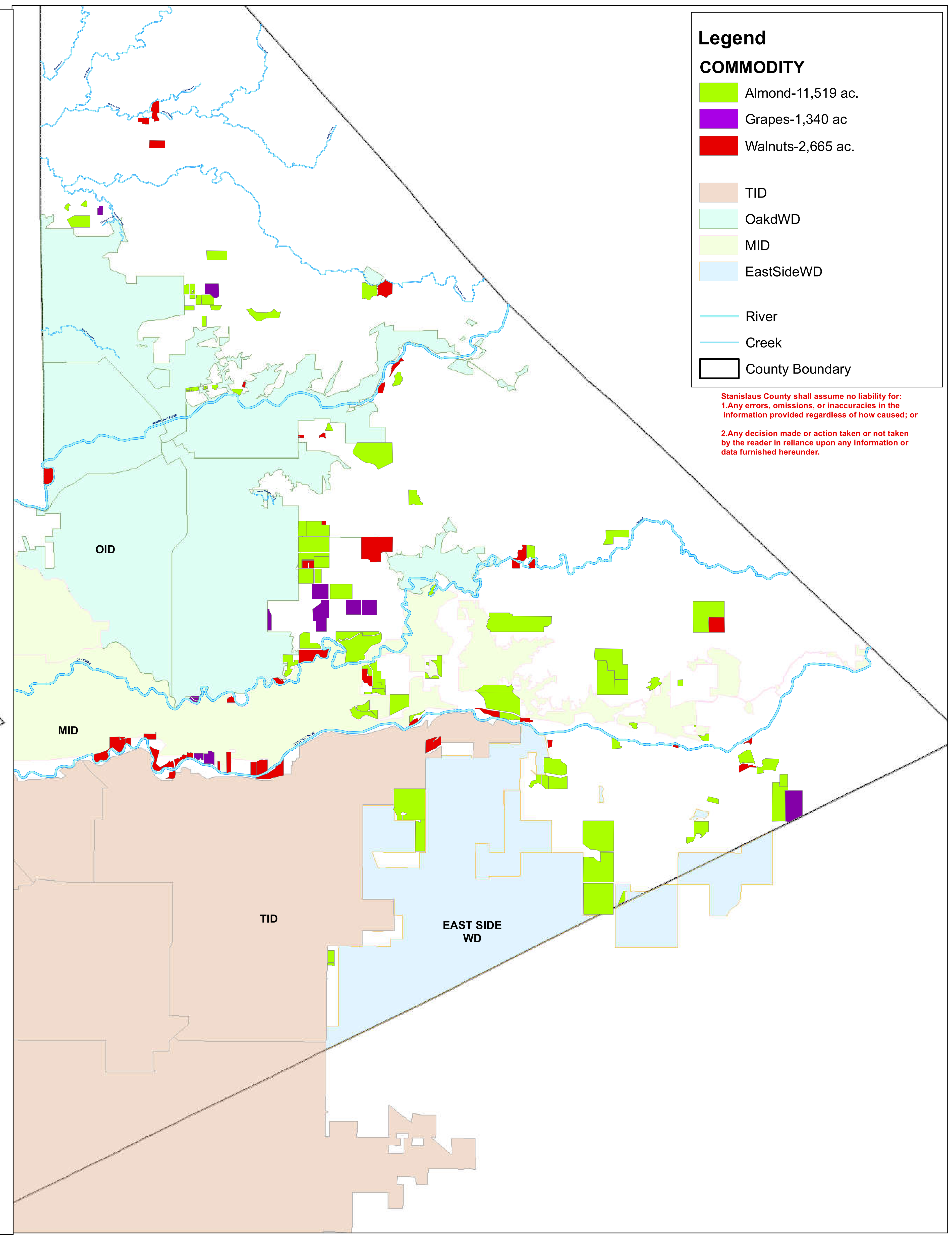
APPENDIX C

NON-DISTRICT CROPPING PATTERNS IN EAST STANISLAUS COUNTY, 2000 – 2015

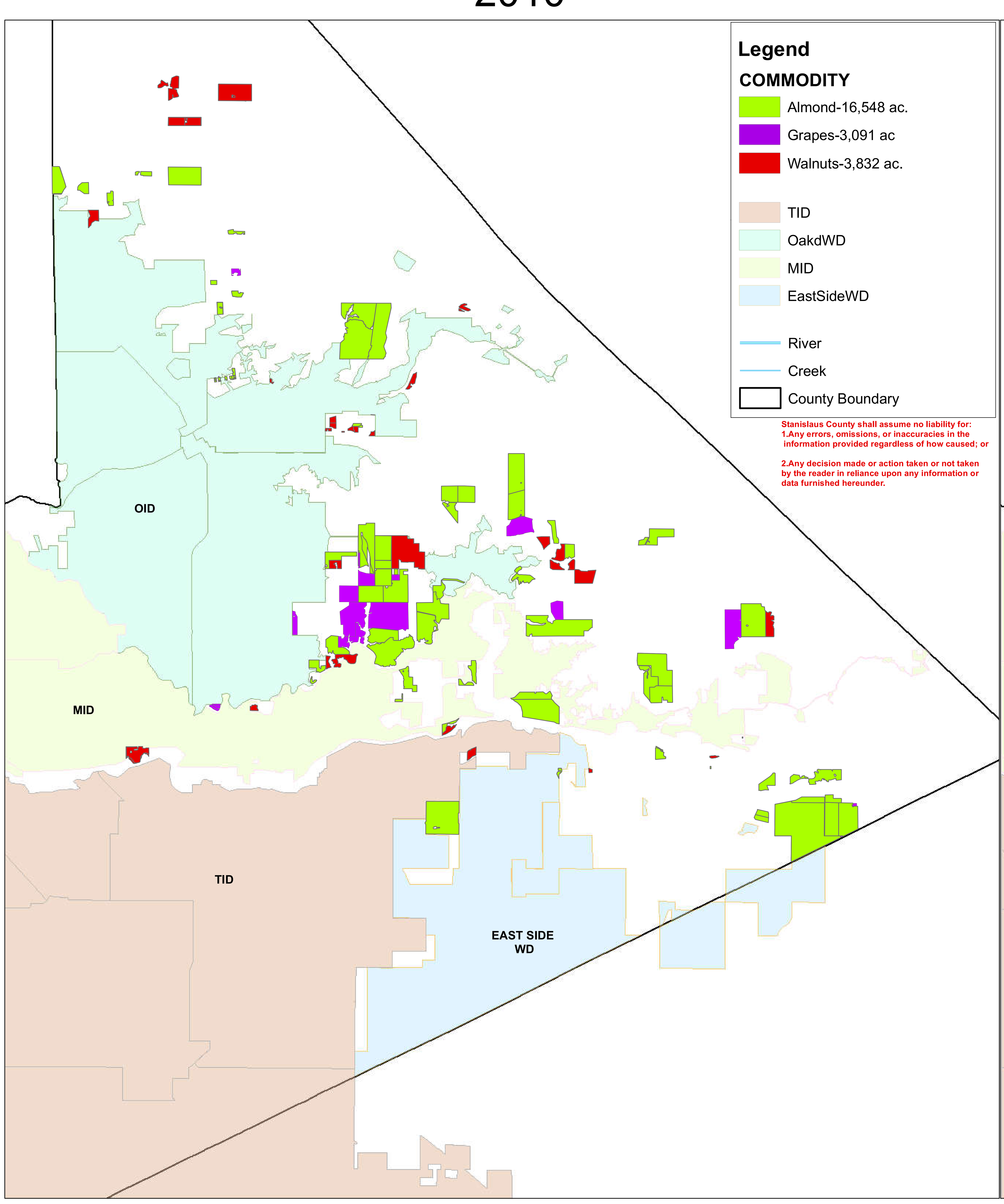
2001



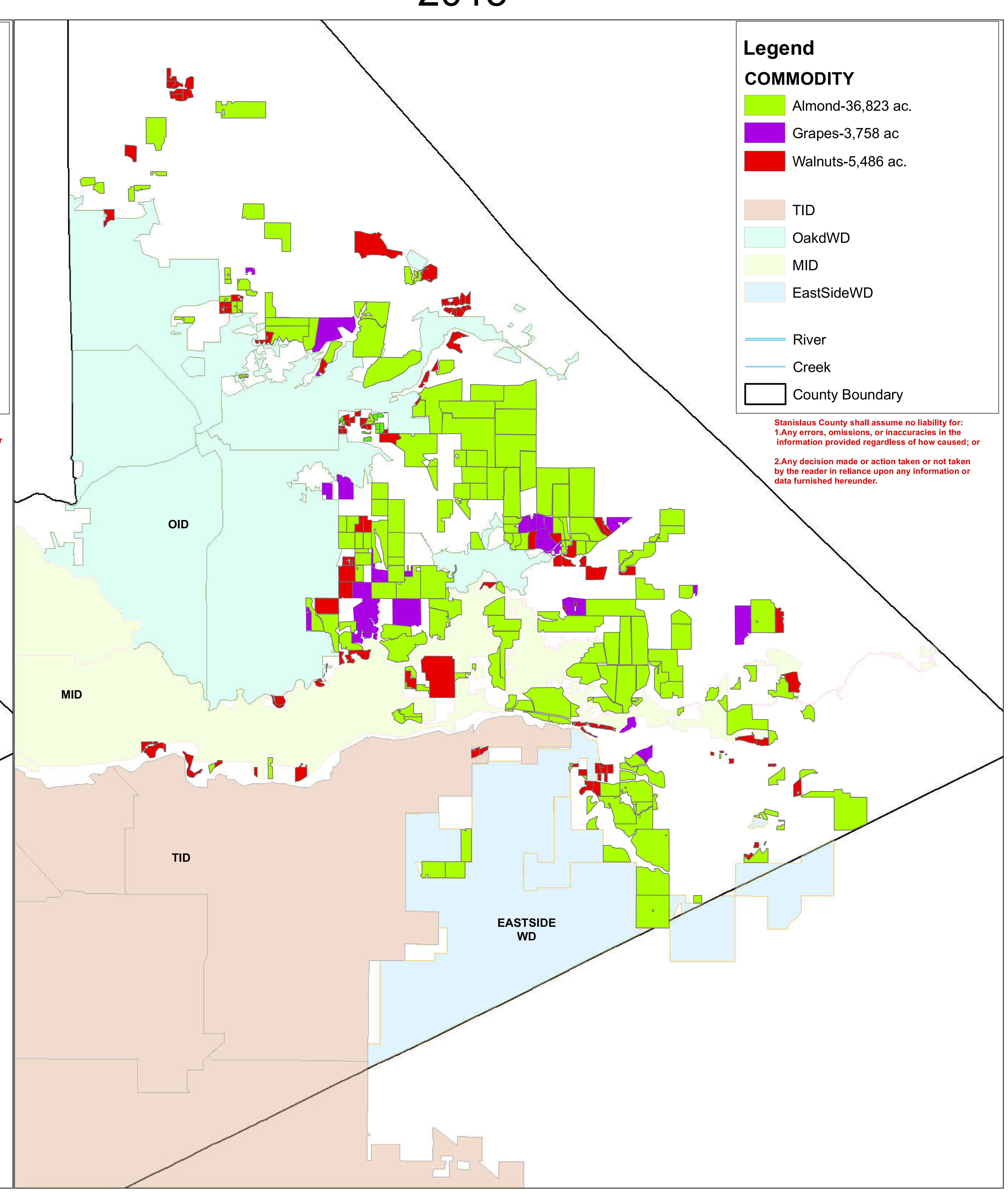
2005/2006



2010



2015



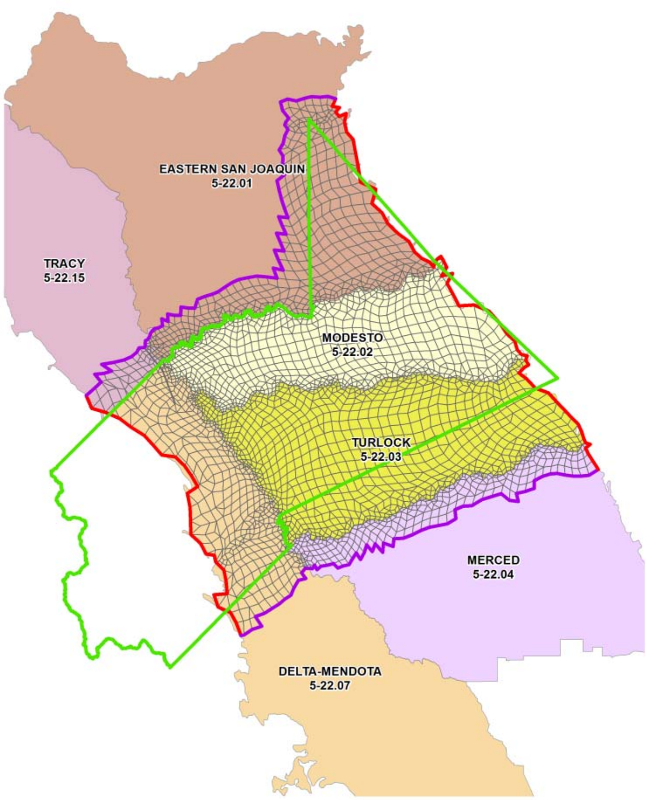
APPENDIX D

HYDROLOGIC MODELING TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

December 20, 2017



Prepared for:

Stanislaus County
Department of Environmental Resources
3800 Cornucopia Road
Modesto, California 95358

Prepared by:

Jacobson James & Associates, Inc.
9083 Foothills Boulevard, Suite 370
Roseville, California 95747

and

Tetra Tech, Inc.
3746 Mt. Diablo Boulevard, Suite 300.
Lafayette, California 94549

TECHNICAL MEMORANDUM

Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

December 20, 2017

REGISTERED GEOLOGIST
MICHAEL TIETZE
No. HG 63
EXP. 4/30/2019
CERTIFIED HYDROGEOLOGIST
STATE OF CALIFORNIA

Prepared by:

Mike Tietze, PG, CEG, CHG
Principal Engineering Geologist

Nick Anchor, PE
Staff Engineer

Juliet Hutchins
Staff Hydrogeologist

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LIST OF ACRONYMS AND ABBREVIATIONS

AF	acre feet
AFY	acre feet per year
APA	Agricultural Preservation Alliance
AWMP	Agricultural Water Management Plan
^{o}C	Degrees Celsius
C2VSim	California Central Valley Groundwater-Surface Water Simulation
CASGEM	California Statewide Groundwater Elevation Monitoring
CDEC	California Data Exchange Center
CEQA	California Environmental Quality Act
CVHM	Central Valley Hydrologic Model
DEM	digital elevation model
DWR	California's Department of Water Resources
FERC	Federal Energy Regulatory Commission
ft	foot
GDE	groundwater dependent ecosystem
GSA	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plan
IWFM	Integrated Water Flow Model
JJ&A	Jacobson James & Associates, Inc.
MERSTAN	Merced-Stanislaus
MSR	Municipal Service Review
NWIS	National Water Information System
Ordinance	Stanislaus County Groundwater Ordinance
PEIR	Programmatic Environmental Impact Report
PEST	Parameter Estimation
PRISM	Parameter-elevation Regressions on Independent Slopes Model
SCHM	Stanislaus County Hydrologic Model
SGMA	Sustainable Groundwater Management Act
SSJID	South San Joaquin Irrigation District
SJVGB	San Joaquin Valley Groundwater Basin
SLDMWMA	San Luis and Delta-Mendota Water Management Authority

SLDMWUA	San Luis and Delta-Mendota Water Users Authority
STRGBA	Stanislaus and Tuolumne Rivers Groundwater Basin Association
SWRA	Stanislaus Regional Water Authority
TAC	Stanislaus County's Technical Advisory Committee
TGBA	Turlock Groundwater Basin Association
TID	Turlock Irrigation District
TM	Technical Memorandum: Stanislaus County Hydrologic Model: Development and Forecast Modeling
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WAC	Stanislaus County's Water Advisory Committee
WY	water year
%	percent

1.0 INTRODUCTION

1.1 Project Background

Stanislaus County adopted a Groundwater Ordinance in November 2014 (Chapter 9.37 of the County Code, hereinafter, the "Ordinance") that codifies requirements, prohibitions, and exemptions intended to help promote sustainable groundwater extraction in unincorporated areas of the county. The Ordinance prohibits the unsustainable extraction of groundwater and makes issuing well construction permits discretionary for new wells that are not exempt from this prohibition. The ordinance does not apply to incorporated areas of the county. Exemptions apply to water districts operating under a functional groundwater management plan and their rate payers. Applications for non-exempt wells must include substantial evidence that they will not withdraw groundwater unsustainably. After an unincorporated area adopts a Groundwater Sustainability Plan (GSP) pursuant to California's Sustainable Groundwater Management Act (SGMA), it becomes exempt from this requirement, and the sustainable management of new wells will follow the SGMA-mandated process by which a Groundwater Sustainability Agency (GSA) advises the county whether the proposed new well complies with the GSP and extracts groundwater sustainably. Upon receiving such an assessment, the county would issue a well construction permit on a ministerial basis. However, after GSPs are adopted, the county can also require holders of permits for wells it reasonably concludes are withdrawing groundwater unsustainably to provide substantial evidence that continued operation of such wells does not constitute unsustainable extraction, and has the authority to regulate future groundwater extraction from such wells. Given that GSAs have the primary responsibility for regulation of sustainable groundwater extraction under SGMA, it is unlikely that the county would ever exercise this authority under the Ordinance, but it exists as a backstop to help assure sustainable groundwater management.

As the lead agency under the California Environmental Quality Act (CEQA), Stanislaus County is voluntarily preparing a Programmatic Environmental Impact Report for Discretionary Well Permitting and Management under the Stanislaus County Groundwater Ordinance (the PEIR) to evaluate the broad-scale environmental impacts of issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance. The purpose of the PEIR is to develop a more robust basis for managing these discretionary programs and streamline the application and review process for new well permits. The PEIR may also inform future groundwater management policy alternatives and, if necessary, identify program-level mitigation measures.

As part of this effort, a hydrologic model (the Stanislaus County Hydrologic Model or SCHM) has been developed to help characterize the affected groundwater environment and facilitate evaluation of potential environmental effects associated with the permitting of discretionary wells, and other reasonably foreseeable groundwater management actions and trends. The development of the SCHM and its application to identification of reasonably foreseeable groundwater conditions and hydrologic impacts of Ordinance implementation are discussed in this Technical Memorandum (the TM).

1.2 Objectives

The PEIR will evaluate the effects of permitting new discretionary wells under the Ordinance, primarily before GSPs are adopted, and of regulating wells from which the County has reason to believe that groundwater is being extracted unsustainably after GSPs are adopted. The PEIR, and by extension the SCHM, is therefore intended to support the following major objectives:

1. Evaluation of hydrologic and water supply impacts at a programmatic level, such as regional drawdown, groundwater storage depletion, surface water depletion, effects on groundwater-dependent ecosystems (GDEs), water quality, land subsidence, and ability to meet future water demands; as well as non-hydrologic, indirect, and cumulative impacts;
2. Development of a Tier I document that can be used to refine the County's well permitting program, streamline the well permit application process and help facilitate the transition to groundwater management under SGMA; and
3. Gathering and evaluating information that will be relevant to Groundwater Sustainability Agencies (GSAs) in their early stages of planning for compliance with the SGMA, including technical data compilation and analysis that will assist GSP development.

Development of the SCHM serves as a key tool to meet the objectives of the PEIR, and therefore is guided by the following additional objectives:

1. Extensive groundwater basin characterization and modeling has been completed in the County by the United States Geological Survey (USGS), California's Department of Water Resources (DWR), Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), Turlock Groundwater Basin Association (TGBA), and other stakeholders. The SCHM does not duplicate this work, and to the extent possible, leverages previous work for the model-development effort.
2. The SCHM supports a programmatic-level assessment of potential impacts associated with permitting wells under the Ordinance. The specific locations, completion details, and pumping rates of these wells are not yet known.
3. Several water management programs with significant implications for the Stanislaus County area are in the early stages of development at this time, and their outcomes and potential effects on groundwater resources are not known. The potential effects of these programs will be discussed in the PEIR, but because their outcomes are uncertain and evaluation would be speculative, they will not be addressed in the modeling evaluation. These include (1) implementation of the GSPs that will not be developed until 2020 or 2022; (2) proposed requirements for unimpaired flow on the Stanislaus, Tuolumne and Merced Rivers to support proposed amendments to Bay-Delta Water Quality Control Plan of the State Water Resources Control Board; and (3) relicensing of Modesto Irrigation District and Turlock Irrigation District (TID) hydroelectric projects on the Stanislaus and Tuolumne Rivers by the Federal Energy Regulatory Commission (FERC).

4. To support impact assessment, in light of the above objectives, the following specific modeling objectives were adopted in development of the SCHM and defining the forecast scenarios that were used in impact assessment:

    - The model was developed to include the entirety of the County and, at the request of stakeholders in the Turlock Groundwater Basin who were interested in using the model as a preliminary evaluation tool, the entirety of the Turlock Groundwater Subbasin, including the portion that extends into Merced County. Collectively, these areas are referred to as the Study Area.

    - Boundary locations and boundary conditions were determined with the goal of minimizing the size of the model, to the extent possible, while not introducing artificial boundary effects within the Study Area.

    - The model was developed to be able to evaluate issues related to groundwater levels, flow, boundary conditions, inter-basin underflow, and groundwater-surface water-interactions at a level of detail sufficient to recognize potential issues for programmatic impact assessment. As such, it was developed to be generally more detailed and locally accurate than existing regional models developed by the USGS and the DWR,[1] but a subbasin scale model capable of accurately predicting head elevations was not necessary to meet the objectives of this project.

    - A superposition approach was considered appropriate to meet the objectives of evaluating impacts at a program level. As explained further in Section 3.1.1, in a superposition approach differences between a baseline and forecast condition are compared without the need to accurately simulate the actual baseline or predicted heads, since these are essentially subtracted out. This approach is widely used in impact assessment, and tends to reduce the effect of model uncertainty on model outputs.

    - Extensive data compilation was undertaken, but it is believed that significant additional data exist that were not obtained from stakeholders, and/or were not able to be compiled within the limitations of the project. This means that while the model is sufficiently detailed and accurate to meet the objectives of a program-level impact analysis, further refinement is possible and necessary for construction of subbasin-scale models to support GSP development.

    - Improvements in model calibration can be achieved by varying a number of different parameters in non-unique ways; however, when the data used to build a model are uncertain, more "precise" calibration will not necessarily mean a model is a more "accurate" representation of the actual hydrogeologic system. In recognition of this fact, model calibration was continued as long as it was supported by available data or justified by a

[1] Specifically, the Central Valley Hydrologic Model (CVHM) and the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim), respectively. See USGS, 2009 and DWR, 2013b.

conceptual model of how the aquifer should behave. Further calibration was not considered prudent at this point, or necessary to meet the model objectives.

1.3 Acknowledgements

Development of the SCHM was partially funded by a grant from the DWR under the Sustainable Groundwater Planning Grant program, which was approved by voters in the state as part of Proposition 1 in November 2014. Local matching funds were provided by the following entities:

Stanislaus County	City of Patterson	Oakdale Irrigation District
Rock Creek Water District	City of Modesto	City of Newman
Eastside Water District	City of Hughson	City of Turlock
City of Waterford	City of Riverbank	Modesto Irrigation District
City of Ceres	Agricultural Preservation Alliance	West Stanislaus Irrigation District
City of Oakdale	Patterson Irrigation District	Turlock Irrigation District

The following people provided key input into development of the SCHM:

- Linda Mercurio managed the project;
- Mike Tietze provided technical direction and oversight;
- Bob Abrams was instrumental in developing the model concept, acted as lead modeler in the early phases of model development, and provided guidance and supervision throughout the modeling process;
- Gerry O'Neil assisted with the development of model inputs for municipal wells, evaluation of water budgets, and adjustment of boundary heads;
- Nick Anchor, Juliet Hutchins and Claudia Corona did the bulk of the work of compiling and evaluating the data on which the model is based, and Nick Anchor constructed the model;
- Surface water hydrology, precipitation and climate data were evaluated and provided by Sujoy Roy, PhD and John Rathe of Tetra Tech;
- Advice, guidance and review regarding the hydrogeologic setting and modeling approach were provided by Stephen Carlton of Tetra Tech;
- Charlie Brush and Can Dogrul of the DWR's Groundwater Modeling Branch provided invaluable assistance during construction of the model; and
- Walter Ward, Stanislaus County Water Resources Manager, provided key direction and review, and facilitated coordination of the work with the local groundwater management community.

1.4 Stakeholder Engagement and Outreach

To meet the modeling objectives and facilitate a collaborative and transparent process, coordination with regional water management agencies and other stakeholders was conducted. The County engaged in regular communications and shared regional data with Participating Stakeholders and via the Water Advisory Committee (WAC) and Technical Advisory Committee (TAC). Two regional modeling workshops were convened to discuss the project with regional stakeholders from areas within the model domain and adjacent areas in San Joaquin and Merced Counties. Additional outreach, consultation, and data exchange occurred as requested by individual stakeholders to facilitate regional coordination, data sharing, dialog regarding issues, opportunities, data gaps, and priorities important to groundwater management planning. An online repository of available data relevant to groundwater modeling and management in the region was shared with participating stakeholders and is publicly available.

1.5 Organization

This TM includes the following sections:

- Section 1, Introduction, which presents the project background, identifies objectives, provides acknowledgements, and stakeholder engagement and outreach activities.
- Section 2, Hydrogeologic Setting and Background, which summarizes information regarding the groundwater subbasins underlying the county that is pertinent to understanding the hydrogeology of the County as it pertains to the SCHM.
- Section 3, Model Development, which describes the approach taken to develop the SCHM, including the concept and approach, code selection, discretization, boundaries, sources and sinks, parameterization, time period, initial conditions, and historical water budget inputs.
- Section 4, Calibration, which summarizes the approach and methods used to calibrate the SCHM, including development of calibration datasets, adjustments to the model water budget, diversions, loss factors, land-use-based water budget data, small watersheds, streambed conductance, lateral and vertical hydraulic conductivity, and discusses the results.
- Section 5, Sensitivity Analysis, which evaluates the sensitivity of model response to changes in aquifer lateral hydraulic conductivity, aquitard vertical hydraulic conductivity, aquifer storage coefficients, and evapotranspiration.
- Section 6, Model Forecasts, which summarizes the approach used in applying the model to forecasting future groundwater conditions, and discusses the results of four future scenarios, including high demand increase, low demand increase, discretionary well permitting under the Ordinance, and enhanced recharge.
- Section 7, Conclusions and Recommendations, which summarizes the conclusions and recommendations resulting from development, calibration and application of the SCHM.
- Section 8, References, which lists the references cited in the TM.

2.0 HYDROGEOLOGIC SETTING AND BACKGROUND

2.1 Overview

2.1.1 Water Use in the SCHM

Stanislaus County relies on the conjunctive use of surface water and groundwater to meet a variety of water demands. The Stanislaus and Tuolumne Rivers are an important agricultural and municipal water supply sources to the county via diversions that occur under senior water rights held by Modesto Irrigation District, Oakdale Irrigation District and Turlock Irrigation District (Figure 2-1). These districts deliver water to their agricultural and municipal customers through locally developed and financed water projects. Several public water agencies also divert at least a portion of the water they deliver from the San Joaquin River, for example El Solyo Water District, Patterson Irrigation District and Westside Irrigation District. Additional riparian and appropriative water rights holders near these rivers divert water for local use. The California Aqueduct and Delta Mendota Canal skirt the western edge of the San Joaquin Valley and also provide water to several public water agencies, for example Central California Irrigation District, Del Puerto Water District, Oak Flat Water District, Patterson Irrigation District and Westside Irrigation District.

Groundwater is the predominant source of municipal water in the county, although surface water makes up a growing percentage of the municipal water supply, and additional projects to provide surface water for municipal use are being planned. Throughout most of the county, groundwater is used conjunctively with surface water as an irrigation water supply. Generally, in areas that receive surface water deliveries, groundwater is used as a supplemental irrigation supply during times of surface water shortage. This conjunctive use pattern, combined with deep percolation of applied water to recharge groundwater supplies, has resulted in generally stable groundwater levels over the long term. A few areas rely primarily on groundwater as an irrigation water supply. These areas include, for example, Eastin Water District, Eastside Water District and the unincorporated areas of the county that are located outside of the boundaries of existing public water agencies. Groundwater resources in these areas are more vulnerable to long term stress and depletion; however, enhanced groundwater recharge and other means of relieving stress on groundwater resources are being investigated in these areas.

Due to regulatory restrictions associated with pumping water through the Sacramento-San Joaquin Delta and recent drought conditions, surface water deliveries from the state and federal water projects to water agencies west of the San Joaquin River have been significantly less than their contract allocations. For example, during the last seven years, Del Puerto Water District received 10 percent (%) (2009), 80% (2010), 45% (2011), 40% (2012), 20% (2013), 0% (2014), and 0% (2015) of its contract allocation. In addition, irrigation districts east of the San Joaquin River have not been able to deliver their full allocations during the drought. The affected water districts have actively engaged in local, regional, and statewide efforts to secure additional water supplies as needed to help meet customer demand; however, in some cases landowners have relied on the fallowing of productive lands or turned to groundwater for irrigation supplies, where available.

2.1.2 Groundwater Hydrology

Stanislaus County is underlain by the Delta-Mendota, Eastern San Joaquin, Modesto, and Turlock groundwater subbasins of the San Joaquin Valley Groundwater Basin, as shown in Figure 2-2. Data regarding the groundwater subbasins in Stanislaus County is summarized in Table 2-1, below.

Table 2-1: Summary of Stanislaus County Groundwater Subbasins

Groundwater Subbasin (DWR Basin Number)	Approximate Area	CASGEM Priority	Critical Overdraft Listing
Eastern San Joaquin Subbasin (5-22.01)	1,105 mi^2 (707,000 acres, including areas outside the county)	High	Listed
Modesto Subbasin (5-22.02)	385 mi^2 (247,00 acres, entirely within the county)	High	No
Turlock Subbasin (5-22.03)	542 mi^2 (347,000 acres, including areas outside the county)	High	No
Delta-Mendota Subbasin (5-22.07)	1,170 mi^2 (747,000 acres, including areas outside county)	High	Listed
Sources: California Department of Water Resources (DWR), 2003. *California's Groundwater, Bulletin 118.* Last update for Eastern San Joaquin, Turlock, and Delta-Mendota Subbasins: 2006; Modesto Subbasin: 2004. DWR. 2016. *Water Management Planning Tool.* Website: http://water.ca.gov/groundwater/boundaries.cfm. Accessed July 12, 2017.			

Groundwater in most of the county has been sustainably managed for many years through conjunctive use with surface water under groundwater management plans that are being implemented by the San Luis and Delta-Mendota Water Users Authority (SLDMWUA), the STRGBA, and the TGBA. Nevertheless, all four subbasins have experienced storage depletion and other stresses resulting from conditions of drought. Particular current concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county, and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to the drought and changing surface water allocations. In addition, the Eastern San Joaquin Subbasin and the Delta-

Mendota Subbasin, portions of which underlie the county, are designated as critically overdrafted[2] by the DWR as a result of overdraft conditions and subsidence outside the county.

2.2 Understanding of Hydrogeologic Setting

Aquifer systems in the San Joaquin Valley Groundwater Basin (SJVGB) consist mostly of continental sediments derived from erosion of the Sierra Nevada to the east and the Coast Ranges to the west, and deposited in the valley. The alluvial aquifer system, much of which occurs as fan deposits, consists of a complex set of interbedded aquifers and aquitards that function regionally as a single water-yielding system. The aquifers are relatively thick, with the upper approximately 800 feet providing the primary source of groundwater supply in the area. Aquifer materials consist of gravel and sand, which become increasingly interbedded with fine-grained silt, clay, and lakebed deposits toward the center of the valley. Regionally, the aquifer system of the SJVGB can be divided into an upper unconfined to semi-confined aquifer system, a series of geographically extensive confining clay layers, and a deep confined aquifer system that occupies the central portions of the basin. Toward the center of the valley, the distal, finer-grained facies of the alluvial deposits are interfingered and interbedded with flood plain and basin deposits. Buried river-channel deposits occur in the alluvial fan deposits at the margins of the valley and along Pleistocene and modern river courses (DWR, 2013a).

The principal water-bearing formations on the east side of SJVGB include the semi-consolidated to consolidated Mehrten Formation (Miocene-Pliocene), the semi-consolidated to unconsolidated Turlock Lake Formation (Plio-Pleistocene),[3] the unconsolidated Riverbank and Modesto Formations (Pleistocene), and the overlying unconsolidated Holocene Alluvium and Basin Deposits. These sedimentary deposits dip gently westward and increase in thickness with distance from the Sierra Nevada foothills and from north to south along the valley axis. Aquifers in these deposits tend to be unconfined to semi-confined near the valley margin, grading to semi-confined and confined near the valley axis (USGS, 2004b; DWR, 2013a).

The principal water-bearing formation on the west side of the SJVGB is the Plio-Pleistocene Tulare Formation, which increases in thickness eastward away from the Coast Range to a maximum thickness of approximately 1,400 feet near the valley axis (SLDMWUA, 2011). The Tulare Formation consists of alluvial deposits separated by a series of fine-grained lacustrine deposits. It is broadly separated into an upper unconfined to semi-confined aquifer and a lower confined aquifer. The unconfined and confined aquifer systems are separated by a regionally extensive lacustrine unit in the upper Tulare Formation known as the Corcoran Clay, which is important throughout the SJVGB (USGS, 2004b; DWR, 2013a).[4]

[2] The DWR has adopted the following definition of critical overdraft: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts" (DWR Bulletin 118-80).

[3] Some workers have mapped the Turlock Lake Formation as transitioning to the Plio-Pleistocene Laguna Formation north of Oakdale.

[4] The Corcoran Clay is also reported as a member of the Turlock Lake Formation, which is coeval and interfingered with the Tulare Formation near the center of the SJVGB (USGS, 2004b).

2.2.1 Eastern San Joaquin Groundwater Subbasin

The Eastern San Joaquin Groundwater (SJGW) Subbasin underlies the "northern triangle" of Stanislaus County. Topographically, this area is characterized by low, rolling hills on the eastern flank of the San Joaquin Valley. It is bounded to the south by the Stanislaus River and to the east by low-permeability bedrock formations of the Sierra Nevada. To the north and west it extends outside the county boundaries into San Joaquin County. A small portion of the Eastern SJGW Subbasin also extends into Calaveras County to the east. Woodward Reservoir is located in the south-central portion of the northern triangle, and the Calaveras River is located near its northern apex.

Groundwater in this portion of the subbasin occurs primarily in the Mehrten Formation under unconfined to semi-confined conditions. The southeastern portion of this area is also underlain by the Turlock Lake, Laguna, and Riverbank Formations, and by valley-fill alluvium near the Stanislaus River. These units supply more limited quantities of groundwater. The Stanislaus River in this area is groundwater-connected and includes both gaining and losing reaches (USGS, 2004b; SWRCB, 2012).

A portion of the area southwest of Woodward Reservoir is served by surface water from the Oakdale Irrigation District; however, groundwater is the primary water source for most of the remaining portion of the Eastern SJGW Subbasin that underlies the County. Most high-capacity irrigation wells in the area are completed in the Mehrten Formation; whereas the Turlock Lake Formation, Riverbank Formation, and valley-fill alluvium primarily serve as the water supply for lower-capacity and domestic wells.

The lack of current surface-water supply options in the eastern portions of the County, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, have placed significant stress on groundwater resources in the portion of the Eastern SJGW Subbasin underlying the County. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, these groundwater stresses may be expected to continue. Groundwater monitoring data are limited in this area; however, information compiled by the County suggests that groundwater levels have fallen in some areas by tens of feet in recent years. At this time, available data are insufficient to assess long-term trends in much of this area.

In 2015, the County registered with the DWR to be the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for that portion of the Eastern SJGW Subbasin that lies within the County's boundaries, and submitted a monitoring plan that was accepted by DWR. Stanislaus County is coordinating monitoring activities in this area with Oakdale Irrigation District, Rock Creek Water District, and private land owners. The public agencies involved in groundwater management within the eastern portion of the Eastern San Joaquin Groundwater Subbasin, including the northern triangle area, have formed the Eastside San Joaquin Groundwater Sustainability Agency to address compliance with the SGMA. The locations of water agencies in this effort are shown in Figure 2-1.

2.2.2 Modesto Groundwater Subbasin

The Modesto Subbasin is bounded to the south by the Tuolumne River, to the north by the Stanislaus River, to the west by the San Joaquin River, and to the east by low-permeability bedrock formations of the Sierra Nevada. The subbasin lies entirely within the County. Topography ranges from gently rolling hills in the eastern portion of the subbasin to alluvial plains in the central and western portions. Modesto Reservoir is located in the rolling topography in the eastern portion of the subbasin, near the contact between the Mehrten Formation and the younger alluvial formations.

Groundwater in the eastern portion of the subbasin occurs primarily in the Mehrten, Turlock Lake, Riverbank, and Modesto formations under unconfined to semi-confined conditions. In the central and western portions of the subbasin, an unconfined to semi-confined aquifer system occurs above the Corcoran Clay in the Modesto and Riverbank Formations and Holocene alluvial deposits. Confined aquifers occur in the Turlock Lake Formation and Mehrten Formation below the Corcoran Clay. Groundwater production wells are completed in both the confined and unconfined aquifer systems. The Stanislaus and Tuolumne Rivers are groundwater-connected, and include both gaining and losing reaches (USGS, 2015; TGBA, 2008).

Agricultural water demand in the central and western portions of the subbasin are primarily served by surface-water deliveries from Modesto Irrigation District and Oakdale Irrigation District, and to a lesser extent by groundwater extraction. Municipal water demand is met with a combination of surface water and groundwater supplied by the Cities of Modesto, Oakdale, Riverbank, and Waterford. The central and western portions of the Modesto Subbasin have a history of successful conjunctive use of groundwater and surface water that spans several decades, as evidenced by long-term well hydrographs indicating groundwater levels have generally recovered after periods of drought. The eastern portion of the subbasin is served almost exclusively by groundwater derived from the Mehrten Formation. Recent groundwater-level declines in portions of the basin that have been monitored under the CASGEM program.

As discussed above, the lack of current surface-water supply options in the eastern portions of the subbasin, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, have placed significant stress on groundwater resources in the Modesto Subbasin. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, these groundwater stresses may be expected to continue. Groundwater monitoring data are limited in the eastern portion of the County. At this time, available data are insufficient to assess long-term trends in much of this area.

Additional stress on the entire subbasin may occur if, as is currently proposed, the state mandates minimum unimpaired flow requirements for the Stanislaus and Tuolumne Rivers as part of the Bay-Delta Water Quality Control Plan Amendment process. Under these conditions, it is anticipated that less water will be available for diversion to meet existing agricultural and municipal water demands. The shortfall in demand is expected to be met through additional groundwater pumping. This scenario will potentially result in significant additional stress throughout the subbasin.

The Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) is registered with the DWR to be the CASGEM monitoring entity for the Modesto Subbasin. This group, consisting of the Cities of Modesto, Riverbank, Waterford and Oakdale, as well as Oakdale Irrigation District (OID), Modesto Irrigation District (MID) and Stanislaus County, has recently organized to form the STRGBA GSA to address compliance with the SGMA. The locations of water agencies in this effort are shown in Figure 2-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and shares information with them through direct communication and via the WAC and TAC, and as a member of the GSA.

2.2.3 Turlock Groundwater Subbasin

Turlock Subbasin is bounded to the south by Merced River, to the north by Tuolumne River, to the west by San Joaquin River, and to the east by low-permeability bedrock formations of the Sierra Nevada; the subbasin extends southward from Stanislaus County into Merced County (Figure 2-1). Topography ranges from gently rolling hills in the eastern subbasin to alluvial plains in the central and western portions. Turlock Lake is located in the rolling topography in the eastern portion of the subbasin.

Similar to the Modesto Subbasin, groundwater in the eastern portion of the Turlock Subbasin occurs mainly in the Mehrten, Turlock Lake, Riverbank, and Modesto formations under unconfined to semi-confined conditions. An unconfined to semi-confined aquifer system occurs in the central and western portions of the subbasin in the Modesto and Riverbank Formations and Holocene alluvial deposits overlying the Corcoran Clay, and confined aquifers occur in the Turlock Lake Formation and Mehrten Formation below the Corcoran Clay. Groundwater production wells are completed in both the confined and unconfined aquifer systems. The Tuolumne River is groundwater-connected and includes both gaining and losing reaches (SWRCB, 2012; TGBA, 2008).

Agricultural water demand in the western and central portions of the subbasin is served primarily by surface-water deliveries from Turlock Irrigation District and to a lesser extent by groundwater extraction. Within Eastside Irrigation District, irrigation water demand is met entirely by groundwater pumping. Municipal water demand is met via groundwater supplied by the Cities of Turlock, Ceres, Hughson and Delhi, and the Denair Community Services District. New projects are proposed that would increase reliance on conjunctive use of groundwater and surface water. The central and western portions of the basin have a history of successful agricultural conjunctive use of groundwater and surface water that spans several decades, as evidenced by long-term well hydrographs indicating groundwater levels have recovered after periods of drought. The eastern portion of the subbasin is served almost exclusively by groundwater from the Mehrten Formation and overlying alluvial aquifers. Recent groundwater-level declines in portions of the basin that have been monitored under the CASGEM program.

As discussed above, the lack of current surface-water supply options in the eastern portions of the subbasin, coupled with agricultural land conversion trends that are served almost exclusively by local groundwater extraction, has placed significant stress on groundwater resources in the Turlock Subbasin. Because economic pressures toward land conversion to predominantly permanent crops are ongoing, this groundwater stress may be expected to continue. Groundwater monitoring data in the vicinity of Eastside

Irrigation District indicate groundwater-level declines of over 40 feet within the last 10 years with a resulting groundwater gradient reversal near the Tuolumne River (TGBA, 2008). Data are limited further east, and at this time, available data are insufficient to assess long-term trends.

Additional stress on the entire subbasin may occur if, as is currently proposed, the state mandates minimum unimpaired flow requirements for the Stanislaus and Tuolumne Rivers as part of the Bay-Delta Water Quality Control Plan Amendment process. Under these conditions, it is anticipated that less water will be available for diversion to meet existing agricultural and municipal water demands. The shortfall in demand is expected to be met through additional groundwater pumping. This scenario will potentially result in significant additional groundwater stress throughout the subbasin.

The Turlock Groundwater Basin Association (TGBA) is registered with the DWR to be the CASGEM monitoring entity for the Turlock Subbasin. The western members of this group, consisting of the Cities of Turlock, Modesto, Ceres, Hughson and Waterford, as well as Turlock Irrigation District (TID), Delhi County Water District, Hilmar County Water District, Stevinson Water District, Merced Irrigation District, Merced County, Stanislaus County, Keyes Community Services District and Denair Community Services District have recently organized to form the West Turlock Subbasin GSA to address compliance with the SGMA. The eastern members of TGBA, including Eastside Water District (EWD), Ballico Cortez Water District, Merced Irrigation District, Merced County, Stanislaus County and the City of Turlock have formed the East Turlock Subbasin GSA. The locations of water agencies in this effort are shown in Figure 2-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and shares information with them through direct communication and via the WAC and TAC, and as a member of the GSAs in the subbasin.

2.2.4 Delta Mendota Groundwater Subbasin

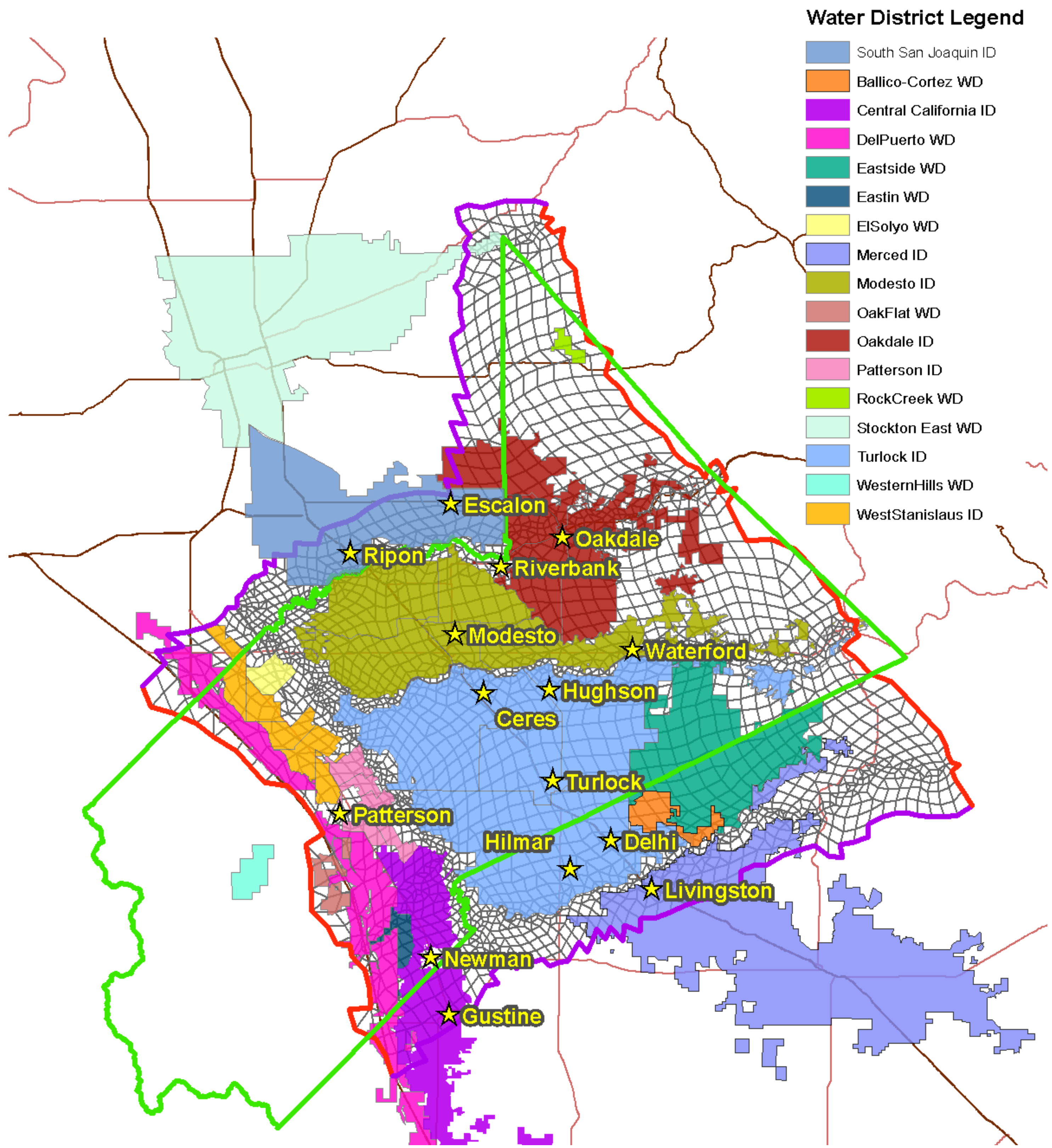
Within Stanislaus County, the Delta Mendota Subbasin is bounded to the east by the San Joaquin River and to the west by low-permeability bedrock formations of the Coast Ranges. The subbasin extends southward from the northern boundary of Stanislaus County along the west side of San Joaquin Valley for approximately 80 miles, and crosses a total of five counties. The western margin of the subbasin consists of low hills and dissected alluvial fans at the foot of the Coast Range. A short distance to the east, elevations drop off into alluvial and flood plains associated with the San Joaquin River. The Delta Mendota Canal and California Aqueduct run along the western margin of the subbasin.

Groundwater in the Delta Mendota Subbasin occurs in the Tulare Formation and overlying Holocene Alluvium. The top of the Corcoran Clay occurs at depths of approximately 100 to 300 feet below ground surface (bgs) in this area, and extends from near the western margin of the subbasin to beneath the San Joaquin River. Near the western margin of the subbasin, the Corcoran Clay divides the Tulare Formation into an upper aquifer system that is unconfined to semi-confined and a lower aquifer system that is confined. The Tulare Formation extends to a depth of over 1,000 feet and includes other lacustrine clay units; however, the Corcoran Clay is the most prominent and continuous (DWR, 2013). Groundwater production wells are completed in both the unconfined and confined aquifer systems; however, most high-capacity wells extend into the confined aquifer system, beneath the Corcoran Clay. Portions of the San Joaquin River are groundwater-connected (SWRCB, 2015).

Land use overlying the Delta Mendota Subbasin is primarily agricultural, with agricultural water demand served by surface-water deliveries from Del Puerto Water District, West Stanislaus Irrigation District, and Central California Irrigation District (one of the San Joaquin Exchange Contractors), supplemented by groundwater extraction. Municipal water demand for the City of Patterson is met using groundwater.

DWR has included the Delta Mendota Subbasin on the list of critically overdrafted basins, largely due to subsidence reported outside Stanislaus County to the south (DWR, 2015a). Nevertheless, the unreliability of surface-water deliveries from the State and Federal water projects has resulted in an increase in agricultural and municipal groundwater demand. This trend is expected to continue in the future as climatic variability and environmental flow requirements continue to affect the reliability of surface-water deliveries. Groundwater levels have fallen over 40 feet in the last 10 years in the southern portion of the Delta Mendota Subbasin in Stanislaus County. In addition, active subsidence of 1 to 2.5 inches has been reported at a continuous survey station near Patterson (DWR, 2015b). DWR has designated the Delta Mendota Subbasin as having a high potential for future subsidence.

Groundwater monitoring and management in the Delta Mendota Subbasin have been implemented through the San Luis & Delta Mendota Water Users Authority (SLDMWUA), of which Del Puerto Water District, West Stanislaus Irrigation District, Patterson Irrigation District, and Central California Irrigation District are members. Water management entities within the portion of the Delta-Mendota Subbasin that lies in the SCHM have formed five separate GSAs to implement compliance with the SGMA. These include the City of Patterson, Patterson Irrigation District, Del Puerto Water District, West Stanislaus Irrigation District, and the Northwestern Delta-Mendota GSA, which consists of several cooperating entities. The locations of water agencies in these efforts are shown in Figure 2-1. Stanislaus County coordinates groundwater-related activities in the subbasin with these entities, and shares information with them through direct communication and via the WAC and TAC.



Notes:
ID = irrigation district
WD = water district

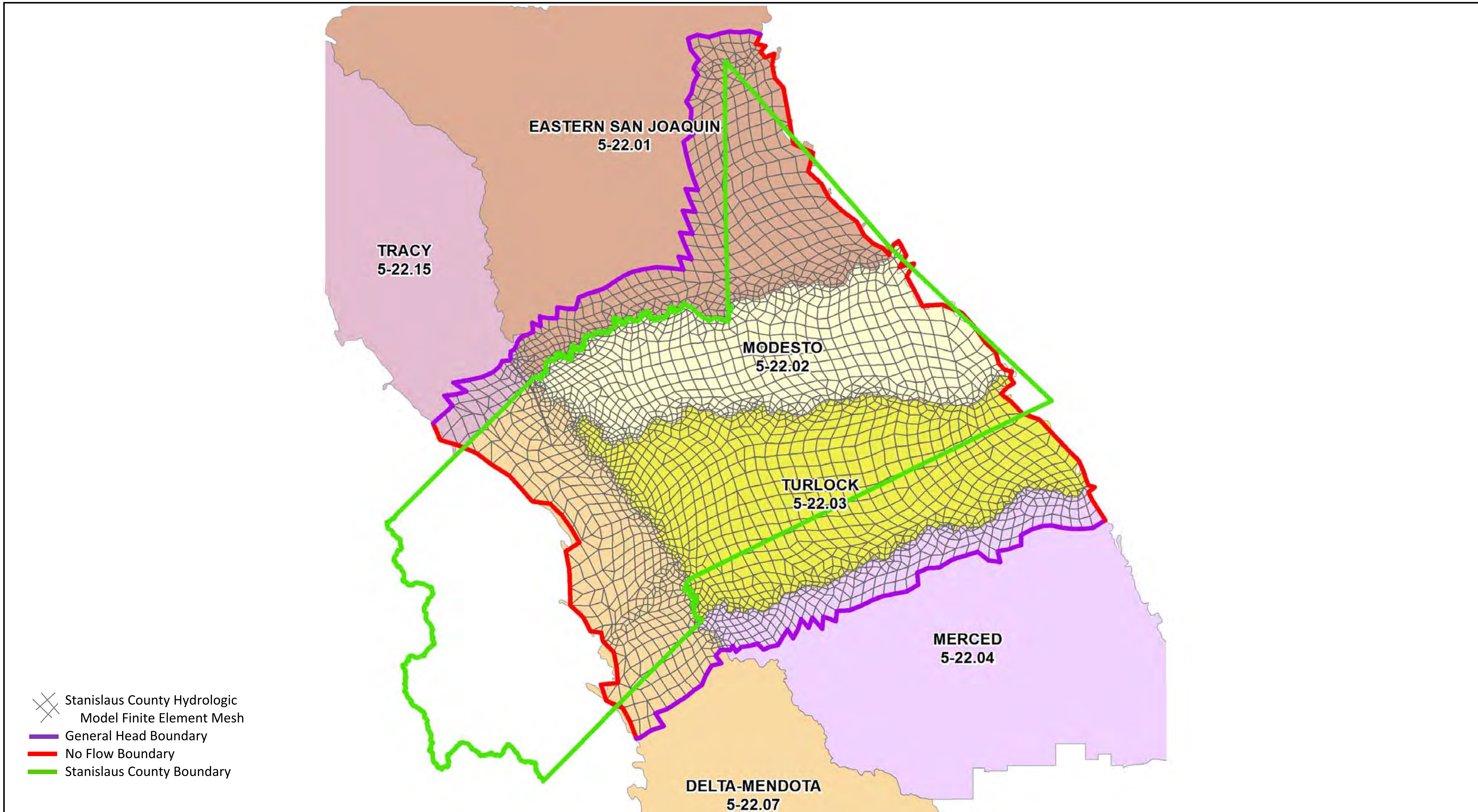
JACOBSON | JAMES
& associates, inc

Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	11/17/17	JH	MT

FIGURE 2-1

Locations of Irrigation and Water Districts within SCHM Study Area



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Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	11/10/17	JH	MT

FIGURE 2-2

Groundwater Subbasins and SCHM Discretization

3.0 MODEL DEVELOPMENT

3.1 Model Conceptualization and General Approach

3.1.1 Approach

Development of the SCHM followed the general groundwater model development steps laid out by Anderson and Woessner (2002), in general conformance with the Modeling Plan (JJ&A, 2016b):

- A conceptual model was developed based on the conceptual understanding summarized below in Section 3.1.2.
- An existing model and modeling code were selected for development of the SCHM as discussed further in Section 3.2, consistent with Modeling Objective 4 (Section 1.2).
- The model grid, boundary, and initial conditions were selected based on the conceptual model and available information from prior modeling in the County, as discussed in Section 3.3 through 3.8.
- The model was calibrated, and the accuracy of simulation results was improved by analyzing the calibration results and identifying aquifer parameters and inputs that needed to be modified or additional processes that needed to be considered or refined. This was achieved by implementation of iterative calibration and sensitivity analysis.
- The calibrated model was used to predict changes in groundwater elevation, storage, and flow as a result of implementing discretionary well permitting under the Ordinance as well as a reasonable range of water demand changes based on future groundwater demand projections.

Consistent with the modeling objectives described in Section 1.2, a superposition modeling approach was used for impact assessment. Superposition or impact modeling is a robust modeling approach which focuses on evaluation of drawdown as opposed to actual hydraulic head, and allows the modeler to focus more on the evaluation of the changes introduced by a project, rather than the simulation of past or future groundwater levels (Reilly, Franke and Bennett, 1987). The use of superposition modeling in hydrogeologic literature is well established, and this approach has been widely used to evaluate the impacts of water supply pumping. The SCHM consists of (1) a calibrated historical model that simulates groundwater and surface water conditions from Water Year (WY) 2000 to WY 2015,[5] (2) a baseline forecast model and a set of forecast scenarios from WY 2016 to WY 2042 to establish the aquifer response under a reasonable range of possible water management scenarios,[6] and to evaluate the effects of groundwater withdrawal from new wells that will potentially be permitted under the Ordinance.

[5] This time period includes a range of climatic/groundwater conditions, which is necessary for meaningful model calibration.

[6] Although 2042 represents the time when all groundwater sub-basins within the County must be managed sustainably as defined in SGMA, and is thus an appropriate time frame for the PEIR impact evaluation, the specific requirements of GSPs necessary to achieve this objective remain to be developed. GSAs to be formed within the County by June 2017 will be vested with the responsibility of developing GSPs. As such, the specific groundwater management strategies necessary to achieve sustainable groundwater management under SGMA are not considered reasonably foreseeable at this time, and will not be evaluated in the PEIR.

3.1.2 Conceptual Understanding

The conceptual model for construction of the SCHM consists of the principal components summarized below.

- The area of interest for this study is the portion of the San Joaquin Valley Groundwater Basin that underlies the County. This area includes all of the Modesto Subbasin and portions of the Eastern San Joaquin and Delta Mendota Subbasins. In addition, all of the Turlock Subbasin, including portions that lie in Merced County to the south, is included in the Study Area (Figure 2-1).
- Low permeability bedrock of the Sierra Nevada and the Diablo Range from the eastern and western boundaries of the basin, respectively.
- A series of broad, coalescing alluvial fans along the western slope of the Sierra Nevada foothills contain aquifers with unconfined to semi-confined conditions and represent a recharge zone (forebay) for deeper confined aquifers closer to the center of the basin. In the eastern portion of this area, Miocene fluvio-volcanic deposits of the Mehrten Formation contain productive aquifers, but the presence of well-developed duripan soils limits local recharge.
- A narrow band of alluvial fans along the eastern margin of the Diablo Range behaves in a similar fashion, functions as a region for local mountain-front recharge, and contains aquifers with unconfined to semi-confined conditions.
- A central region with an upper unconfined to semi-confined aquifer system that is separated by the Corcoran Clay from an underlying confined aquifer system underlies the center of the basin, where deposits from the Sierra Nevada and the Coast Range interfinger.
- The freshwater-bearing valley-fill sediments are underlain by marine sedimentary deposits that contain brackish water at depths between about 900 to 1,500 feet below ground surface.
- Groundwater-connected streams and rivers, including the Stanislaus, Tuolumne, and Merced Rivers, enter the basin from the east and merge with the groundwater-connected San Joaquin River, which flows northward along the valley axis. The Calaveras River crosses the northern triangle portion of the SCHM.
- Reservoirs along the Stanislaus and Tuolumne River are located in the proximal alluvial fan areas near the eastern margin of the basin.
- Groundwater flow, in the absence of groundwater pumping, is generally away from the Sierra Nevada on the east and the Diablo Range on the west, toward the San Joaquin River in the center of the valley, and northward along the San Joaquin River out of the County.

3.2 Modeling Code Selection

3.2.1 Available Models

Several existing groundwater flow models have been developed that cover all or portions of Stanislaus County and are pertinent to the proposed modeling effort:

- The Merced-Stanislaus (MERSTAN) model was developed by USGS in 2015, and covers portions of three of the four groundwater subbasins in the County (Phillips, S.P. *et al*, 2015). It encompasses an area of about 1,000 square miles centered on the Cities of Modesto and Turlock and was developed using the MODFLOW-OWHM modeling code.
- The more generalized regional Central Valley Hydrologic Model (CVHM) developed by USGS includes all of the groundwater subbasins in the County (USGS, 2009 and 2017). The current version of CVHM was also developed using the MODFLOW-OWHM code and is currently being updated.
- The California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) was developed by DWR with the Integrated Water Flow Model (IWFM) code to evaluate groundwater and surface water management issues in the Central Valley and delta (DWR, 2013b and 2016a). The model comes in both a coarse grid version and a fine grid beta version, with the fine grid beta version improved to support evaluation of groundwater flow at a local scale. The model is currently being updated and is expected to be released in late 2017 or early 2018; however, some land use and other data utilized for the updates have been made available by the DWR.
- A three-dimensional finite element model was prepared for the Turlock Subbasin by Timothy J. Durbin as a consultant for TGBA and TID using a customized version of the FEMFLOW3D modeling code (the TID Model) (Durbin, 2008). This model was recently used by TGBA for a study in the eastern Turlock Subbasin. FEMFLOW3D is a proprietary modeling code.
- In support of its Aquifer Characterization and Recharge Project, the City of Modesto has developed a city-wide groundwater flow model with the USGS MODFLOW code, using the GMS modeling platform (the Modesto Model) (Todd and RMC, 2016). The model was extracted from the MERSTAN model to evaluate groundwater flow on a more localized level. The underlying lithology and discretization of the MERSTAN model were not changed.

3.2.2 Model and Code Selection

Consistent with the modeling objectives discussed in Section 1.2, the existing available models were evaluated to determine if one of them could be used as a starting point for construction of the SCHM. The MERSTAN, TID and Modesto models are not able, by themselves, to meet the modeling objectives, as they do not cover all of Stanislaus County. In addition, the TID model is based on a proprietary modeling code and therefore is not consistent with DWR guidance for development of models that would support GSPs (DWR, 2016b). Data from these models may be used to refine the SCHM, but they were not considered suitable as a starting point for model construction. The CVHM and the fine grid version of C2VSim (C2VSim-FG) are both suitable starting points for development of a model that would meet the objectives discussed in Section 1.2, and were evaluated in greater detail in the Modeling Plan (JJ&A, 2016a).

Although based on different modeling codes, C2VSim-FG and CVHM have many similarities, and use some of the same data. Both models were constructed with the objectives of understanding the water budget of the Central Valley, including groundwater/surface water interactions, irrigation demand, and changes in groundwater levels and storage. In addition, both models provide a basis for continued investigations at the local scale via the development of "child" models based on regional "parent" analysis. Of these two models, C2VSim was selected as the starting point for development of the SCHM for the following reasons:

- Planned use of C2VSim by DWR to evaluate the compliance of GSPs with the requirements of SGMA;
- It was anticipated that ongoing efforts by DWR would result in a greater level of support and beta data availability than the CVHM;
- Compatibility with the CalSim and CalLite surface water models and related diversion data;
- Compatibility with groundwater modeling efforts to the north and south of the SCHM in San Joaquin and Merced Counties, which are developing models based on the C2VSim modeling code, IWFM; and
- CVHM has limited options for pre- and post-processing tools that are publicly available; whereas, several Excel and GIS pre- and post-processing tools are available for C2VSim.

When the decision was made to select C2VSim as the starting point for development of the SCHM, it was expected that a calibrated update to the C2VSim-CG model would be released in early 2017, and an updated beta version of C2VSim-FG would also be available. Both models were to be upgraded to the latest version of the IWFM modeling code (IWFM version 2015), which includes several significant improvements over the previous version, IWFM 3.02. Unfortunately, DWR's updates of C2VSim took longer than originally anticipated, and are now expected to be released in late 2017 or early 2018, as of the date of this report. Therefore, the SCHM was constructed using the previously released beta version of C2VSim-FG, which is based on the IWFM 3.02 modeling code and includes historical data through WY 2009. DWR was able to make available several IWFM-formatted datasets, including updated precipitation data and land use data based on updated crop surveys with data through WY 2015, which were able to be incorporated into the SCHM.

3.3 Model Discretization

3.3.1 Finite Element Mesh

The finite element mesh for the SCHM was extracted from the C2VSim-FG model and is shown in Figure 2-1. The mesh includes a total of 3,105 elements and 2,923 nodes, which average approximately 0.6 miles across and range in size from 17 to approximately 1,500 acres within the SCHM domain. The extracted finite element mesh for the SCHM covers Stanislaus County and the entirety of the Turlock Subbasin in Stanislaus and Merced Counties. The mesh extends approximately 3 miles outside the boundaries of the primary model area in order to provide a buffer zone that decreases the potential for boundary effects to influence model results in the primary area of interest.

3.3.2 Water Budget Subregions

IWFM 3.02 utilizes water budget subregions for input of certain water budget data, including surface water diversions and land use data (e.g., crop types). In order to accept updated land use data provided by DWR, the model domain was therefore subdivided in 108 subregions to correspond approximately with the C2VSim coarse grid elements for which the land use data were provided. The subregions are shown graphically in Figure 3-1.

3.3.3 Layering

The SCHM retained the layering scheme of the current C2VSim model, that is, a three-layer system with a vertical conductance pseudo-layer to simulate the Corcoran Clay at the top of Model Layer 2. These layers may be described as follows:

- Layer 1 extends from the ground surface to a depth of 202 to 1,005 feet, and represents the uppermost unconfined to semi-confined aquifer system.
- Layer 2 underlies Layer 1 and ranges in thickness from 16 to 647 feet. It represents the semi-confined to confined aquifer system that underlies the basin at depth to the east and west of the Corcoran Clay subcrop area, and the lower, confined aquifer system below the Corcoran Clay.
- A vertical conductance pseudo-layer is defined at the top of Layer 2 to represent the Corcoran Clay. The vertical conductance of the layer is defined by a hydraulic conductivity multiplied by a thickness, which is set to the interpreted thickness of the Corcoran Clay where it is present, and to zero (providing no impedance) where it is not. The extent of the Corcoran Clay layer is shown on Figure 3-2.
- Layer 3 underlies Layer 2 and represents a regional deep aquifer that ranges in thickness from 30 to 1,572 feet and overlies the interpreted base of fresh water in the area. This layer is penetrated by few wells in the area, and its properties are therefore poorly documented.

3.4 Model Boundaries

The following boundary conditions were assigned, as shown in Figure 2-1:

- Similar to the C2VSim-FG model, the eastern and western boundaries of the model were designated as no flow boundaries along the contact between the valley-fill alluvium and relatively impermeable formations exposed in the foothills of the Sierra Nevada and the Diablo Range.
- The northern and southern model boundaries were designated as general-head boundaries, which require designation of a general head and distance to the general head. Variable flow may occur across these boundaries depending on variations in simulated hydraulic gradients over time. Time-series head values for these boundaries were initially assigned based on heads extracted from beta version of the C2VSim-FG model for WY 1991 to WY 2009. Boundary heads for WY 2010 to WY 2015 were duplicated from C2VSim data for years with similar hydrologic characteristics. These boundary heads were updated during the model calibration process as discussed in Section 4.3.1.3. The distance to the general heads was set at 1 meter.

3.5 Sources and Sinks

Sources and sinks were modeled as follows:

- Rivers and streams, including Merced River, Orestimba Creek, Calaveras River, Stanislaus River and Tuolumne River, were simulated using river nodes as shown in Figure 3-3. River boundary cells are a head-dependent boundary condition that allows water to enter or exit the river according to the head difference between the groundwater elevation and the surface water elevation, and in proportion to the hydraulic conductivity and thickness of the stream bed layer, which is represented by a conductance term. The stream bed conductance values from C2VSim were initially adopted for use in the model, and updated during the calibration process as discussed in Section 4.3.3.
- Small watersheds that are tributary to the model were adopted from C2VSim and refined as described in Section 3.9.3.3. They were further updated and refined during the calibration process as described in Section 4.3.2.
- Reservoirs were simulated using recharge nodes with 100 percent recoverable losses (i.e., all seepage losses remain within the model) in the footprints of the reservoirs shown in Figure 3-3. Additional information regarding the assigned recharge rates at these nodes is provided in Section 3.9.3.4. The diversion for Turlock Lake was adjusted during the calibration process to 33 percent recoverable and 67 percent non-recoverable losses.
- There are no tile drains in the current version of C2VSim within the domain of the SCHM. Tile drains are reported to be located in some areas of shallow groundwater near the San Joaquin River within TID; however, they are a relatively small component of the water budgets and information regarding the drain depths and locations was not readily available, so they were not incorporated into the model. These could be added at a later date if data regarding drain elevations and conductance values is obtained.
- Municipal pumping wells were added based on data provided by municipal water agencies or obtained from Urban Water Management Plans (UWMPs), Municipal Service Reviews (MSRs) and other sources as described in Table 3-1. The locations of these wells are shown on Figure 3-4. Additional information regarding development of the municipal pumping component of the model groundwater budget is described in Section 3.9.4.1.
- Rural domestic pumping was evaluated using the methodology described in Section 3.9.4.2, and a single surrogate well was defined in each of the 108 water-budget subregions in Layer 1 to simulate this component of the regional groundwater demand. The locations of these wells are shown on Figure 3-4.
- Recharge elements are designated in C2VSim to receive urban return flow, recoverable diversion losses, and recharge from small watershed stream inflows. These nodes were retained, except that recharge nodes for small watersheds were updated and refined during the model calibration process as described in Section 4.3.2.

3.6 Parameterization

The model was originally extracted with the aquifer parameter values assigned by C2VSim, which were then updated as follows:

- Spatial data (xyz) regarding the distribution of hydraulic conductivity in the MERSTAN model were extracted from that model and uploaded into the SCHM. Parameter data for the inactive portions of the MERSTAN model west of the San Joaquin River were not used, as USGS staff indicated that the data in this area were not subjected to the same level of geostatistical analysis as data east of the river, and were therefore less reliable.[7] The MERSTAN model includes 16 layers, which were assigned as follows:
    - Hydraulic conductivity values from MERSTAN Layers 1 through 7 were assigned to SCHM Layer 1;
    - Hydraulic conductivity values from MERSTAN Layer 8 represent the Corcoran Clay, and were not used;
    - Hydraulic conductivity values form MERSTAN Layers 9 through 13 were assigned to SCHM Layer 2; and
    - Hydraulic conductivity values from MERSTAN Layers 14 through 16 were assigned to SCHM Layer 3

  The hydraulic conductivities at each model node were calculated using the standard formulas for calculation of effective vertical and lateral hydraulic conductivities of heterogeneous layered systems as follows:

    - Lateral hydraulic conductivity was calculated using the following formula:

    $$\boldsymbol{K_x = \sum_{i=1}^{n} \frac{k_i d_i}{d}}$$

    - Vertical hydraulic conductivity was calculated using the following formula:

    $$\boldsymbol{K_z = \sum_{i=1}^{n} \frac{d}{\frac{d_i}{K_i}}}$$

- Hydraulic conductivity data estimated from 30 specific capacity tests performed on wells in the eastern foothills area of the County were used to update and adjust hydraulic conductivity values in areas east of the MERSTAN model domain using a modified nearest-neighbor geospatial analysis technique.
- Hydraulic conductivity data estimated from 23 specific capacity and aquifer pumping tests west of the San Joaquin River were similarly used to update and adjust hydraulic conductivity values in that area using a modified nearest neighbor geospatial analysis technique.

[7] Steve Phillips, USGS, personal communication, July 2017.

- The vertical hydraulic conductivity and thickness of the Corcoran Clay were used to calculate the conductance term assigned to aquitard at the top of Layer 2. To do this, the lateral extent and thickness of the Corcoran Clay reported by the USGS was used (USGS, 2012), as shown in Figure 3-2. The vertical hydraulic conductivity of the Corcoran Clay within the SCHM is not well characterized, but a reasonable range based on the literature is approximately 6.2×10^{-4} to 3.0×10^{-6} ft/day (USGS, 2004b; USGS, 2009). A uniform vertical hydraulic conductivity of 1×10^{-5} feet/day was applied to the Corcoran Clay based on these values, and then adjusted as appropriate during calibration as discussed in Section 4.3.5.
- Targeted changes to the initial lateral and vertical hydraulic conductivity assignments were made during the calibration process as described in Section 4.3.4.
- The SCHM retained the aquifer specific yield, specific storage, elastic and inelastic storage coefficients, interbed thickness, minimum interbed thickness, and precompaction hydraulic head incorporated in C2VSim.

To help illustrate the above described parameterization process, the initial distribution of lateral hydraulic conductivity in SCHM Layer 1 in relation to the MERSTAN model domain, and the locations of wells for which hydraulic conductivity data were calculated is shown in Figure 3-5.

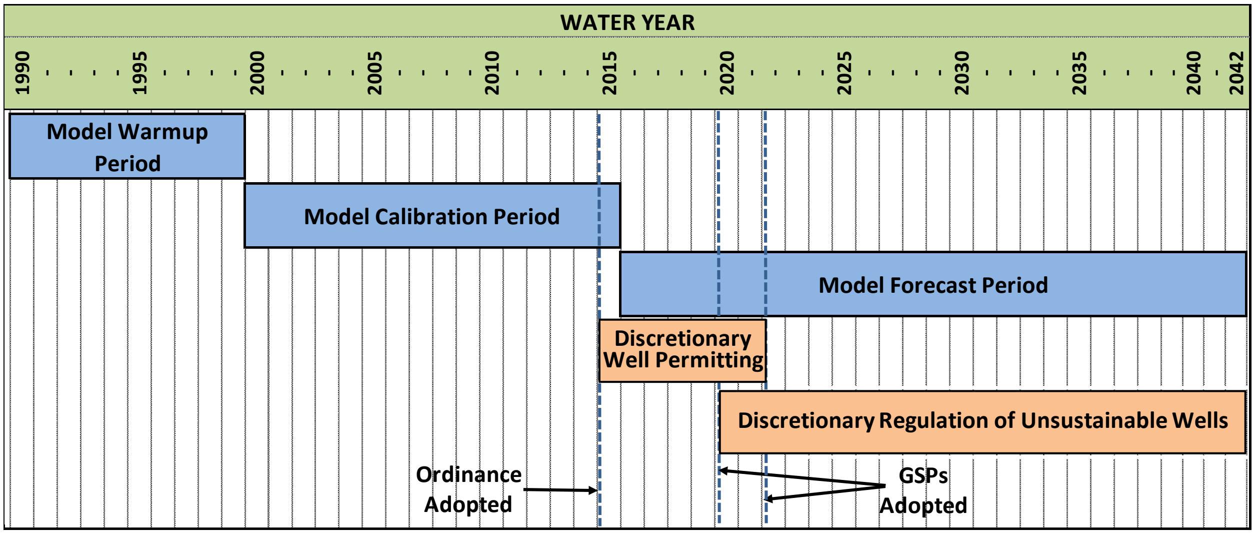
3.7 Model Time Period

The Ordinance was adopted in November of 2014, and the primary period of interest to be evaluated using the SCHM covers the time that discretionary well permits will be issued in unincorporated, non-district lands prior to adoption of GSPs. Adoption and implementation of GSPs will take place in the Delta Mendota and Eastern San Joaquin Subbasins beginning in 2020, and in the Modesto and Turlock Subbasins beginning in 2022. Achievement of sustainable groundwater management is required throughout the basins within 20 years after GSPs are adopted, or in 2040 and 2042, respectively. During this time, wells determined by the County to be operated unsustainably may be regulated under the Ordinance.

Based on this information, the temporal simulation periods of the model may be subdivided as shown graphically in Figure 3-6 and as described below:

- A model “warm up period” was established from WY 1991 to WY 1999 to allow the model to reach conditions that are consistent with historical water budget inputs;
- A calibration or history matching period of WY2000 to WY2015 was selected, and includes a selection of wet, dry and normal hydrologic years to allow for a robust calibration process;
- A forecast period extending from WY 2016 to WY 2042 was established to run forward simulations capable of assessing reasonably foreseeable water management and climatic trends, and evaluating the impacts of issuing discretionary well permits under the Ordinance.

Figure 3-6: Timeline for Well Permitting Requirements Evaluated in the SCHM



3.8 Initial Conditions

Starting heads for the model were initially extracted for October of 1990 (the beginning of WY 1991) after running the existing version of C2VSim from 1921 to 1990. The use of a warmup period makes the model less sensitive to the choice of initial heads. Nevertheless, after the water budget adjustments during the calibration process (Section 4.3.1), WY 1999 model heads were substituted as the initial WY 1991 heads because these were generally more closely aligned with observed heads as seen in the calibration wells reported for the model warmup period (WY 1991 to WY 1999). Historical Water Budget Data

Water budget data for the model calibration (history match) period were compiled from several sources as follows:

- The water budget data from C2VSim-FG were initially retained in the SCHM and updated when more reliable data were deemed to be available;
- Updated land use and precipitation data from WY 1991 through WY 2015 were provided by DWR from its work in updating C2VSim and were incorporated into the SCHM;
- Municipal water budget data provided by municipal water purveyors and/or data from UWMPS, MSRs and other plans and reports were incorporated into the model as described in Table 3-1 and in Sections 3.9.4.1;
- Diversion data from C2VSim were re-allocated from the six water budget subregions defined in C2VSim to the 108 water budget subregions defined in the SCHM, and updated based on information provided by agricultural water purveyors and/or data from Agricultural Water Management Plans (AWMPs), MSRs and other plans and reports as described in Table 3-2 and in Section 4.3.1.1;

- Agricultural land use and water budget data provided by agricultural water purveyors and/or data from AWMPs, MSRs and other plans and reports were used as described in Table 3-3 to refine model cropping data, the diversions listed in Table 3-2 and the diversion recoverable and non-recoverable losses (Table 3-4), allocation loss and cropping data as further described in Sections 3.9.4.3 and 4.3.1.2;
- Agricultural land use data provided by the Stanislaus County Agricultural Commissioner for non-district areas in the eastern portion of the SCHM were incorporated during the model calibration process as described in Section 4.3.1.2;
- Small watershed recharge locations and rates were refined to scale small watersheds split across the model boundaries, and were adjusted during the calibration process as discussed in Section 4.3.2;
- Stream inflows were updated for WY 2010 through WY 2015 using gaging station data; and
- River conductance values were adjusted to change the surface-groundwater interaction in some reaches during the calibration process as discussed in Section 4.3.3.

3.8.1 Precipitation

Updated precipitation data were obtained from DWR for WY 1991 through WY 2015 in a gridded dataset that was applied to the 108 water-budget subregions defined in the SCHM. The data were derived by DWR using the Parameter-elevation Regressions on Independent Slopes Model (PRISM), which is a climate analysis system that uses point data, a digital elevation model (DEM), and other spatial datasets to generate gridded estimates of annual, monthly and event-based climatic parameters (Daly et al., 1997 and 2004).

3.8.2 Stream Inflows

The major stream inflows into the SCHM were developed as follows:

- River inflows (Rim Inflows) for the Stanislaus River, Tuolumne River, Merced River, Calaveras River, and Orestimba Creek were adopted from C2VSim for WY 1991 through WY 2009, and derived from the USGS gaging station flow data for the C2VSim-assigned gaging stations for WY 2010 through WY 2015; and
- River inflows for the San Joaquin River were defined using the C2VSim river node at the river's entry point into the SCHM for WY 1991 through WY 2009; for WY 2010 through WY 2015, inflows were extrapolated based on USGS gaging station data for the San Joaquin River at Newman which were scaled based on pre-2010 correlation with the SCHM inflow data.

3.8.3 Recharge

Recharge, or deep percolation, is calculated in IWFM 3.02 by routing excess water from land surface processes such as land use (agricultural, urban, native vegetation or riparian), precipitation, irrigation, conveyance losses, runoff, return flow and surface water, as infiltration into a root-zone model, from which it is routed downward through the vadose zone model and into groundwater based on soil moisture content and field capacity (or directly into groundwater when it is shallow enough) (DWR, 2013c). The land surface, root zone and vadose zone processes are controlled by a number of sub-processes, water budget and soil property variables that can be defined in the model input files. The reader is referred to the document DWR 2013b for a more complete discussion regarding the model's approach to the generation and routing of recharge.

3.8.3.1 Areal Recharge from Precipitation

Areal infiltration into the root zone in IWFM 3.02 is calculated on a subregional level based on precipitation, soil properties and designated elemental land use. Precipitation inputs into the SCHM were updated based on data provided by the DWR as described in Section 3.9.1. The remaining factors used by the surface and land use processes, root zone model and vadose zone model to calculate areal recharge were adopted unchanged from C2VSim.

3.8.3.2 Streams

Recharge from streams (or discharge to streams) in IWFM 3.02 is governed by defined streambed geometry and conductance terms at each stream node, stream flows and the surface and groundwater hydrology modeled at the stream (i.e., whether the stream is gaining, losing, or disconnected from direct groundwater interaction). Stream flows in the SCHM were simulated as discussed in Section 3.9.2. The conductance terms consist of a streambed thickness and hydraulic conductivity. Streambed conductance values in C2VSim were adopted in the SCHM, and then adjusted for some reaches as discussed in Section 4.3.3.

3.8.3.3 Small Watersheds

Inflow into the model from tributary watersheds that are not modeled as streams is simulated in IWFM using "small watersheds" for which runoff, underflow in, and recharge at designated recharge nodes are simulated. C2VSim includes 18 small watersheds that are tributary to the SCHM, some of which are also tributary to portions of C2VSim that fall outside the SCHM model domain. The input data for the overlapping small watersheds was scaled based on the portion of the watersheds tributary to the SCHM model domain, and the C2VSim data for the small watersheds was adopted unchanged into the SCHM. Changes to the number of specifications of recharge nodes for some of the small watersheds were made during the calibration process as described in Section 4.3.2.

3.8.3.4 Reservoirs

Three reservoirs in the eastern Stanislaus County serve to provide off-stream storage for water to be delivered for agricultural and municipal use: Modesto Reservoir and Turlock Lake, which receive water diverted from the Tuolumne River, and Woodward Reservoir, which receives water diverted from the Stanislaus River. These reservoirs are located in the low foothills of the Sierra Nevada near the contact between the Mehrten and Turlock Lake Formations, which include relatively permeable sands, and the reservoirs therefore are a significant source of local recharge. C2VSim does not simulate these reservoirs, so they were added by designating recharge nodes with 100 % recoverable losses (i.e., all of the water stays within the model) within the footprints of the reservoirs that receive water imports from outside the model in proportion to the estimated seepage losses, as described in Section 3.5. Losses for Turlock Lake were adjusted during the calibration process. Recharge from these reservoirs was estimated using the following approach:

- Annual seepage losses from Woodward Reservoir from 1994 through 2014 were taken from a water balance table provided in the 2015 AWMP for South San Joaquin Irrigation District (SSJID) (Davids Engineering, 2015). Values for 1990 to 1993 and 2015 were substituted from similar hydrologic years in the available record. In the absence of specific data, seepage was assumed to be a constant value during each month of any given year.
- Monthly seepage losses for Turlock Lake were calculated from lake inflow, outflow and storage data provided by TID, subtracting evaporation losses. Evaporation losses were calculated by scaling annual evaporation losses reported for Woodward Reservoir (Davids Engineering, 2015) based on the relative size of the free water surface areas of the reservoirs at average high-water levels, distributed based on reported monthly potential evapotranspiration.
- Monthly seepage losses for Modesto Reservoir were calculated from lake inflow and outflow data provided by Modesto Irrigation District, and storage data from California Data Exchange Center (CDEC), subtracting evaporation losses. Evaporation losses were calculated by scaling annual evaporation losses reported for Woodward Reservoir (Davids Engineering, 2015) based on the relative size of the free water surface areas of the reservoirs at average high-water levels, distributed based on reported monthly potential evapotranspiration.

3.8.3.5 Urban Deep Percolation

Urban deep percolation is derived from diversion conveyance losses, urban landscape irrigation, wastewater return flows and precipitation. Infiltration into the root zone model is controlled by a number of factors that can be defined in the model inputs (indoor vs. outdoor water use fractions, urban evapotranspiration, percent of impervious materials, designated return flow and recharge fractions, etc.). From the root zone model, infiltration is routed through a vadose zone model and into groundwater depending on soil properties and antecedent moisture conditions. Urban deep percolation as a function of urban supply therefore varies from year to year in the model. Refining these variables was beyond the scope of this project. They were therefore adopted unchanged from C2VSim, and could be refined during future modeling efforts.

3.8.3.6 Agricultural Deep Percolation

Similar to urban deep percolation, agricultural deep percolation is calculated by the model based on a complex series of interactions between land use, water supply, evapotranspiration, irrigation efficiency, drainage, applied water and soil conditions. Similar to urban deep percolation, agricultural infiltration is routed from the root zone model through a vadose zone model and into groundwater depending on soil properties and antecedent moisture conditions. Agricultural deep percolation as a function of applied water therefore varies by location and from year to year in the model. Refining these variables was beyond the scope of this project. They were therefore adopted unchanged from C2VSim, and could be refined during future modeling efforts. WALT: Same comment applies here.

3.8.4 Pumpage

3.8.4.1 Municipal Pumping

Municipal pumping in IWFM 3.02 can either be designated by entering pumping well specifications or by entering a municipal demand and allowing the model to calculate pumping based on the difference between available surface water diversions and demand. C2VSim identified centrally located surrogate wells for each urban area to simulate municipal groundwater pumping. For the SCHM, municipal pumping was specified by entering well data. The approach used is summarized in Table 3-1 and included the following steps:

- The locations of 218 municipal wells reported by municipal water purveyors or identified from UWMPs, MSRs or other planning documents were entered into the model;
- Completion depths and screen intervals were added for the wells when available, or were estimated based on nearby supply wells when they were not available;
- The locations and completion details of four surrogate wells used in C2VSim to simulate municipal groundwater pumping in four cities located within the buffer zone outside the primary model area (Escalon, Ripon, Gustine and Livingston) were retained; and
- Annual and monthly municipal groundwater pumping was specified based on information reported by municipal water purveyors, and/or data from UWMPs, MSRs or other planning documents, augmented by information regarding population trends, as summarized in Table 3-1.

3.8.4.2 Rural Domestic Pumping

Rural domestic pumping was assumed to occur from Model Layer 1 and was estimated using the following geospatial analysis approach:

- Rural domestic pumping was assumed to occur in each water budget subregion with land falling outside the cities and community service districts included in the SCHM;
- The intersection between the areas identified as having rural domestic water demand and Census 2000 tracts was used to estimate the number of households reliant on rural domestic pumping for their water supply in that year;
- A default water demand of 0.5 acre-feet per year (AFY) was assumed for each rural domestic household (Water Research Foundation, 2016), and was decreased by 38% to account for return flows from landscape irrigation and wastewater disposal to septic systems (Aquacraft, 2011); and
- The rural domestic water demand was adjusted for the model period prior to and following 2000 based on rural population trends reported in the Stanislaus County General Plan Housing Element (Michael Baker International, 2016).

3.8.4.3 Agricultural Pumping

Agricultural pumping is calculated by IWFM 3.02 based on the difference between the total irrigation water demand and the amount of surface water and precipitation available to meet the demand. The resulting agricultural pumpage is applied on an elemental basis. The irrigation water demand is calculated by the model for each subregion based on designated land use, crop type, evapotranspiration, irrigation efficiency and soil properties. The following approach was used to calculate agricultural pumping in the SCHM:

- Land use data from DWR crop surveys was provided by DWR through WY 2015 and entered into the input files for each SCHM subregion;
- Crop types were adjusted from C2VSim/IWFM 2015 data (which is the format provided by DWR) to correlate with the crop types available in C2VSim/IWFM 3.02;
- Evapotranspiration, irrigation efficiencies, and soil properties were adopted unchanged from C2VSim;
- Diversions and diversion losses were determined based on data provided by irrigation districts or available from AWMPs, MSRs and various planning documents using the process described in Tables 3-2, 3-3 and 3-4; and
- Diversions, diversion losses and crop data were adjusted during the calibration process based on comparison between modelled and reported farm gate water deliveries and groundwater pumping as described in Table 3-3 and Section 4.3.1.1.

Jurisdiction	Groundwater Subbasin	Water Supply Source	Description	Groundwater		
				Well Location Data Source	Well Completion Data Source	Groundwater Pumping Data Source
Ballico CSD	Turlock	Groundwater	One well serves a population of approximately 400 via 70 connections.	--	--	Use data for 2000-2006 in TGBGMP and extrapolate for other years based on population trends.
Ceres	Turlock	Groundwater	15 potable and 11 non-potable wells serve a population of approximately 48,000 via 11,300 connections.	Map in 2016 1,2,3-TCP Feasibility Study; 11 wells coordinates in Modesto LGA Model inputs.	Modesto LGA Model input file	City-provided spreadsheet: 2001-2015 monthly pumping by well.
Crows Landing CSD	Delta-Mendota	Groundwater	Two wells serve a population of approximately 500 via 140 connections.	Map from City	Logs from City	Aggregated monthly data 2013-2015 provided by CSD, extrapolate other years 2000 based on population trends.
Delhi County WD	Turlock	Groundwater	Four wells serve a population of approximately 7,800 via 2,400 connections.	--	--	Use data for 2000-2006 in TGBGMP and extrapolate for other years based on population trends.
Denair CSD	Turlock	Groundwater	Four wells and one standby well serve a population of approximately 3,200 via 1,400 connections.	--	--	Use data for 2000-2006 in TGBGMP and extrapolate for other years based on population trends.
Escalon	Eastern San Joaquin	Groundwater	Four wells serving population of approximately 8,800.	Use C2VSim data	Use C2VSim data	Use data from C2VSim for 1990-2000;
Gustine	Delta-Mendota			Use C2VSim data	Use C2VSim data	Use data from C2VSim for 1990-2000;
Hilmar County WD	Turlock	Groundwater	Four wells serve a population of approximately 4,850 via 1,570 connections.	--	--	Use data provided by RMC or extrapolate from MAGPI Model based on population, compare to 2000-2006 graph in TGBGMP.
Hughson	Turlock	Groundwater	3 active and 2 standby wells serving a population of approximately 6,100 with 2,000 connections.	Ground-truthed City data and Modesto LGA Model inputs.	In Modesto LGA Model input file	Average aggregated annual for 2000 and 2005 in 2005 UWMP; extrapolate other years based on population.
Industrial Pumping	All	Groundwater	Some food processing and other industrial facilties in the area utilize their own water supply wells.	Not provided	Not provided	Assume included in C2VSim elemental M&I pumping.
Keyes CSD	Turlock	Groundwater	Four wells serve a population of approximately 4,800 via 1,500 connections.	Latitude/Longitude provided via email	SRF application indicates 200-800 ft screen.	Aggregated annual pumping graph for 2000-2006 in TGBGMP; Spreadsheet with monthly pumping by well 2007-2015; Extrapolate other years based on population.
Knights Ferry CSD	Modesto	Surface Water	Surface water delivered by an OID diversion from the Stanislaus River.	--	--	--
Livingston	Merced	Groundwater	Eight wells serving population of approximately 14,000.	Use C2VSim data	Use C2VSim data	Use data from C2VSim for 1990-2000;
Modesto	Modesto Turlock	60% Groundwater 40% Surface Water	88 wells plus surface water serve a population of approximately 260,000 via 75,000 connections (2015), including several "service island" systems (Grayson, Turlock, Del Rio, Empire, Hickman).	GIS files provided by City	Spreadsheet provided by City.	Spreadsheet: 2000-2015 monthly by well
Monterey Park CSD	Modesto	Groundwater	2 wells serve a population of approximately 200 via 50 connections.	Assume center of CSD	Assume Model Layer 1	Assume included in C2VSim elemental M&I pumping.
Newman	Delta-Mendota	Groundwater	3 active and 1 standby wells serving a population of approx 11,000 with approx 3,300 connections.	Map and WCRs	WCRs	2013-2015 City data, interpolated to 2010 using UWMP data, and 2000 based on population.
Oakdale	Modesto Eastern San Joaquin	Groundwater	9 wells serve a population of approximately 22,000 Via 7,700 connections.	Map in 2015 WMP	2015 WMP (well depths only)	2000-2014 Aggregated annual pumping in MSR; extrapolate to 2015 based on population.
Patterson	Delta-Mendota	Groundwater	7 wells and 2 non-potable wells serving a population of approx 22,600 with approx 6,300 service connections.	Map from City	Arambel Business Park WSA	2012-2015 Tabulated monthly pumping by well provided by city; extrapolate backward based on aggregated annual data in 2015 UWMP (various tables).
Ripon	Eastern San Joaquin	Groundwater	8 groundwater serving population of approximately 18,100	Use C2VSim data	Use C2VSim data	Use data from C2VSim for 1990-2000;
Riverbank	Modesto	Groundwater	10 wells serve a population of 23,000 via 6,800 connections.	Map in 2010 UWMP or Nolte 2007 WMP	2010 UWMP	Aggregated annual pumping for 2000-2013 2010 UWMP; apporationed based on monthly pumping by well for 2006 in Nolte 2007; extrapolated forward based on population.
Riverdale Park CSD	Modesto	Groundwater	1 well serves a population of approximately 300 via 180 connections.	Not provided	Not provided	Assume included in C2VSim elemental M&I pumping.
Turlock	Turlock	TID Surface Water and Groundwater	20 active, 1 standby and 4 non-potable wells plus surface water serve a population of approximately 70,000 via 18,500 connections.	Determine from addresses in spreadsheet.	Interpret from casing and seal depths in spreadsheet	2000-2015 monthly aggregated pumping in city spreadsheet equally apportioned.

Jurisdiction	Groundwater Subbasin	Water Supply Source	Description	Groundwater		
				Well Location Data Source	Well Completion Data Source	Groundwater Pumping Data Source
Waterford	Modesto	Groundwater	Three systems serve a population of approximately 10,000: Two adjacent systems (Waterford and River Pointe) with 8 wells serve 2,400 connections; Hickman with 2 wells serves 180 connections.	Maps in 2016 WMP	2016 WMP Well depth table	Calculate from data in 2016 WMP and extrapolate based on population.
Westley CSD	Delta-Mendota	Groundwater	Groundwater purchased from Hillview Homes: 2 wells serve a population of approximately 70.	NA	NA	Assume included in C2VSim elemental M&I pumping.

Notes:
C2VSim = California Central Valley Groundwater-Surface Water Simulation Model
CSD = Community Services District
ft = foot
GIS = geographic information system
KMZ = keyhole markup language (geographic annotation for two-dimensional maps and three-dimensional Earth browsers)
LGA = Local Groundwater Assistance
MAGPI = Merced Area Groundwater Pool Interest
M&I = municipal and industrial
MSR = Municipal Service Review
RMC = RMC Water and Environment
SRF = Safe Drinking Water State Revolving Fund
1,2,3-Trichloropropane
TGBGMP = Turlock Groundwater Basin Groundwater Management Plan
TID = Turlock Irrigation District
UWMP = Urban Water Management Plan
WCR = well completion report
WD = Water District
WMP = Water Master Plan
WSA = Water Supply Assessment
% = percent
-- = not available/not applicable

References:
City of Patterson, 2012. *Water Supply Assessment for Arambel Business Park/KDN Retail Center Final Draft.* April.
Nolte Associates, Inc., 2007. *City of Riverbank Water Supply Study and Water Master Plan. Volume I.* Prepared for City of Riverbank. November.
Provost & Pritchard Consulting Group, 2016. *City of Ceres 1,2,3-TCP Mitigation Feasibiilty Study.* Prepared for City of Ceres. August 22.

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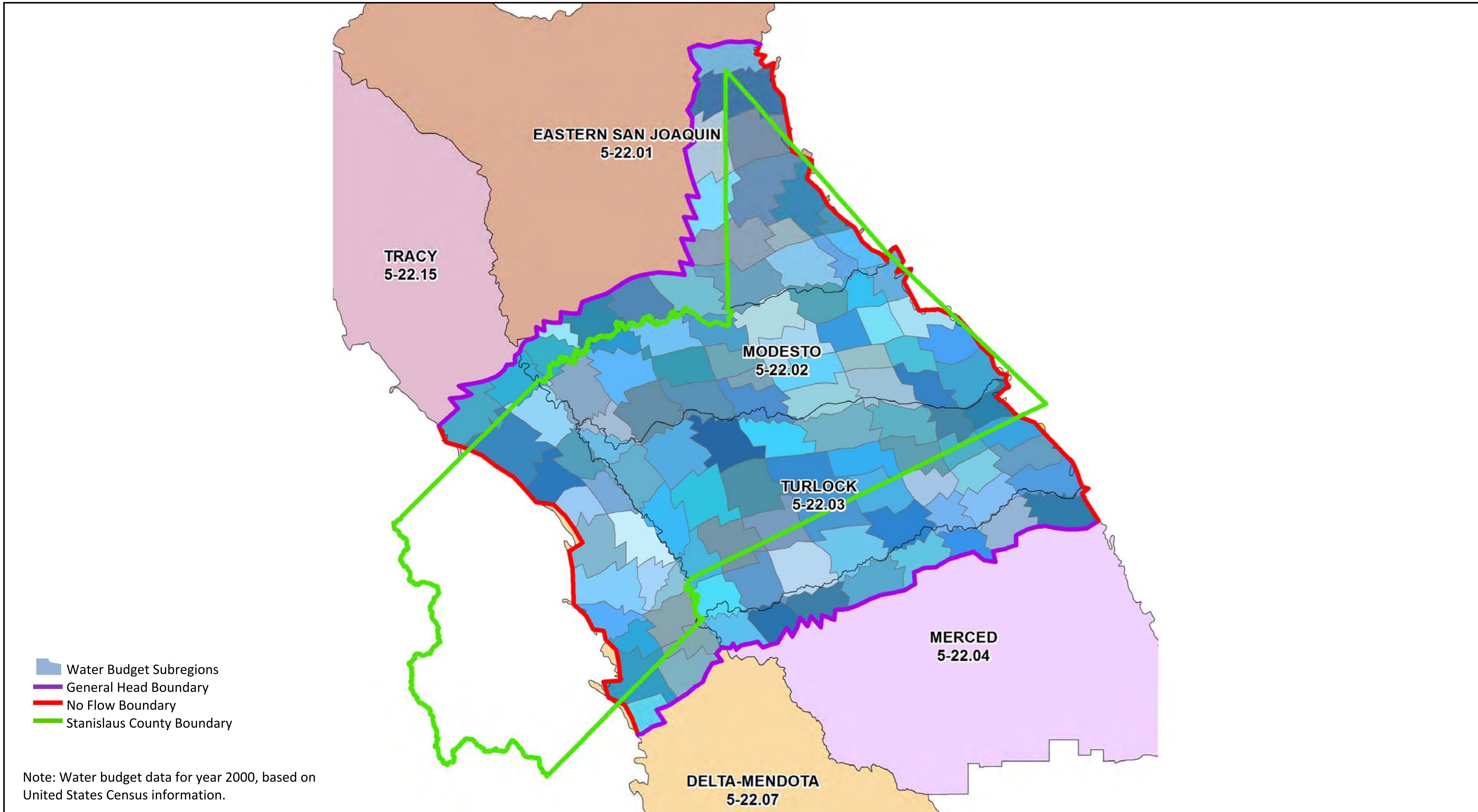
C2VSim Diversion ID	SCHM Diversion ID	C2VSim Diversion Name	Water District(s)/Area Receiving Water Deliveries	Approach for Calculating Diversions for Historical Model Period (WY1990 - WY2015)	Approach for Calculating Diversions for Forecast Model Period (WY2016 - WY2042)
85	1	Calaveras River	SEWD	Use reported diversions from New Hogan Reservoir for 2013-2015 in Table 7 of the SEWD AWMP. For 1990-2012, calculate the fraction of the 2014 Diversion 85 volume in each year, and multiply it by the 2014 delivery reported in the AWMP. Multiply all diversions by 0.09 based on the percentage of the SEWD service territory within the model domain. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 1990, respectively).
93	2	Sacramento-San Joaquin Delta to SWP	Oak Flat Water District	Use reported 2006 - 2015 diversions reported in 2016 Municipal Service Review. Calculate 1990-2005 diversions by multiplying the maximum district allocation by reported historical SWP deliveries. Calculate monthly delivery fraction using reported average deliveries reported for DPWD.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
94	3	Stanislaus River to South San Joaquin Canal for Agriculture	SEWD	Use reported diversions from New Melones Reservoir for 2013-2015 in Table 7 of the SEWD AWMP. For 1990-2012,calculate the fraction of the 2014 Diversion 85 volume in each year, and multiply it by the 2014 delivery reported in the AWMP. Multiply all diversions by 0.09 based on the percentage of the SEWD service territory within the model domain. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
94	3	Stanislaus River to South San Joaquin Canal for Agriculture	SSJID	Use reported 1994-2014 releases from Woodward Reservoir in Table 14 of the SSJID AWMP. For 1990-1993 and 2015, calculate the fraction of the 2014 Diversion 94 volume in each year, and multiply it by the 2014 delivery reported in the AWMP. Multiply all diversions by 0.51 based on the percentage of the SSJID service territory within the model domain. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
95	4	Stanislaus River to South San Joaquin Canal for M&I	City of Ripon	Use 0 for 1990-1998, 0.5 TAF for 1999-2005, 1 TAF for 2006-2010, 1.5 TAF for 2011-2015. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use 0.
96	5	Stanislaus River to Oakdale Canal for Agriculture	OID	Use data from OID-provided spreadsheet "OID Hist Use - DW & Surface H2O_1990 to 2016.xls", adjusted for 98% of service territory in SCHM. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
98	6	Stanislaus River riparian for Agriculture	Non-district parcels near Stanislaus River	Use C2VSim diversions unchanged.	Use historical C2VSim Diversion 98 data in the order specified in Table 3.
100	7	Tuolumne River to Modesto Canal	Primary diversion to Modesto Reservoir for Modesto Irrigation District and City of Modesto	Use C2VSim diversions multiplied by 0.93 to match reported farm gate deliveries for Diversion 101 and reasonable losses.	Use historical C2VSim Diversion 100 data in the order specified in Table 3, multiplied by 0.93.
101	8	Modesto Canal for Agriculture	Modesto Irrigation District	Calculate based on difference between adjused Diversion 100 after lossses minus Diversion 102 ([Diversion 100 x 0.93] - Diversion 102). Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset during which surface water deliveries were made (1995, 1996, 2004, 2005, and 2007, respectively).
102	9	Modesto Canal for M&I	City of Modesto	Use 2000-2015 "MID" data from City-provided spreadsheet titled "Modesto Monthly system flow totals 2000-2017.xls" and multiply by 1.06. For 1995 to 1999, use 35,616. For 1994, use 15,710. Assume constant puming rate throughout each year.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset during which surface water deliveries were made (1995, 1996, 2004, 2005, and 2007, respectively).
103	10	Tuolumne River right bank riparian diversions for Agriculture	Non-district parcels near Tuolumne River right bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Table 3.
105	11	Tuolumne River left bank riparian diversions for Agriculture	Non-district parcels near Tuolumne River left bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Table 3.
107	12	Tuolumne River to Turlock Canal	Primary diversion to Turlock Lake for TID	Use C2VSim Diversion 107 multiplied by 0.90.	Use adjusted historical C2VSim Diversion 107 data in the order specified in Table 3.
108	13	Turlock Canal for Agriculture	TID	Use unadjusted C2VSim Diversion 107 minus 13%. Distribute in proportional to farm gate delivery data provided by TID.	Use adjusted historical C2VSim Diversion 107 data in the order specified in Table 3.
110	14	Merced River to Merced ID Northside Canal for Agriculture	Merced Irrigation District north of Merced River	Use 2010 to 2015 data from Table 5-15 in the Merced ID AWMP multiplied by the fraction of the Merced ID service territory located north of the Merced River. Apply average monthly OID delivery fractions. For 1990 to 2009, use C2VSim monthly diversions unchanged.	Use historical year data in the order specified in Table 3. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).

C2VSim Diversion ID	SCHM Diversion ID	C2VSim Diversion Name	Water District(s)/Area Receiving Water Deliveries	Approach for Calculating Diversions for Historical Model Period (WY1990 - WY2015)	Approach for Calculating Diversions for Forecast Model Period (WY2016 - WY2042)
112	15	Merced River right bank riparian diversions for Agriculture	Non-district parcels near Merced River right bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Table 3.
114	16	Merced River left bank riparian diversions for Agriculture	Non-district parcels near Merced River left bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Table 3.
116	17	Merced River to Merced ID Main Canal for Agriculture	Merced Irrigation District south of Merced River	Use 2010 to 2015 data from Table 5-15 in the Merced ID AWMP multiplied by the fraction of the Merced ID service territory located south of the Merced River, plus Stevinson Water District deliveries. Apply average monthly OID delivery fractions. For 1990 to 2009, use C2VSim monthly diversions unchanged. Apply Stevinson Water District diversion to model subregion that corresponds with their territory.	Use historical year data in the order specified in Figure 6-1. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
128	18	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 10 for Agriculture	Non-district parcels near San Joaquin River left bank	Assume same as right bank diversions, which are C2VSim Diversion 129 + Diversion 130.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
128	18	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 10 for Agriculture	PID	Use 2001 to 2010 data from the "Local Water" column in Table 8 of the PID AWMP. For 1990 to 2000 and 2011 to 2013, use the 2001-2010 average. For 2014 and 2015, use half the average. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
128	18	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 10 for Agriculture	El Solyo Water District	For 2008-2015, use EWRIMS data. For 1990 to 2007, use average of 2008 to 2013 EWRIMS data. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
128	18	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 10 for Agriculture	West San Joaquin Irrigation District	For 2012 to 2015, use diversion data from WSID tab of comparison spreadsheet (J31:J34). For 1990 to 2011, refer "WSID Reports 2015.xls" in the data library. In the Water Delivery tab: From Total Diverted, subtract CVP. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
129	19	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 11 for Agriculture	Non-district parcels near San Joaquin River in Turlock Subbasin, right bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Figure 6-1. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
130	20	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 12 for Agriculture	Non-district parcels near San Joaquin River in Modesto and Eastern San Joaquin Subbasins, right bank	Use C2VSim monthly diversions unchanged.	Use historical C2VSim data in the order specified in Figure 6-1. For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
171	21	Delta Mendota Canal to Subregion 9 for Agriculture	Del Puerto Irrigation District in San Joaquin County	Use 1999 to 2015 diversions reported in 2016 MSR and and multiply by 0.07 (model area in C2VSim SR 9). For 1990 to 1998, use average of 1999-2015. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
172	22	Delta Mendota Canal to Subregion 10 for Agriculture	Del Puerto Irrigation District in Stanislaus County	Use 1999 to 2015 diversions reported in 2016 MSR and and multiply by 0.63 (model area in C2VSim SR 10). For 1990 to 1998, use average of 1999-2015. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
172	22	Delta Mendota Canal to Subregion 10 for Agriculture	WSJID	Use 2001 to 2010 Federal Agriculture Water from Table 8 of WSJID AWMP. For 2011 to 2013 and 2015, use 3,000 AF. For 2015, use 0. For 1990 to 2000, use 6,000. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).
177	23	Mendota Pool to Subregion 10 for Agriculture	CCID	For 2010 to 2015, use CCID reported CVP allocation multiplied by the fraction of the district area in the SCHM. For 1990 to 2009, use the value for 2010. Apply monthly delivery fractions reported in the 2008 DPWD AWMP.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).

C2VSim Diversion ID	SCHM Diversion ID	C2VSim Diversion Name	Water District(s)/Area Receiving Water Deliveries	Approach for Calculating Diversions for Historical Model Period (WY1990 - WY2015)	Approach for Calculating Diversions for Forecast Model Period (WY2016 - WY2042)
N/A	24	Not in C2VSim - Rock Creek Water District	Rock Creek Water District	Use diversion data from EWRIMS. Calculate monthly delivery fraction using reported average monthly deliveries reported for OID.	Use historical year data in the order specified in Figure 6-1 For historical years 1983-1987, use years of the same hydrologic year type from the historical model dataset (1995, 1996, 2004, 2005 and 2007, respectively).

Notes:
AF = acre foot
AWMP = Agricultural Water Management Plan
C2VSim = California Central Valley Groundwater-Surface Water Simulation Model
CVP = Central Valley Project
DPWD = Del Puerto Water District
EWRIMS = Electronic Water Right Information Management System
ID = identification
M & I = Municipal and Industrial
MID = Modesto Irrigation District
MSR = Municipal Service Review
N/A = not applicable
OID = Oakdale Irrigation District
PID = Patterson Irrigation District
SCHM = Stanislaus County Hydrologic Model
SEWD = Stockton East Water District
SSJID = South San Joaquin Irrigation District
SWP = State Water Project
TAF = thousand acre foot
TID = Turlock Irrigation District
WSJID = West San Joaquin Irrigation District
WY = water year



Note: Water budget data for year 2000, based on United States Census information.

JACOBSON | JAMES & associates, inc	*Stanislaus County Hydrologic Model: Development and Forecasts* *Stanislaus County, California*				*FIGURE 3-1* ***Water Budget Subregions within SCHM***
	PROJECT NO. *STANCO.002*	DATE *11/10/17*	DRAWN BY *JH*	APPR. BY *MT*	

Jurisdiction	Groundwater Subbasin	Water Source	Description	Approach to Initial Model Inputs and Calibration						
				Irrigated Acreage and Crop Types	Surface Water Diversions	Diversion Losses	Groundwater Pumping	Well Data	Soil Conditions	Other Considerations
Central California Irrigation District	Delta-Mendota	CCID delivers CVP water (as a San Joaquin River Exchange Contractor) and groundwater, which is augmented by private groundwater pumping.	CCID serves approximately 560 customers in a service territory of 143,400 acres, of which 20,000 acres are in western Stanislaus County, via a system of ditches and canals. CVP allocations average 510,000 AFY, but can be significantly less during drought years.	DWR crop survey data (developed for C2VSim updates and provided by DWR in 2017) applied to water budget subregions in SCHM.	Use reported allocation data in CCID spreadsheet for 2010 to 2015; Use 2010 value for earlier years. Multiply by 22% for fraction of district within the model.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate	Use elemental pumping to simulate private and district pumping (district well data available but not be entered as private well data are not available).	C2VSim	
Del Puerto Water District	Delta-Mendota	DPWD delivers CVP water, which is augmented by private groundwater pumping.	DPWD is contracted to deliver up to 140,210 AFY to 147 retail customers with 44,000 irrigable acres in a 53,000 acre service area, mostly in Stanislaus County, via a system of ditches and canals.	Use DWR 2017 crop survey data; compare to 2008 irrigated acreage reported in 2011 AWMP.	Use 1999 to 2015 diversions reported in 2016 MSR and and multiply by the fraction of district within each subregion. For 1990 to 1998, use average of 1999-2015 data.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate; Compare to 2008 private pumping reported in 2011 AWMP and adjust irrigated acreage as needed.	None reported, use elemental pumping	C2VSim	Incidental M&I deliveries of 3 AF/month; Slow rate of conversion to M&I use lands, especially in Patterson.
Eastin Water District	Delta-Mendota	Groundwater	At this time, water within the 3,520-acre district is provided entirely by private groundwater pumping.	DWR 2017 crop survey data	None	NA	Allow model to calculate; compare to KDSA 2000	Unknown, use elemental pumping	C2VSim	No population growth expected per 2016 MSR.
Eastside Water District	Turlock	Groundwater	At this time, water within the approximately 54,000-acre district is provided primarily by private groundwater pumping, with minor deliveries of TID surface water in years when surplus water is avaialble	DWR 2017 crop survey data; adjusted using rangeland conversion rate in east Stanislaus County reported by County Agricultural Commissioner in 2000 to 2015.	None	NA	Allow model to calculate, check against Durbin 2003 and Todd 2016 Water Budget and adjust irrigated acreage as needed.	Unknown, use elemental pumping	C2VSim	
El Solyo Water District	Delta-Mendota	San Joaquin River water, augmented by private groundwater.	ESWD delivers water to agricultural customers in a 4,060-acre service area through a system of canals and ditches.	DWR crop survey data	For 2008-2015, use EWRIMS data. For 1990 to 2007, use average of 2008 to 2013 EWRIMS data.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate	Unknown, use elemental pumping	C2VSim	No population growth expected per 2016 MSR.

Jurisdiction	Groundwater Subbasin	Water Source	Description	Approach to Initial Model Inputs and Calibration						
				Irrigated Acreage and Crop Types	Surface Water Diversions	Diversion Losses	Groundwater Pumping	Well Data	Soil Conditions	Other Considerations
Modesto Irrigation District	Modesto	Modesto ID delivers Tuolumne River water and groundwater, which is augmented to some extent by private groundwater pumping.	Modesto ID serves approximately 3,100 retail agricultural irrigation customers on 60,000 acres of irrigable land in a service territory of approximately 101,700 acres via a system of ditches and canals. In addition, the district delivers wholesale domestic water to the City of Modesto.	DWR crop survey data; Compare to irrigated acreage and crop water demand in 2015 AWMP.	Calculate based on C2VSim Diversion 100 minus deliveries to City of Modesto; Compare to 2000-2015 data in summary provided by Modesto ID and 2010-2014 data in 2015 AWMP. Adjust deliveries to subregions based on data in USGS, 2004.	Estimated seepage and evaporation losses based on difference between reported diversions and farm gate deliveries, adjusted by 20% to account for possible reporting bias.	Allow model to calculate; compare to data in 2015 AWMP and adjust irrigated acreage as needed.	District well data available, but private well data unknown, use elemental pumping.	C2VSim	Modesto ID delivers municipal supply to Modesto; See Modesto UWMP for estimated demand growth over time.
Oak Flat Water District	Delta-Mendota	OFWD delivers SWP water, which is augmented by private groundwater pumping.	OFWD is contracted to deliver up to 5,700 AFY to 2,158 irrigable acres in a 4,537 acre service area via a system of ditches and canals.	DWR crop survey data.	Use reported 2006 - 2015 diversions reported in 2016 MSR. Calculate 1990-2005 diversions by multiplying the maximum allocation by reported SWP delivery fractions.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate	Unknown, use elemental pumping	C2VSim	No population growth expected per 2016 MSR.
Oakdale Irrigation District	Modesto Eastern San Joaquin	OID delivers Stanislaus River water, drainage water and groundwater, which is augmented to some extent by private groundwater pumping.	OID serves approximately 2,900 retail agricultural irrigation customers and nine domestic water systems in a service territory of approximately 73,660 acres via a system of ditches and canals.	DWR crop survey data; Compare to tabulated data for 2009-2015 in district crop reports	Use data reported in OID-provided spreadsheet.	Estimated seepage and evaporation losses based on reported delivery fractions calculated from OID data.	Allow model to calculate. Compare to data in 2015 AWMP and 2000 to 2015 spreadsheet data and adjust irrigated areage as needed.	District well data available, but private well data unknown, use elemental pumping.	C2VSim	
Patterson Irrigation District	Delta-Mendota	PID delivers CVP, reclaimed drainage, groundwater and San Joaquin River Water, which is augmented by private groundwater pumping.	PID serves approximately 725 retail customsers in a 13,150 acre service area via a system of ditches and canals.	DWR crop survey data; Compare to irrigated acres and crop water demand reported in 2016 AWMP	Use 2001 to 2010 data from AWMP; For 1990 to 2000 and 2011 to 2013, use the 2001-2010 average; For 2014 and 2015, use half the average.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate. Compare to groundwater pumping reported in 2016 AWMP and adjust irrigated areage as needed.	None reported, use elemental pumping	C2VSim	Growth of the City of Patterson is expected to result in decreased acreage served

Jurisdiction	Groundwater Subbasin	Water Source	Description	Approach to Initial Model Inputs and Calibration						
				Irrigated Acreage and Crop Types	Surface Water Diversions	Diversion Losses	Groundwater Pumping	Well Data	Soil Conditions	Other Considerations
Rock Creek Water District	Eastern San Joaquin	RCWD delivers surface water from the Salt Spring Reservoir in Calaveras County, which is augmented by private groundwater pumping.	RCWD serves four retail customers in a service territory of 1,844 acres via a canal from Salt Springs Reservoir.	DWR crop survey data	Use EWRIMS data	Estimated seepage and evaporation losses based on reported delivery fractions in WSID and OID AWMPs.	Allow model to calculate.	None reported, use elemental pumping	C2VSim	No population growth expected
Turlock Irrigation District	Turlock	TID delivers Tuolumne River water and groundwater, which is augmented to some extent by private groundwater pumping.	TID serves approximately 5,800 retail agricultural irrigation customers on 150,000 acres of irrigable land in a service territory of approximately 196,500 acres via system of ditches and canals. In addition, the district delivers domestic water to the community of La Grange.	DWR crop survey data, compare to crop data provided by district.	Use Calsim Diversion 107 data after accounting for losses; Distribute in accordance with reported subregional farm gate deliveries reported by district.	Use C2VSim data for primary diversion, adjust using professional judment during calibration process; Calculate diversion losses for ag deliveries based on TID provided data.	Allow model to calculate, compare to spreadsheet data provided by district and adjust irrigated acreage and crop water demand as appropriate.	None reported, use elemental pumping	C2VSim, compare to IDC data files provided by district.	
West Stanislaus Irrigation District	Delta-Mendota	WSID delivers water from the San Joaquin River, CVP and groundwater, which is augmented by private groundwater pumping.	WSID serves 83 retail customers in a 21,774 acre service territory via a system of ditches and canals. WSID also sells water to the 2,203 acres in the White Lake area, north of Grayson.	DWR crop survey data, compare to district crop data for 2015 and irrigated acreage for 2000-2015.	CalSim, allocated proportionally. Compare to spreadsheet data for 2000 - 2015 and water budgets from 2009 and 2014 AWMPs.	Estimated seepage and evaporation losses based on reported delivery fractions in WSID AWMP.	Allow model to calculate, compare to spreadsheet data provided by district for 2015, and to 2009 and 2014 AWMPs.	Some district well data available, but private well data unknown, use elemental pumping.	C2VSim	Growth in Grayson, Westley and Patterson will decrease irrigated acreage.
Ballico-Cortez Water District	Turlock	Groundwater	At this time, water within the approximately 6,700-acre district is provided primarily by private groundwater pumping, with minor deliveries of TID surface water in years when surplus water is avaialble.	DWR 2017 crop survey data; adjusted using rangeland conversion rate in east Stanislaus County reported by County Agricultural Commissioner in 2000 to 2015.	None	NA	Allow model to calculate, check against Durbin 2003 and Todd 2016 Water Budget and adjust irrigated acreage as appropriate.	Unknown, use elemental pumping	C2VSim	

Jurisdiction	Groundwater Subbasin	Water Source	Description	Approach to Initial Model Inputs and Calibration						
				Irrigated Acreage and Crop Types	Surface Water Diversions	Diversion Losses	Groundwater Pumping	Well Data	Soil Conditions	Other Considerations
Merced Irrigation District	Turlock	Merced ID delivers Merced River water and groundwater, which is augmented by private groundwater pumping.	Merced ID delivers up to 310,000 AFY to 2,200 retail customers with 110,000 irrigable acres in a 164,000 acre service area, via a system of ditches and canals. Approximately 10,000 acres of Merced ID's service territory overlies the Turlock Subbasin in Merced County.	DWR crop survey data, compare to 2016 AWMP	Use 2010 to 2015 data from 2016 AWMP for Northside Canal and Main Canal, and multiply by the fraction of Merced ID service area for each canal within SCHM. For 1990 to 2009, use C2VSim diversions. Allocate Stevinson Water District deliveries to the corresponding subregions.	Calculate seepage and evaporation losses based on data in the 2016 AWMP and adjust using professional judgment during the calibration process.	Allow model to calculate, compare to Durbin 2003 Water Budget and 2016 AWMP and adjust irrigated acreage and crop demand as appropriate	Unknown, use elemental pumping	C2VSim	

Notes:
AF = acre foot
AFY = acre foot per year
AWMP = Agricultural Water Management Plan
C2VSim = California Central Valley Groundwater Surface Water Simulation Model
CalSim = formal name for Water Resource Integrated Modeling System (WRIMS model engine or WRIMS)
CCID = Central California Irrigation District
CVP = Central Valley Project
DPWD = Del Puerto Water District
DWR = California Department of Water Resources
ESWD = El Solyo Water District
EWRIMS = Electronic Water Rights Information System
IDC = Irrigation Demand Calculator
ID = Irrigation District
KDSA = Kenneth D. Schmidt and Associates
M&I = Municipal and Industrial
MSR = Municipal Service Review
NA = not available
OFWD = Oak Flat Water District
OID = Oakdale Water District
RCWD = Rock Creek Water District
SCHM = Stanislaus County Hydrologic Model
SWP = State Water Project
TID = Turlock Irrigation District
USGS = United States Geological Survey
UWMP = Urban Water Management Plan
WSID = West Stanislaus Irrigation District
% = percent

References:
Timothy J. Durbin, Inc., 2003. *Turlock Groundwater Basin Water Budget 1952 - 2002.* Prepared for Turlock Groundwater Basin Association. December.
KDSA, 2000. *Groundwater Conditions in and near the Eastin Water District.* Prepared for Central California Irrigation District and Eastin Water District. February.
Todd Groundwater, 2016. *Final Report Hydrogeological Characterization of the Eastern Turlock Subbasin.* March.
USGS, 2004. *Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California.* Scientific Investigations Report 2004-5232.

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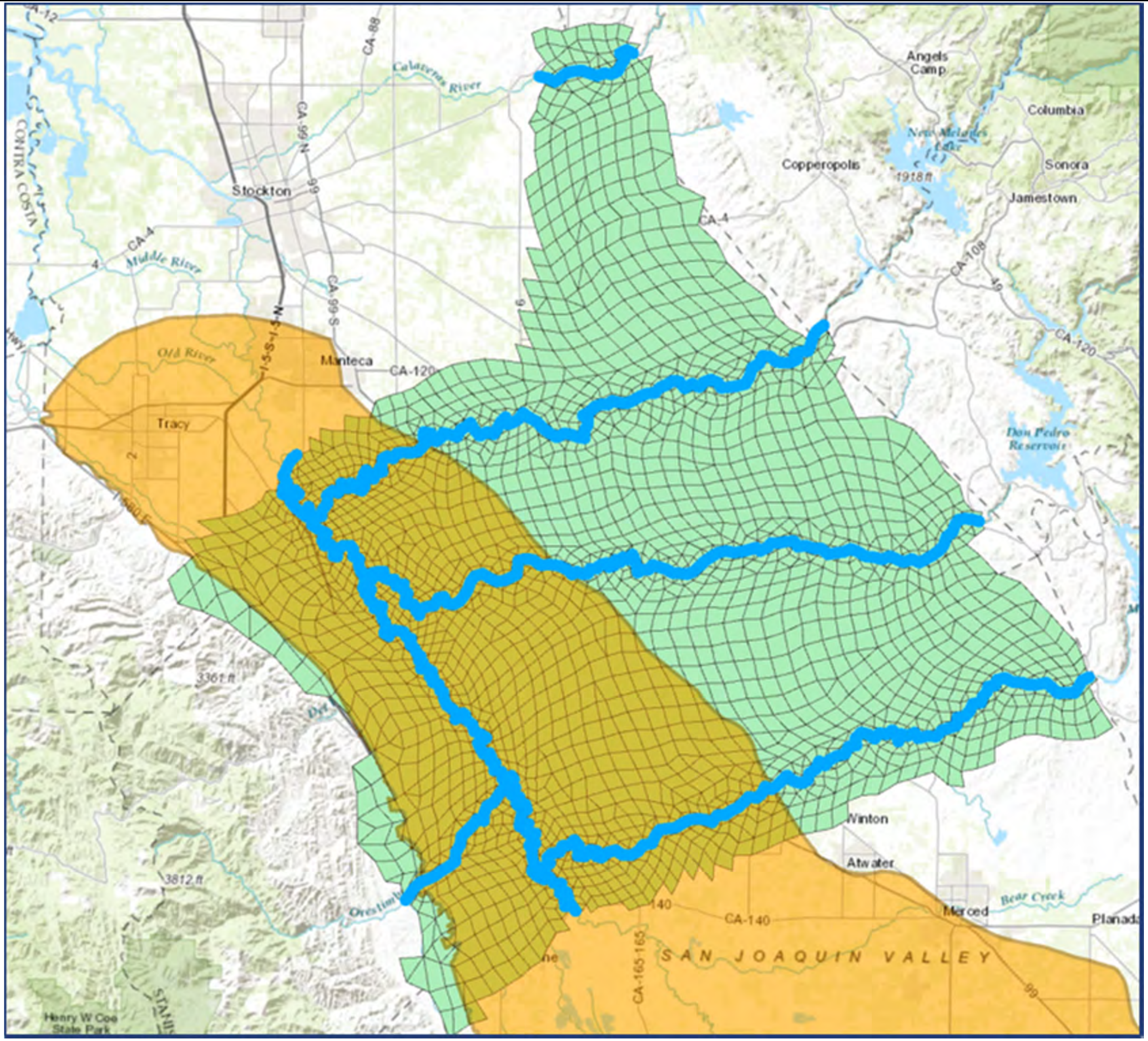
TABLE 3-4
SUMMARY OF SCHM DIVERSION LOSS FRACTIONS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

C2VSim Diversion ID	SCHM Diversion ID	Description	Recoverable Loss Fraction[a]	Non-Recoverable Loss Fraction[b]	Comments
85	1	Calaveras River	0.15	0.32	Calculated from SEWD data
93	2	Sacramento-San Joaquin Delta to SWP	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
94	3	Stanislaus River to South San Joaquin Canal for Ag	0.12	0.06	Calculated from SSJID data
95	4	Stanislaus River to South San Joaquin Canal for M&I	0.9	0.1	Professional judgment based on SSJID delivery to recharge basins in Ripon
96	5	Stanislaus River to Oakdale Canal for Agriculture	0.1	0.01	Calculated from OID data
98	6	Stanislaus River riparian for Agriculture	0.15	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
100	7	Tuolumne River to Modesto Canal	0.02	0.01	Adjusted from C2Vsim values during calibration to reflect more reasonable loss factors based on available data
101	8	Modesto Canal for Agriculture	0.15	0.15	Calculated from Modesto Irrigation District data
102	9	Modesto Canal for M&I	0.05	0.01	From C2VSim
103	10	Tuolumne River right bank riparian diversions for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
105	11	Tuolumne River left bank riparian diversions for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
107	12	Tuolumne River to Turlock Canal	0.02	0.01	Adjusted from C2Vsim values during calibration to reflect more reasonable loss factors based on available data
108	13	Turlock Canal for Agriculture	0.08	0.05	Calculated from TID data
110	14	Merced River to Merced Irrigation District Northside Canal for Agriculture	0.1	0.22	Calculated from Merced Irrigation District data and adjusted during calibration based on professional experience regarding farm gate delivery reporting
112	15	Merced River right bank riparian diversions for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
114	16	Merced River left bank riparian diversions for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
116	17	Merced River to Merced Irrigation District Main Canal for Agriculture	0.1	0.22	Calculated from Merced Irrigation District data and adjusted during calibration based on professional experience regarding farm gate delivery reporting
128	18	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 10 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
129	19	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 11 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
130	20	San Joaquin River riparian diversions, Fremont Ford to Vernalis, to Subregion 12 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim

TABLE 3-4
SUMMARY OF SCHM DIVERSION LOSS FRACTIONS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

C2VSim Diversion ID	SCHM Diversion ID	Description	Recoverable Loss Fraction[a]	Non-Recoverable Loss Fraction[b]	Comments
171	21	Delta Mendota Canal to Subregion 9 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
172	21	Delta Mendota Canal to Subregion 10 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
177	21	Mendota Pool to Subregion 10 for Agriculture	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim
N/A	22	Rock Creek Water District	0.1	0.03	Assumed default based on reported typical loss fractions reported in WSID and OID AWMPs and C2VSim

Notes:
[a] Recoverable losses include deep percolation and recharge.
[b] Non-Recoverable losses include evaporation and spills exiting the model.
AWMP = Agricultural Water Management Plan
C2VSim = California Central Valley Groundwater-Surface Water Simulation Model
ID = identification
M&I = Municipal and Industrial
OID = Oakdale Irrigation District
SCHM = Stanislaus County Hydrologic Model
SEWD = Stockton East Water District
SSJID = South San Joaquin Irrigation District
SWP = State Water Project
TID = Turlock Irrigation District
WSID = West San Joaquin Irrigation District



Stanislaus County Hydrologic Model Finite Element Mesh
River Nodes
Corcoran Clay

Note:
Corcoran Clay source: USGS, 2012. *Extent of Corcoran Clay modified from Page (1986) for the Central Valley Hydrologic Model (CVHM):*
https://water.usgs.gov/GIS/metadata/usgswrd/XML/pp1766_corcoran_clay_extent.

Map Source: Esri, HERE, DeLorme, Tom Tom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, OpenStreetMap contributors, and the GIS User Community

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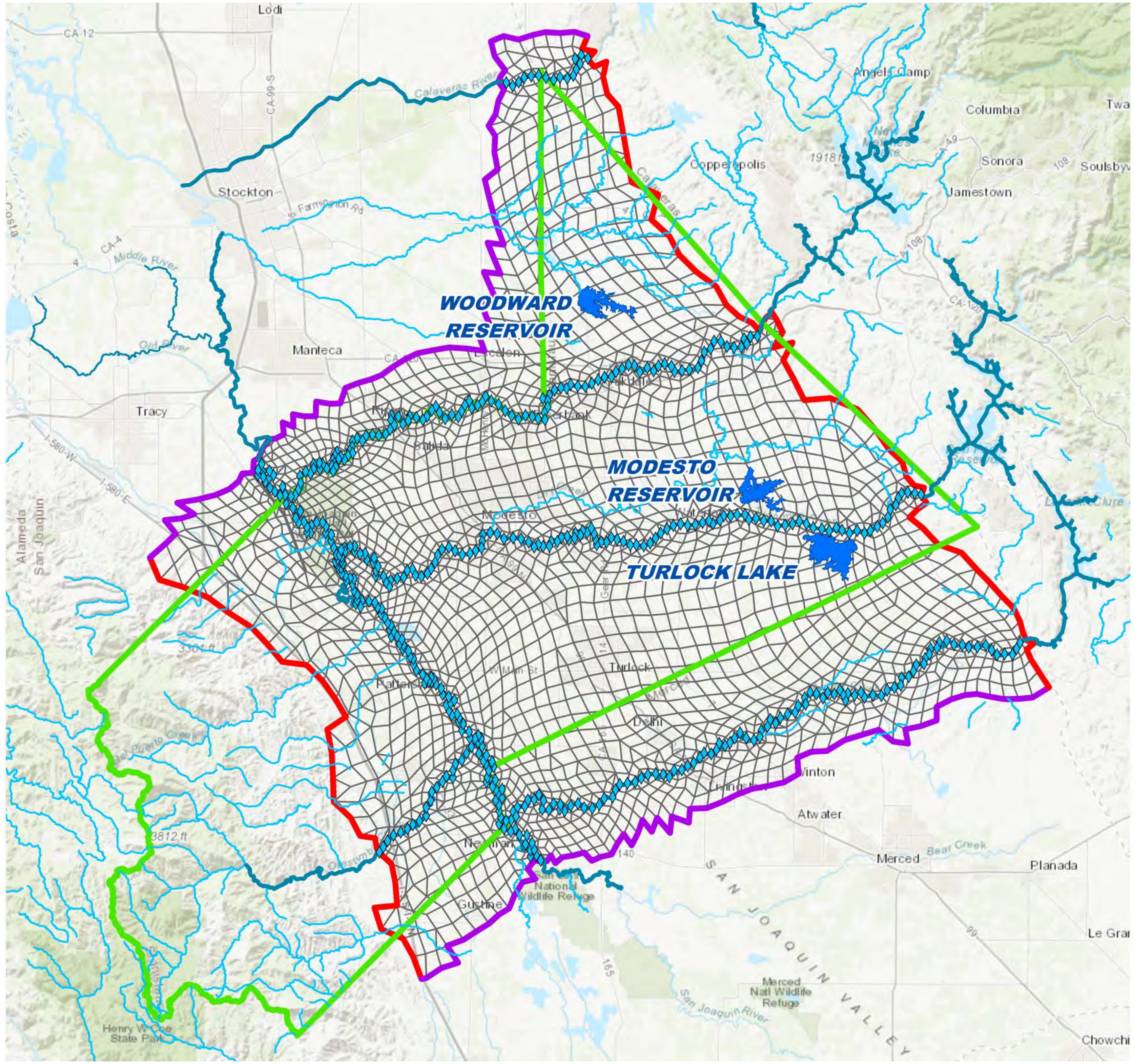
Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.002	11/16/17	JH	MT

FIGURE 3-2

Corcoran Clay Extent in SCHM



- Stanislaus County Hydrologic Model Finite Element Mesh
- River Nodes
- General Head Boundary
- No Flow Boundary
- Stanislaus County Boundary

Map Source: Esri, HERE, DeLorme, Tom Tom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, OpenStreetMap contributors, and the GIS User Community

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Stanislaus County, California

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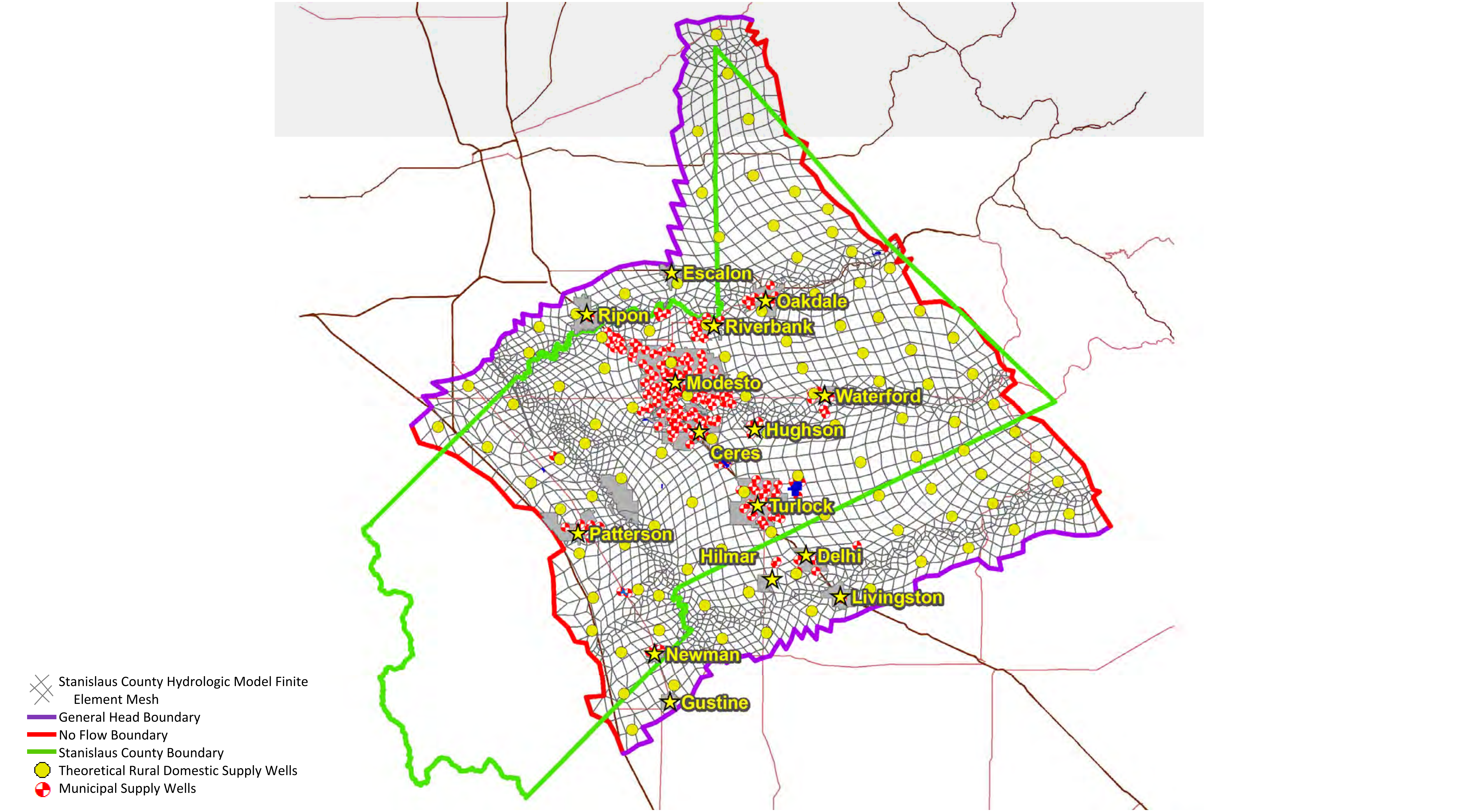
FIGURE 3-3

Surface Water Hydrologic Features within SCHM



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Stanislaus County, California

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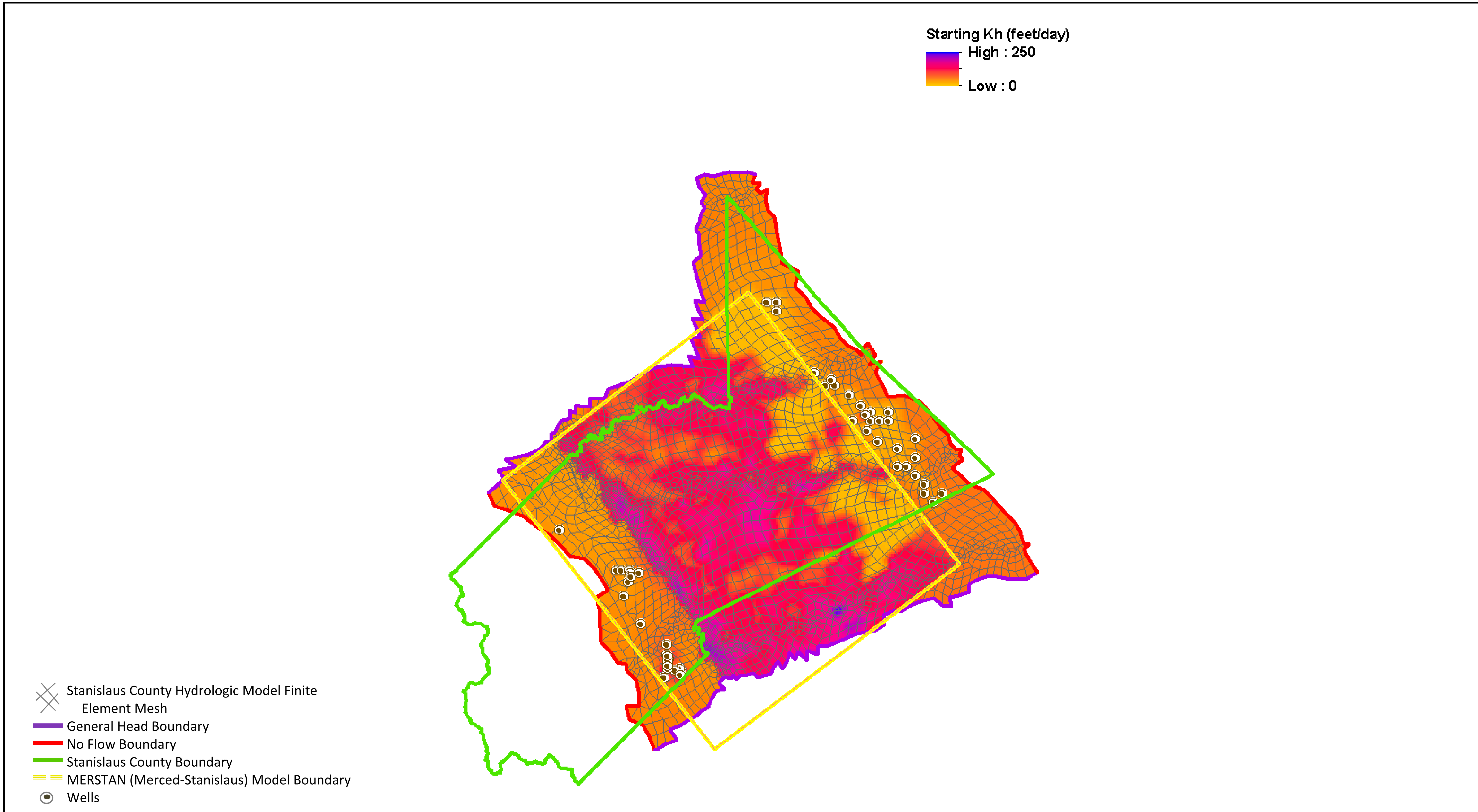
FIGURE 3-4

Location of Municipal Supply Wells and Theoretical Rural Domestic Supply Wells within SCHM



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Stanislaus County, California

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FIGURE 3-5

Development of Starting Hydraulic Conductivity for SCHM Layer 1

4.0 CALIBRATION

4.1 Approach

Calibration of model parameters and inputs is an important and necessary step to improve a model's reliability to predict future conditions. The amount of effort that is appropriate for calibrating a groundwater flow model depends on its intended use (USGS, 2004a). In addition, because the response of a groundwater flow model to introduced stresses is a result of the interaction between a complex series of model inputs and parameters, a variety of adjustments may result in improved model calibration, but not all of them are necessarily realistic. Thus, it is possible to improve a model's calibration response without necessarily making it better reflect the actual conditions it is intended to simulate. For these reasons, the calibration effort focused on making manual adjustments to the model inputs and architecture, and it was decided to forego automated calibration using the Parameter Estimation (PEST) software package, which will not necessarily result in a unique solution. The following approach was taken to calibrate the SCHM:

- Because the current application of the SCHM is to evaluate the broad programmatic effects of groundwater well permitting using a superposition approach, the level of calibration judged to be appropriate is more limited than for a model used to evaluate the more localized effects of specific projects, or to develop sub-basin scale criteria for sustainable groundwater management as part of a GSP. Should more detailed application be required in the future, additional data refinement and calibration could be performed in specific areas of interest.
- Extensive local data have been compiled for construction of the SCHM; however, as discussed in Section 1.2, substantial uncertainties remain and much additional data are likely available to inform and refine future modeling efforts. For this reason, calibration efforts were focused on making changes that were consistent with our understanding of the model hydrogeology and water budget, and on documenting the remaining opportunities for additional refinement and calibration in the future. Calibration activities therefore focused on the following tasks:
    - Adjustments to the model water budget were made when comparison between the model water budget and data provided by local districts or available in water management plans indicated a discrepancy that needed correction.
    - Adjustments to model boundary conditions were implemented where significant discrepancies were observed between boundary heads extracted from C2VSim and near-boundary calibration wells.
    - Adjustments to aquifer parameters (lateral and vertical hydraulic conductivity) were made in an iterative fashion in areas where a bias in calibration results was observed, and where those adjustments were consistent with specific conceptual model refinements, i.e., where there was a specific hydrogeologic rationale for making the changes.

  - Adjustments to streambed conductance and recharge distribution from small watersheds were made where surface water flow and groundwater level data indicated a discrepancy that could be related to surface/groundwater interaction.

4.2 Calibration Datasets

The following dataset of calibration wells and gaging stations was assembled to support the calibration process. Locations of these calibration points are shown on Figure 4-1.

- Sixty-three (63) calibration wells designed in C2VSim within the SCHM model domain were adopted as calibration wells for the model. Groundwater elevation data for these wells after WY 2009 (the current cutoff date in C2VSim) were obtained from the CASGEM database to complete the calibration dataset for these wells.
- One hundred one (101) additional calibration wells were selected from the CASGEM database for use in portions of the SCHM domain that were under-represented in the C2VSim calibration dataset.
- Seven gaging stations were selected from the USGS National Water Information System (NWIS) to represent inflows and outflows from the model along the major streams.

Each calibration well was evaluated for data quality and assigned to a particular model layer or layers. In a limited number of cases, data labeled as questionable by CASGEM were removed when individual data points appeared to be anomalous, but in most cases, all of the water level data were retained. At each well, predicted water levels in Model Layers 1 and 2 were compared to measured water levels, and the results were evaluated in relation to well depth and screen interval (when reported) and to data from nearby wells. In a number of cases, it was found that wells that penetrated to a completion depth within the deeper aquifer system (Layer 2) nevertheless displayed water levels that were more representative of the shallow aquifer system (Layer 1). This was especially the case in areas where groundwater levels in the upper aquifer system are significantly higher than in the deeper aquifer system, suggesting that the well screens or gravel packs are cross connecting the two aquifer systems and the hydraulic signal from the upper aquifer is dominating groundwater levels in the well. In such cases, the wells were assigned to Layer 1. Thirteen calibration (13) calibration wells were considered representative of groundwater levels in both Layers 1 and 2, and are designated and compared as separate wells in the calibration well data set.

4.3 Model Adjustments

4.3.1 Water Budget Adjustments

Because the water budget data compiled for development of the SCHM were considered the most reliable data for characterization of local conditions, the first step of model calibration consisted of comparing model water budget data to the compiled dataset, making adjustments where appropriate, and evaluating the effect of these changes on the groundwater level and surface water flow calibration results. Information regarding municipal surface water deliveries and groundwater pumping was considered reliable as entered into the model using the procedure summarized in Table 3-1, so efforts were focused primarily on refinement and calibration of the agricultural water budget using the procedure summarized in Table 3-3. These initial calibration steps were conducted as described below, and resulted in a substantial improvement in model conformance with historical calibration well groundwater levels and trends.

4.3.1.1 Water Diversions and Deliveries

Surface water deliveries ascribed in the SCHM to each of the 17 water and irrigation and districts shown on Figure 2-1 were compared to data obtained from the districts or compiled from AWMPs, MSRs and other plans and reports as outlined in Table 3-3. This process was conducted iteratively, and effects on model calibration were evaluated at each step. Where discrepancies were noted, the diversions were adjusted, redistributed between the assigned water budget subareas, and/or the loss factors for the diversions were adjusted such that farm gate deliveries more closely approximated reported values. Consistent with the approach taken by the USGS to recent updates of the MERSTAN model, loss factors for some districts were adjusted downward when warranted by calibration data in order to compensate for the potential underestimation of deliveries.[8] For Modesto Irrigation District, water deliveries were allocated throughout the district's service areas in proportion to the delivery fractions reported in the USGS documentation for the MERSTAN model (USGS, 2004b). For TID, water deliveries were allocated throughout the district's service areas based on data provided by the district. The TID dataset was considered the most extensive and reliable provided, and after this initial calibration step, surface water deliveries in the SCHM were approximately 98% of reported farm gate deliveries. The final diversion and diversion loss values adopted in the SCHM are summarized in Tables 3-2 and 3-4, respectively.

4.3.1.2 Land Use-Based Water Budget Data

The second step in the calibration process consisted of comparing the groundwater pumping calculated by the model in each water and irrigation district to reported pumping data obtained from the districts or compiled from AWMPs, MSRs and other plans and reports as outlined in Table 3-3. This process was conducted iteratively, and effects on model calibration were evaluated at each step. Where discrepancies were noted, the irrigated acreage and in some cases crop types were adjusted to align the pumping more closely with the reported values. The most extensive changes during this step were made in the eastern, foothill portion of the model, and changes were made in consideration of aerial imagery that confirmed changes in cropping patterns, and a geospatial analysis cropping trends in eastern, non-district lands provided by the Stanislaus County Agricultural Commissioner (Appendix A).

4.3.1.3 Initial and Boundary Heads

After implementation of refinements to the diversions and cropping were made, the assigned heads for the time-dependent head boundaries were adjusted to match nearby historical data as needed so as to minimize potential boundary effects. This was accomplished by examining data for calibration wells located near the

[8] Per personal communication from Stephen Phillips, USGS, in November 2017 with Walter Ward.

SCHM northern and southern general head boundaries, and interpolating boundary node head elevations based on nearby spatial and temporal water level data. The resulting adjusted boundary heads were loaded into the model files.

4.3.2 Reservoirs and Small Watersheds

After the initial calibration steps, it was found that predicted groundwater levels near and downgradient of Turlock Lake were consistently higher than calibration well groundwater levels. Since the calculated leakage from Turlock Lake was significantly higher than leakage rates reported and calculated for Woodward and Modesto Reservoirs, it was decided to decrease the recoverable losses from Turlock Lake from 100% to 33%. This change improved the calibration for wells in this region.

Recharge from small watersheds was adjusted in areas where, based on calibration results, the known hydrology and hydrogeology of the area, and professional judgment, recharge had either been over or underestimated. This primarily consisted of increasing recharge in proximal alluvial fan areas along the Diablo range near the western no-flow boundary of the model, and in the northern triangle area of the County, where local investigations have indicated that recharge from small streams is more prominent than was reflected in the existing version of C2VSim (JJ&A, 2016a and 2017a). In addition, recharge from small streams along the southeastern no-flow boundary of the model appeared to be overestimated when compared to similar areas further north. In order to adjust recharge form small watersheds, recharge nodes within the model domain were added or moved as deemed appropriate based on local scale geology, and the maximum recharge assigned to the nodes was altered (increased or decreased, as appropriate). This process was conducted iteratively, and effects on model calibration were evaluated at each step.

4.3.3 Streambed Conductance

Next, stream discharge predicted by the model at river nodes corresponding to the calibration gaging stations was compared to actual gaging station data. Adjustments were made to the hydraulic conductivity term of the streambed conductance in groundwater-connected reaches upstream of gaging stations where a bias was observed between actual and predicted data. This process was conducted iteratively, and the effects on model calibration were evaluated at each step.

4.3.4 Aquifer Hydraulic Conductivity

As a final calibration step, targeted manual changes were made to the model hydraulic conductivity of Layers 1 and/or 2. These changes were implemented in areas where a bias was noted in the model to either under- or over-predict groundwater levels, and a rational hydrogeologic explanation could be made to justify the adjustment that did not contradict the findings of prior studies. Within the portion of the SCHM where hydraulic conductivities were extracted from the MERSTAN model (which were based on extensive and detailed geostatistical evaluation of aquifer textural data), care was taken to target changes to follow areas where the prior analysis could have produced a bias (such as through end-point scaling of permeability) and not to randomly make changes simply based on calibration results. Changes were broadly applied to aquifer vertical hydraulic conductivity, which was more poorly constrained by data. Outside the area of the MERSTAN model, changes to the initial model hydraulic conductivity were more liberally applied based on calibration data, with care being taken that they follow the local hydrogeologic conceptual understanding and match conditions in the adjacent MERSTAN area. This process was conducted iteratively, and effects on model calibration were evaluated at each step. It was clearly evident that the effect of hydraulic conductivity on model performance was both locally and regionally complex, and that multiple adjustments could result in "improved" model calibration, without necessarily being a better representation of actual aquifer conditions. It was therefore decided that less focus would be based on parameter adjustment than on water budget adjustment during the calibration process. For this reason, calibration was continued only until the objectives for use of the model for programmatic impact assessment under the PEIR were met. Automated calibration using PEST was not performed, and iterative parameter calibration was limited pending the collection of additional data by workers involved in GSP development that would help to guide the direction of further calibration.

4.3.5 Aquitard Vertical Hydraulic Conductivity

The vertical permeability of the regional Corcoran Clay aquitard and its local variation are poorly understood in the SCHM area and has a profound effect on local groundwater flow patterns. Permeability can vary locally and can be changed by artificial penetrations such as composite wells, absence of well seals, damaged wells, or cross connections created by unsealed boreholes. Adjustments were made to the Corcoran Clay vertical permeability where calibration data indicated that either more or less vertical flow across this aquitard may be locally occurring than represented by the assumed uniform hydraulic conductivity in the SCHM. This process was conducted iteratively, and effects on model calibration were evaluated at each step. Similar to aquifer hydraulic conductivity, it was evident that the effect of aquitard hydraulic conductivity on model performance was both locally and regionally complex, that multiple combinations of adjustments could result in the same "improvements" in model calibration. Adjustment of this parameter was therefore focused on the objective of using the model as a programmatic impact assessment tool for the PEIR.

4.4 Calibration Results

4.4.1 Groundwater Level Calibration Results

Figures 4-2 and 4-3 show plots of the measured vs. the predicted water levels and the residual vs. the measured water levels in each calibration well, respectively. The plots on Figure 4-2 clearly show a clustering of results near the 1:1 correlation line, indicating that at many times and locations the model results are well aligned with historical results. Overall, more points tend to fall below the lines, indicating a slight overall bias of the model to under-predict heads. The clustering of points in bands reflects a bias to either over or under-predict that is associated with particular areas in the model. The biases in these areas could likely be corrected through additional investigation into local conditions and refinement of the model. At some calibration wells, the model under or overpredicts actual heads by several tens of feet. Calibration statistics for the final calibrated model are summarized in Table 4-1, below.

Table 4-1: Summary of Calibration Statistics

Calibration Statistic	Layer 1 Value	Layer 2 Value
Residual Mean	3.89 feet (ft)	7.37 ft
Residual Standard Deviation	19.59 ft	26.24 ft
Mean Absolute Error	13.26 ft	22.57 ft
Mean Error	3.90 ft	7.37 ft
Minimum Residual	-117.05 ft	-114.73 ft
Maximum Residual	76.26 ft	78.56 ft
Range in Target Heads	236.76 ft	236.76 ft
(Standard Deviation) / (Range)	8.4 %	11.1 %
(Mean Absolute Error) / (Range)	5.6 %	9.5 %
(Mean Error) / Range	1.6 %	3.1 %
Nash-Sutcliffe Coefficient	0.60	0.34

Appropriate calibration goals vary with the type of model and its application (Anderson and Woessner, 2002). A model that requires a high degree of accuracy in predicting actual heads and flow will require a higher degree of calibration; whereas, a lower degree of calibration is often acceptable for model that is used in superposition mode. This is especially true when the degree of resolution of the model is lower, such as when a model is used to assess program level changes caused by different scenarios. In all cases, the limitations of a model must be known in order to properly use the model and interpret its results. Generally accepted goals for Standard Deviation/Range and Absolute Mean Error/Range are approximately 10%, and a generally acceptable goal for Mean Error/Range is 5%. Nash-Sutcliffe values greater than 0.5 are generally considered acceptable, values less than 0.5 may be acceptable depending on the model application, and values greater than 0 indicate that calibrated model input values are better predictors of conditions than regional averages (Anderson and Woessner, 2002). The above statistics indicate that the model calibration may be considered acceptable for the evaluation of program-level impacts using a superposition approach, which is the primary application of this model (Section 1.2). Quantitative water budget results, predicted heads and stream flows derived from this version of the SCHM and presented in this TM should be considered indicative based on the known limitations of the model. Other objectives, such as development of sustainable groundwater management criteria, or evaluating the effects of specific projects, may require a greater degree of model refinement and calibration, and potentially a more refined model grid. Such refinements could be targeted at the model subareas where more rigorous data are needed.

4.4.2 Stream Discharge Calibration Results

A comparison of predicted stream discharge and corresponding measurements at the seven selected calibration gaging stations (Table 4-2) is provided in Figures 4-4 and 4-5. As shown in the figure, the predicted and observed stream flows at the gaging stations are closely correlated, with the following exceptions:

- Discharge on the Tuolumne River at the Modesto gaging station is somewhat overpredicted by the model during low flow periods, indicating that groundwater discharge to the river may also be overpredicted.
- At the gaging station on Orestimba Creek, which is located near its confluence with the San Joaquin River, the model significantly under-predicts flow. This is due to the fact that in this area model heads in Layer 1 are under-predicted relative to measured groundwater levels at nearby calibration wells, and as a result the stream is modeled as being disconnected from the groundwater table. Data from nearby calibration wells suggests that in fact Orestimba Creek is groundwater connected and gaining in its middle and lower reaches. This was accepted as a model limitation that should be addressed during future modeling efforts when additional data are available or evaluations conducted to select the appropriate approach to improving the calibration.

4.5 Calibrated Historical Model Results

4.5.1 Hydraulic Conductivity

The final lateral hydraulic conductivity distribution for Model Layers 1, 2, and 3 is shown in Figure 4-6. The model retains many of the characteristics of the original hydraulic conductivity distribution extracted from the MERSTAN with local adjustments, and more significant refinements to the original C2VSim hydraulic conductivity outside the MERSTAN model domain boundaries and west of the San Joaquin River. In general, areas of higher hydraulic conductivity are concentrated in Layer 1 near the current river corridors.

4.5.2 Groundwater Levels and Flow

Simulated groundwater level elevations for Model Layers 1 and 2 are shown for 2000 and 2015 in Figure 4-7 and Figure 4-8, respectively. Groundwater levels and flow directions are generally consistent with historical maps available from DWR through the Groundwater Information Center Interactive Mapping Application (DWR, 2017b). In general, groundwater flows away from the Sierra Nevada and the Diablo Range toward the San Joaquin River, and then northward along the valley axis. A prominent cone of depression is evident in the eastern Turlock Subbasin. Contours near the major streams in the Study area suggest both gaining and losing reaches where prior studies have generally determined they should be located (USGS, 2004b and 2015).

4.5.3 Groundwater Budget

The final, calibrated model diversions are summarized in Tables 3-2 and 3-4, and the water budget for WY 2000, 2005, 2010 and 2015, broken down by subbasin, is summarized in Table 4-3. As noted above, these water budget data should be considered indicative and preliminary; however, the following key observations may be made:

- Both increases and decreases in simulated groundwater storage were observed in the Study Area during the historical evaluation period of the model (WY 2000 to WY 2015). Simulated storage changes are related to variations in hydrologic conditions, the amount of surface water available for irrigation, and the amount of groundwater pumping. As expected, the greatest storage depletions were observed in 2015, at the height of the recent drought.
- Simulated groundwater recharge from streams has generally increased (groundwater discharge to streams has decreased) in the Modesto and Turlock Subbasins. This is consistent with data summarized in Table 4-4, which indicates that simulated groundwater discharge to the Merced, Stanislaus and Tuolumne Rivers is decreasing over time.
- There is a decrease in simulated deep percolation over time across the Study Area.
- A decrease in simulated net underflow into the Turlock Subbasin is evident over time, as discussed in greater detail in Section 4.5.4, below.
- There is an increase in simulated net underflow over time out of the portion of the Eastern San Joaquin Subbasin that lies within the SCHM. A portion of this increase may be related to flow southward into the Modesto Subbasin, as discussed in greater detail in Section 4.5.4, below, but a portion may also be associated with underflow across the county boundary to the west out of the Study Area.
- Simulated agricultural pumping accounts for 80 to 89% of groundwater extraction in the Study Area, and has been variable and dependent on the amount of surface water available for irrigation. The highest agricultural pumping rates were observed at the height of the recent drought during WY 2015. No clear trends are evident, except in the Eastern San Joaquin Subbasin, where a steady increase in agricultural pumping is evident. This trend is consistent with conversion of rangeland to irrigated agriculture in the eastern foothill area of the model during this time period.
- Simulated municipal pumping accounts for 9 to 18% of groundwater extraction in the Study Area, with more limited variability in actual pumping rates than agricultural pumping rates (approximately 90,000 to 110,000 AFY). Pumping rates were generally lowest in 2015, likely due to the effect of water conservation measures that were implemented during the drought.
- Simulated rural domestic pumping accounts for just 1 to 2% of total groundwater extraction in the Study Area, and was modeled to increase with increasing rural population over time.

4.5.4 Interbasin Flows

Interbasin flows simulated between the subbasins that underlie the SCHM domain in WY 2000, 2005, 2010 and 2015 are summarized in Table 4-5. As noted above, these water budget data should be considered indicative and preliminary; however, the following key observations may be made:

- Turlock Subbasin. Underflow into the Turlock Subbasin occurs from the Merced Subbasin to the south and the Modesto Subbasin to the north. Simulated underflow from the Merced Subbasin decreases over time, and the net direction of simulated underflow in Layer 1 reverses direction from northward to southward between WY 2010 and WY 2015. Simulated underflow southward into the Turlock Subbasin from the Modesto Subbasin is variable and does not display a distinct trend, although the rate is greatest in WY 2015, at the height of the recent drought. Simulated underflow out of the Turlock Subbasin is less than underflow in, occurs to the Delta-Mendota Subbasin to the west, and displays a generally increasing trend over time.

- Modesto Subbasin. Underflow into the Modesto Subbasin occurs from the Eastern San Joaquin Subbasin to the north. Simulated underflow from the Eastern San Joaquin Subbasin decreases over time in Layer 1, but does not display a distinct trend in Layer 2. Simulated underflow out of the Modesto Subbasin is greater than underflow in, and occurs to the Turlock Subbasin to the south and the Delta-Mendota Subbasin to the west. Distinct trends in the rate of underflow out of the subbasin are not evident, but the greatest rate of underflow out was simulated in WY 2015, at the height of the recent drought.

- Delta-Mendota Subbasin. Underflow into the portion of the Delta-Mendota Subbasin in the Study Area is simulated to occur in Layer 1 primarily from the Modesto and Turlock Subasins to the east. In Layer 2, underflow into the subbasin is simulated to occur primarily from the Modesto and Turlock Subbasins to the east, and the Tracy Subbasin to the north. It should be noted that there are few calibration wells in the SCHM in the northern portion of the Delta-Mendota Subbasin, so that groundwater levels and flow directions in the confined aquifer system in this area may need further confirmation and the model may require refinement before drawing conclusions regarding cross boundary flows between the Delta-Mendota and Tracy Subbasins. Simulated underflow into the Delta-Mendota Subbasin from the Turlock and Modesto Subbasins displays a generally increasing trend over time. The SCHM does not simulate any significant outflow from the Delta-Mendota Subbasin.

- Eastern San Joaquin Subbasin. The SCHM does not simulate any significant underflow into the portion of the Eastern San Joaquin Subbasin in the Study Area. Underflow out of the portion of the Eastern San Joaquin Subbasin in the Study Area is simulated to occur primarily into the Modesto Subbasin to the south. The simulated rate of underflow out is variable, but generally increasing over time.

TABLE 4-2
NWIS GAGING STATION SUMMARY
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Gaging Station ID	Station Name	USGS Code	Elevation	Latitude	Longitude	Nearby City
NEW	SAN JOAQUIN RIVER NEAR NEWMAN	11274000	90	37.3504944	-120.97715	NEWMAN
VNS	SAN JOAQUIN RIVER NEAR VERNALIS	11303500	35	37.6760406	-121.26633	MODESTO
OCL	ORESTIMBA CK AT RIVER RD NR CROWS LNDG	11274538	65	37.4135475	-121.01604	CROWS LANDING
MOD	TUOLUMNE RIVER AT MODESTO	11290000	90	37.6272222	-120.98333	MODESTO
LGN	TUOLUMNE R BLW LA GRANGE DAM NR LA GRANG	11289650	170	37.6663208	-120.44214	LA GRANGE
RIP	STANISLAUS RIVER AT RIPON	11303000	73	37.7296524	-121.1105	RIPON
FFB[a]	SAN JOAQUIN R AT FREMONT FORD BRIDGE	11261500	--	37.31	-120.93	STEVINSON

Notes:
[a] Gaging Station ID made for purposes of this project, since USGS did not have an ID for this station.
ID = identification
NWIS = National Water Information System
-- = not available

TABLE 4-3
HISTORICAL WATER BUDGET SUMMARY
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Subbasin	Groundwater Budget Component	Water Budget (acre-feet)			
		WY 2000	WY 2005	WY 2010	WY 2015
Delta-Mendota Subbasin (within Stanislaus County)	Recharge from Diversion Losses	10,547	9,488	11,147	6,444
	Net Inflow from (+) or Discharge to (-) Streams	(29,475)	4,376	(3,864)	(22,346)
	Deep Percolation to Groundwater	67,311	61,418	50,278	36,694
	Net Underflow In (+)/Out (-)	81,771	87,392	77,470	115,884
	Agricutrual Pumping	(127,880)	(116,935)	(85,345)	(233,864)
	Municipal Pumping	(4,788)	(6,038)	(6,394)	(5,644)
	Rural Domestic Pumping	(1,371)	(1,394)	(1,416)	(1,467)
	Change in Storage	(3,885)	38,276	41,826	(103,399)
Eastern San Joaquin Subbasin (within Stanislaus County)	Recharge from Diversion Losses	24,054	22,847	24,393	18,783
	Net Inflow from (+) or Discharge to (-) Streams	31,547	35,358	37,407	45,762
	Deep Percolation to Groundwater	5,406	4,430	3,684	3,363
	Net Underflow In (+)/Out (-)	(30,743)	(29,520)	(34,644)	(35,972)
	Agricultural Pumping	(15,605)	(23,729)	(30,489)	(66,315)
	Municipal Pumping	0	0	0	0
	Rural Domestic Pumping	(721)	(731)	(744)	(770)
	Change in Storage	13,940	8,654	(391)	(35,149)
Modesto Subbasin	Recharge from Diversion Losses	87,929	89,008	58,427	48,250
	Net Inflow from (+) or Discharge to (-) Streams	(95,648)	(57,089)	(37,691)	(410)
	Deep Percolation to Groundwater	217,823	220,820	175,652	127,100
	Net Underflow In (+)/Out (-)	(94,378)	(82,764)	(89,335)	(88,920)
	Agricultural Pumping	(54,557)	(56,333)	(53,410)	(170,892)
	Municipal Pumping	(48,696)	(54,394)	(45,268)	(45,968)
	Rural Domestic Pumping	(5,492)	(5,580)	(5,673)	(5,870)
	Change in Storage	6,981	53,667	2,702	(136,711)
Turlock Subbasin	Recharge from Diversion Losses	99,026	117,519	78,750	50,478
	Net Inflow from (+) or Discharge to (-) Streams	(110,378)	(35,190)	7,689	16,058
	Deep Percolation to Groundwater	203,485	213,196	173,297	127,576
	Net Underflow In (+)/Out (-)	203,262	184,370	117,343	74,319
	Agricultural Pumping	(337,533)	(289,579)	(277,113)	(405,274)
	Municipal Pumping	(45,825)	(47,978)	(44,238)	(38,199)
	Rural Domestic Pumping	(5,667)	(5,853)	(5,853)	(6,058)
	Change in Storage	6,369	136,580	49,874	(181,102)
Grand Total SCHM Primary Focus Area	Recharge from Diversion Losses	221,557	238,861	172,716	123,954
	Net Inflow from (+) or Discharge to (-) Streams	(203,954)	(52,546)	3,540	39,064
	Deep Percolation to Groundwater	494,024	499,864	402,912	294,733
	Net Underflow In (+)/Out (-)	159,912	159,478	70,834	65,310
	Agricultural Pumping	(535,574)	(486,577)	(446,357)	(876,345)
	Municipal Pumping	(99,309)	(108,410)	(95,899)	(89,812)
	Rural Domestic Pumping	(13,251)	(13,558)	(13,686)	(14,164)
	Change in Storage	23,405	237,177	94,012	(456,361)

Notes:
SCHM = Stanislaus County Hydrologic Model
WY = water year

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TABLE 4-4
HISTORICAL STREAMFLOW GAIN/LOSS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Stream Reach	Gain/Loss from Groundwater (acre-feet/year) [1]			
	WY 2000	WY 2005	WY 2010	WY 2015
Merced River	10,929	(49,573)	(117,162)	(122,373)
Orestimba Creek [2]	(10,477)	(20,986)	(18,053)	(5,827)
San Joaquin River	79,513	33,288	43,864	60,340
Stanislaus River	(2,820)	(9,329)	(35,801)	(85,214)
Tuolumne River	156,597	101,418	76,181	40,841

Notes:
[1] Based on the level of model calibration, streamflow gain/loss values should be considered indicative.
[2] Hydrograph calibration for Orestimba Creek is relatively poor; therefore the results for this stream should not be considered indicative.
WY = water year

LAYER 1 (by WY)						
2000						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	42,219	--	--	--	--
TURLOCK	--	--	7,340	--	--	--
DELTA-MENDOTA	4,178	--	--	--	69	--
MODESTO	--	18,722	2,230	--	--	--
TRACY	--	--	--	--	--	--
EASTERN SAN JOAQUIN	--	--	--	2,097	1,730	--
2005						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	31,585	--	--	--	--
TURLOCK	--	--	10,229	--	--	--
DELTA-MENDOTA	1,189	--	--	--	--	--
MODESTO	--	20,759	1,780	--	--	--
TRACY	--	--	192	--	--	--
EASTERN SAN JOAQUIN	--	--	--	4,960	1,962	--
2010						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	1,871	523	--	--	--
TURLOCK	--	--	11,665	--	--	--
DELTA-MENDOTA	--	--	--	--	--	--
MODESTO	--	22,155	1,767	--	--	--
TRACY	--	--	59	--	--	--
EASTERN SAN JOAQUIN	--	--	--	3,743	1,910	--
2015						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	--	--	--	--	--
TURLOCK	30,451	--	14,174	--	--	--
DELTA-MENDOTA	1,154	--	--	--	--	--
MODESTO	--	20,884	2,633	--	--	--
TRACY	--	--	363	--	--	--
EASTERN SAN JOAQUIN	--	--	--	5,181	3,060	--

LAYER 2 (by WY)						
2000						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	28,225	--	--	--	--
TURLOCK	--	--	8,026	--	--	--
DELTA-MENDOTA	86	--	--	--	--	--
MODESTO	--	50,295	9,093	--	--	--
TRACY	--	--	17,420	--	--	--
EASTERN SAN JOAQUIN	--	--	--	13,170	2,018	--
2005						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	26,432	--	--	--	--
TURLOCK	--	--	8,468	--	--	--
DELTA-MENDOTA	516	--	--	--	--	--
MODESTO	--	47,942	9,477	--	--	--
TRACY	--	--	20,505	--	--	--
EASTERN SAN JOAQUIN	--	--	--	13,167	197	--
2010						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	10,570	1,091	--	--	--
TURLOCK	--	--	11,653	--	--	--
DELTA-MENDOTA	--	--	--	--	--	--
MODESTO	--	46,365	9,850	--	--	--
TRACY	--	--	15,431	--	--	--
EASTERN SAN JOAQUIN	--	--	--	7,433	1,708	--
2015						
Flow From	Flow To (AC-FT)					
Subbasin Name	MERCED	TURLOCK	DELTA-MENDOTA	MODESTO	TRACY	EASTERN SAN JOAQUIN
MERCED	--	2,575	2,343	--	--	--
TURLOCK	--	--	18,026	--	--	--
DELTA-MENDOTA	--	--	--	--	--	--
MODESTO	--	54,142	16,225	--	--	--
TRACY	--	--	31,620	--	--	--
EASTERN SAN JOAQUIN	--	--	--	18,533	3,796	--

Notes:
AC-FT = acre feet
WY = water year

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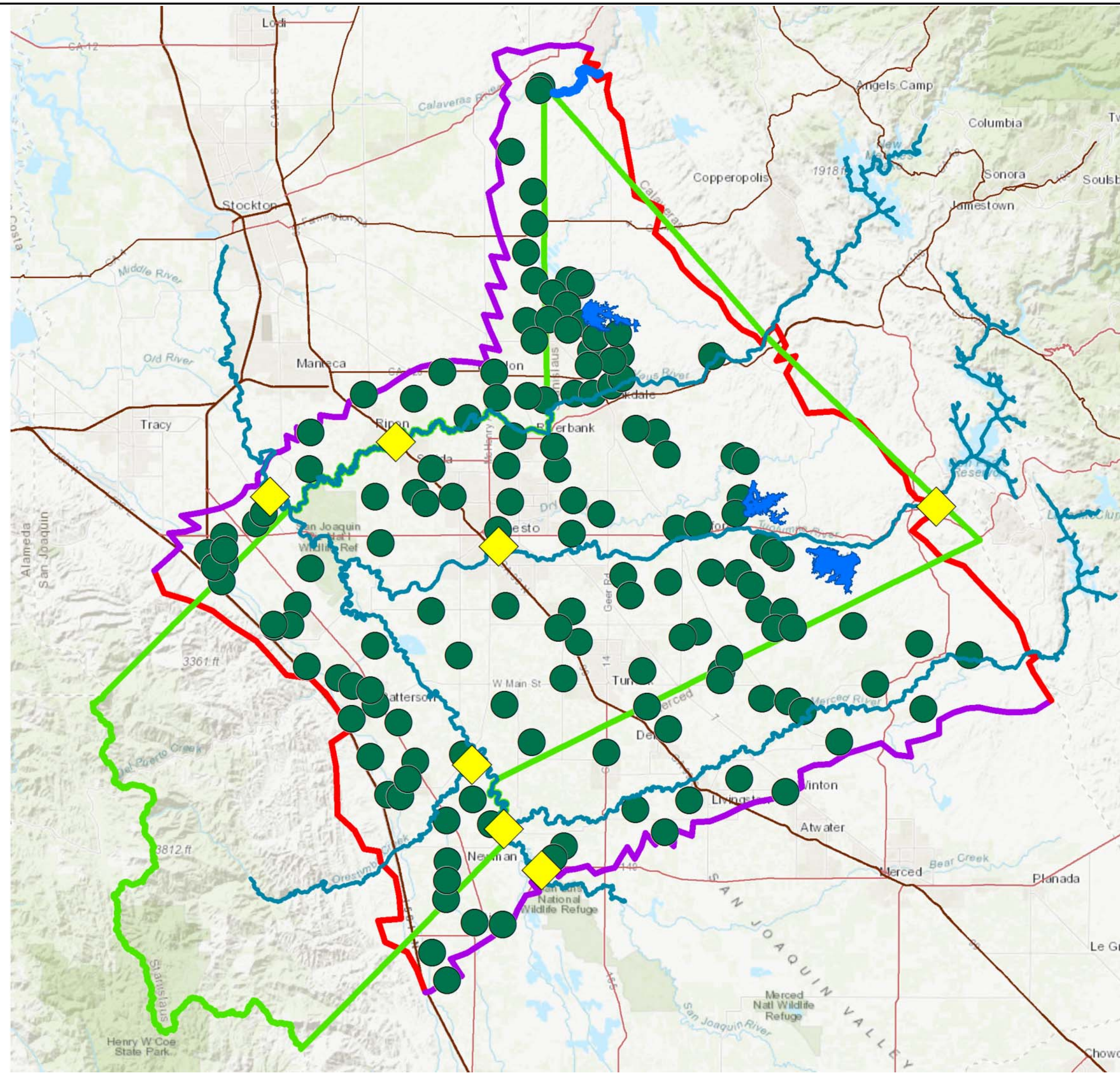

General Head Boundary
No Flow Boundary
Stanislaus County Boundary
Calibration Gaging Stations
Calibration Wells

Map Source: Esri, HERE, DeLorme, Tom Tom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, OpenStreetMap contributors, and the GIS User Community

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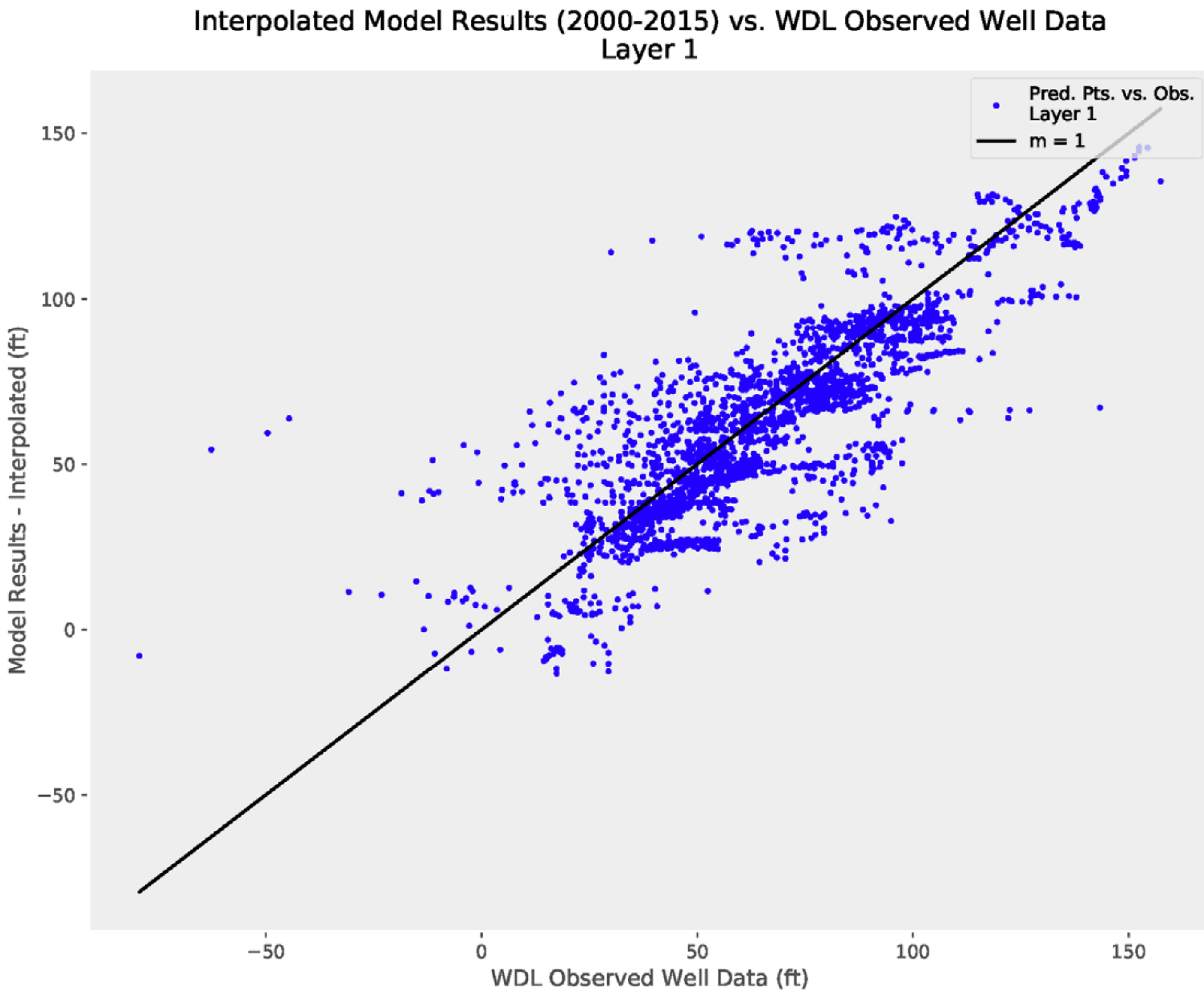
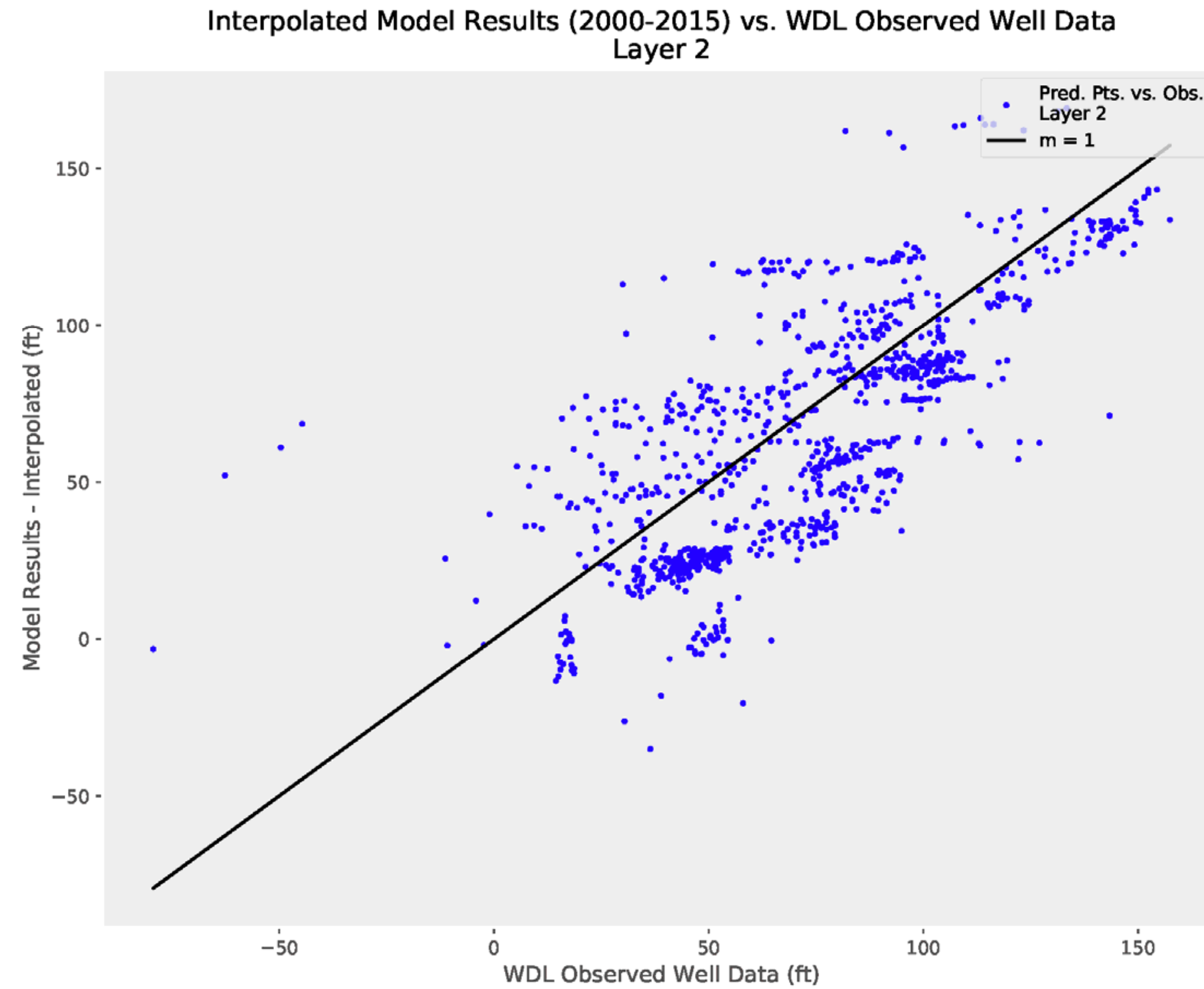
FIGURE 4-1

Locations of Calibration Gaging Stations and Calibration Wells within SCHM





Notes:
ft = foot
WDL = Water Data Library
Modeled water level data were predicted monthly and interpolated to actual WDL measurement dates

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Stanislaus County, California

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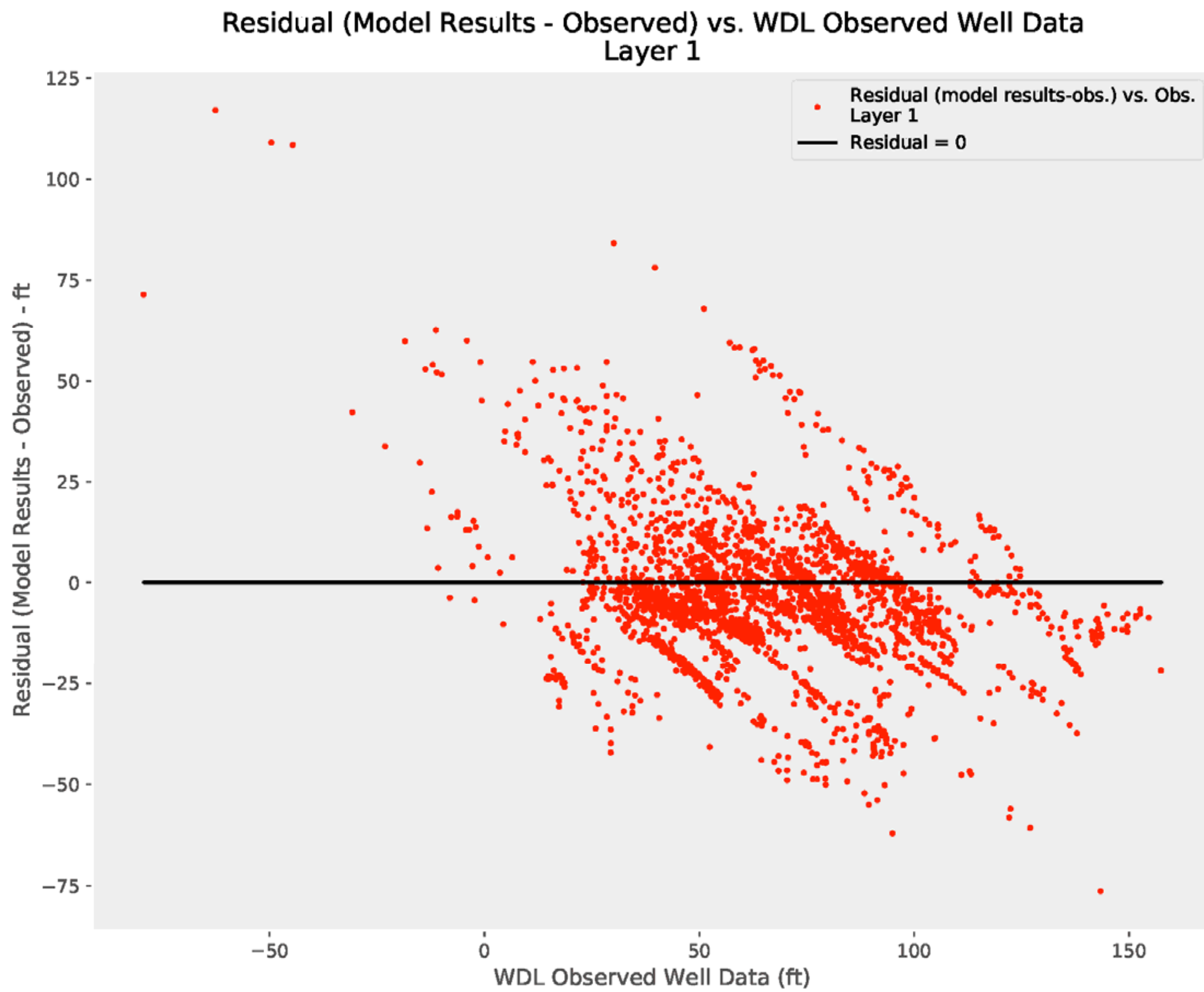
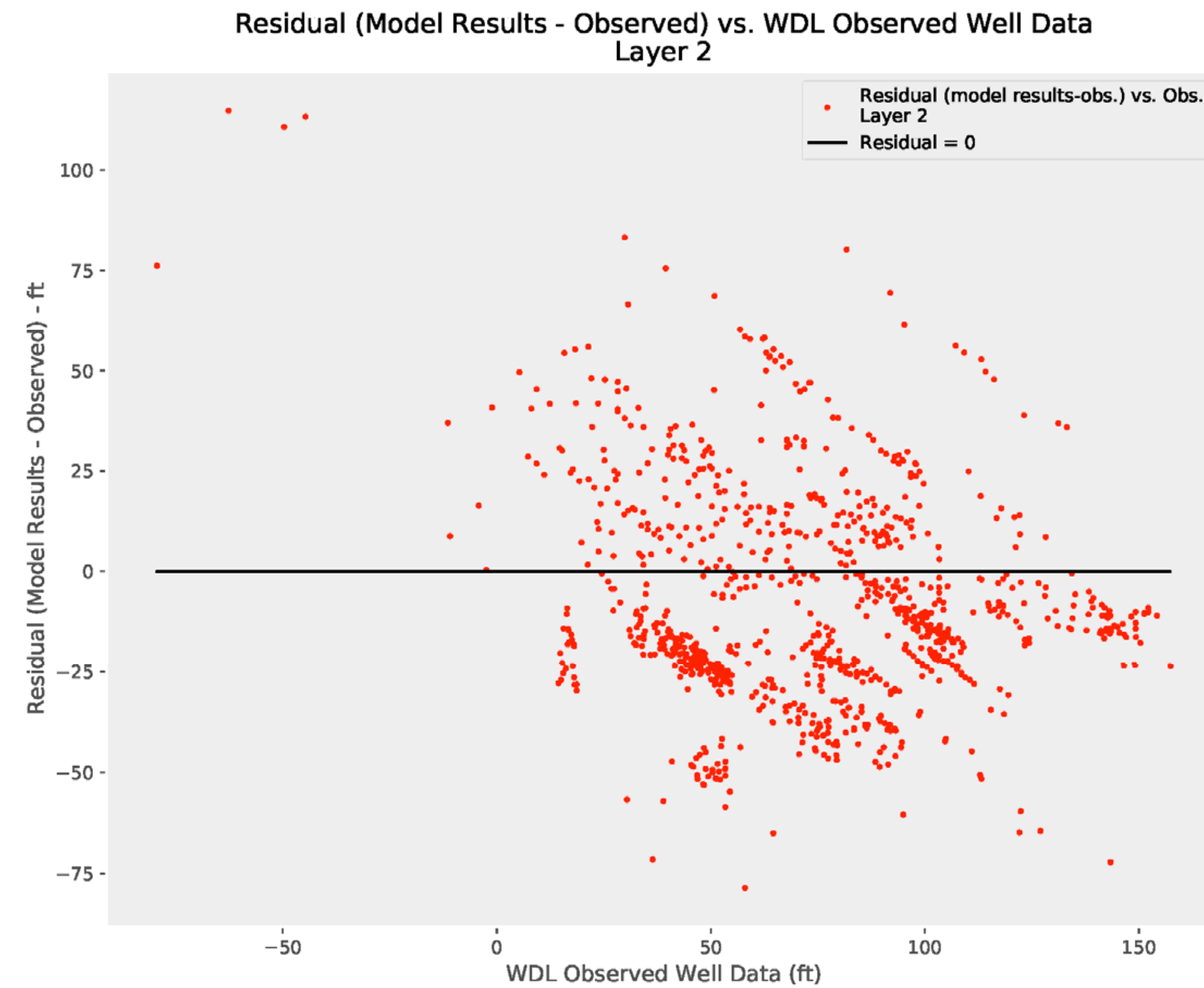
FIGURE 4-2

Measured versus Predicted Water Levels for SCHM Layers 1 and 2





Notes:
ft = foot
WDL = Water Data Library
Modeled water level data were predicted monthly and interpolated to actual WDL measurement dates prior to calculating residuals

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FIGURE 4-3

Residual versus Predicted Water Levels for SCHM Layers 1 and 2

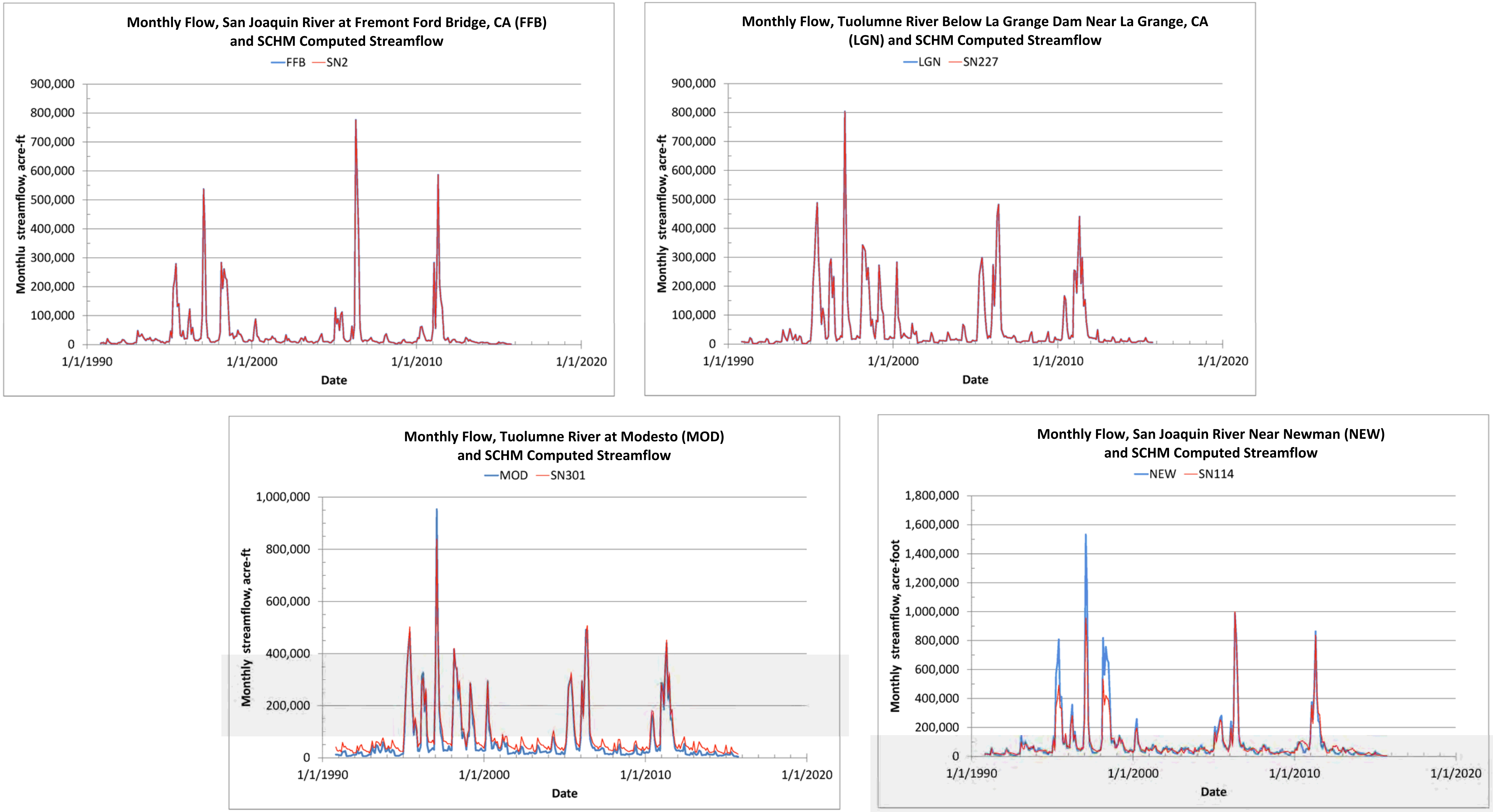

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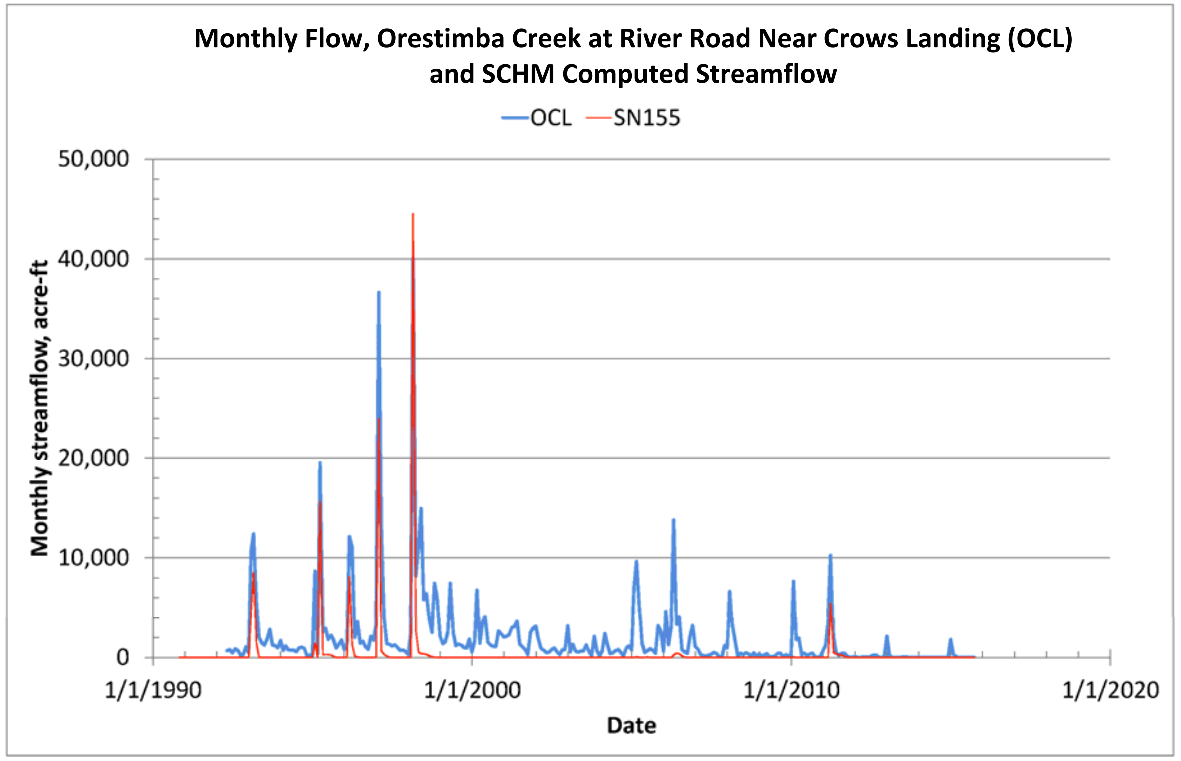
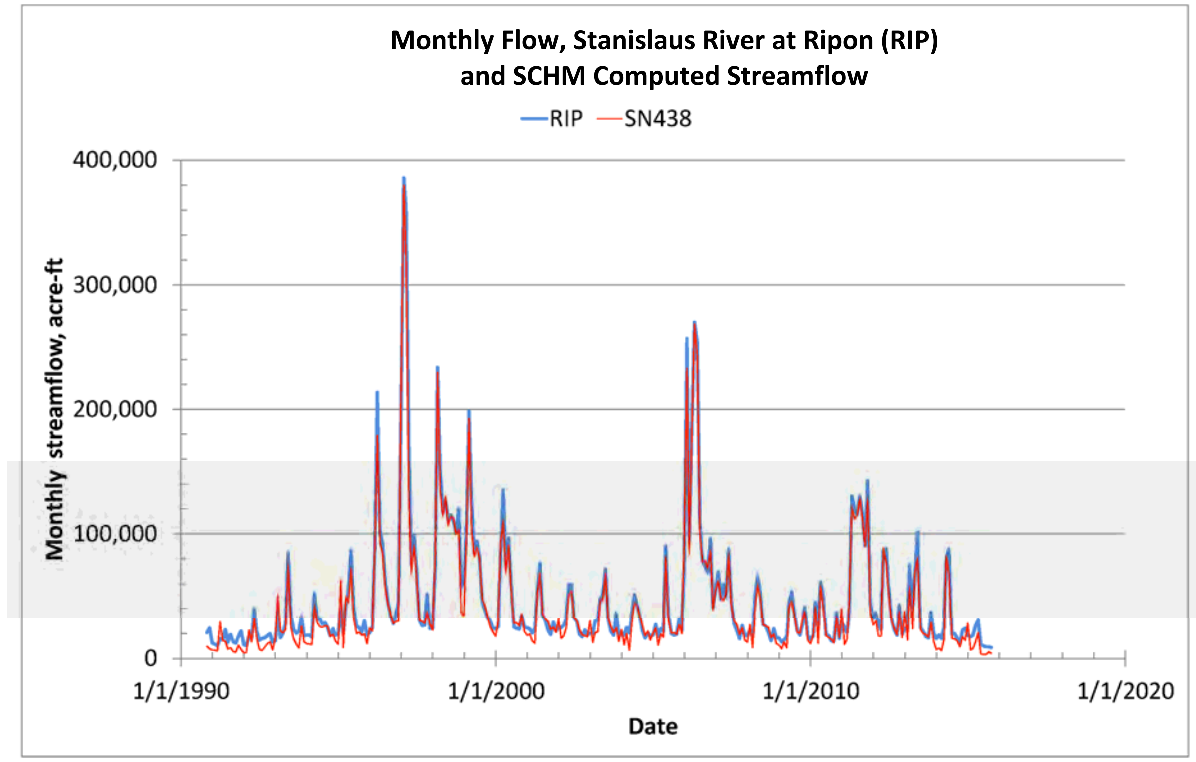
FIGURE 4-4

Monthly Streamflow at FFB, LGN, MOD, and NEW and SCHM Computed Streamflow





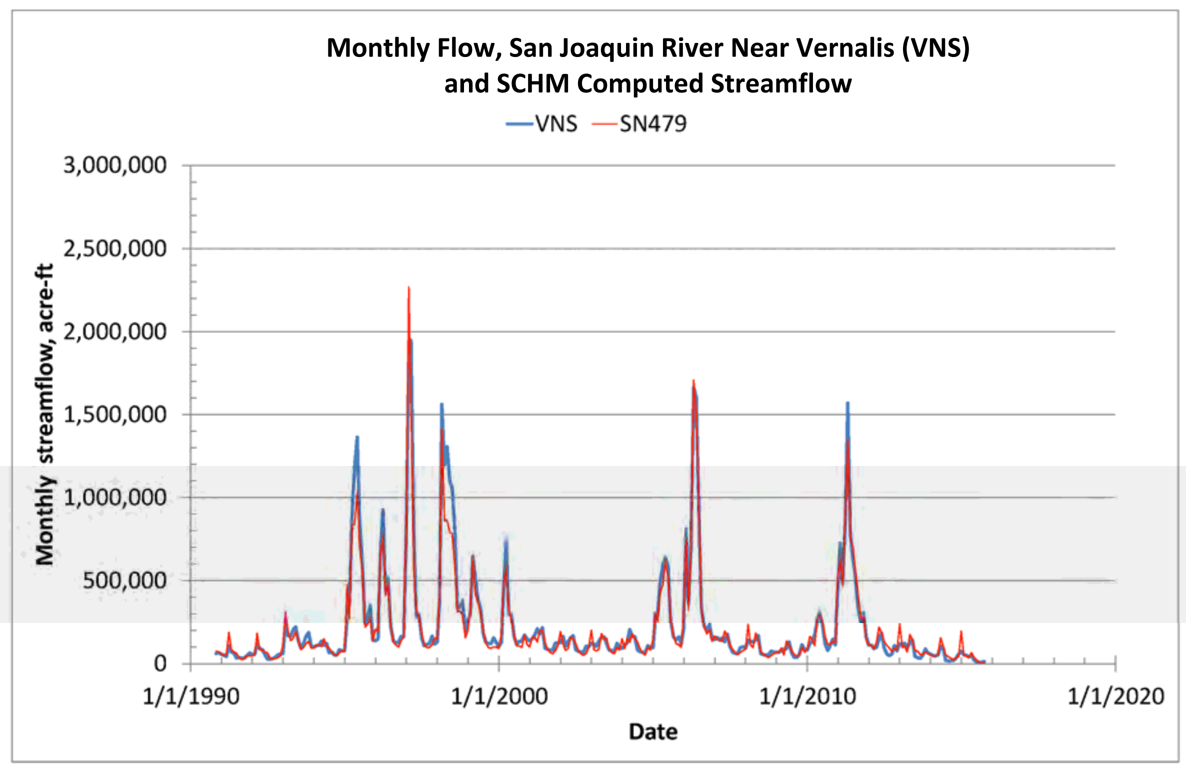


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FIGURE 4-5

Monthly Streamflow at OCL, RIP, and VNS and SCHM Computed Streamflow

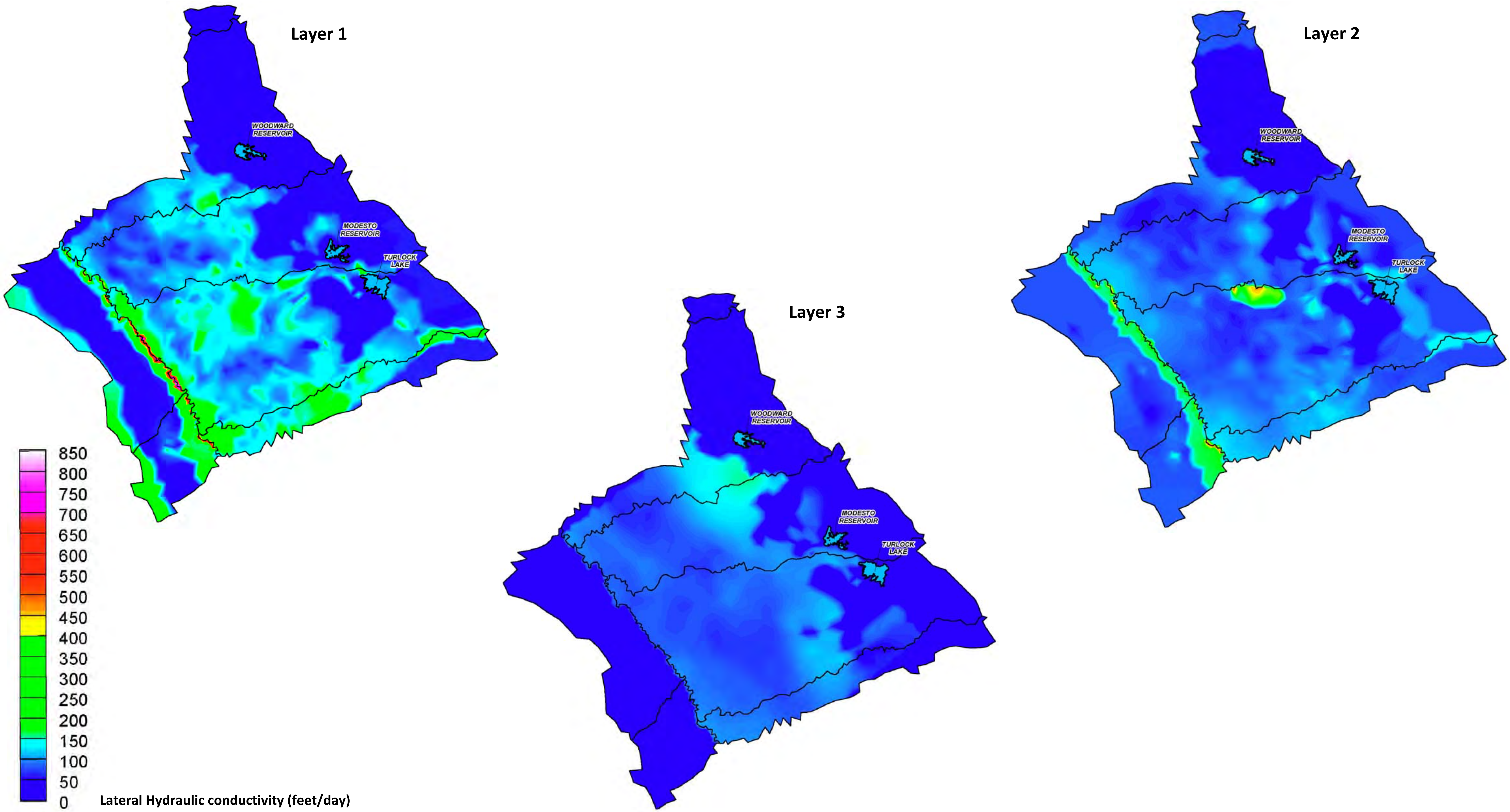

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FIGURE 4-6

Final Hydraulic Conductivity for SCHM Layers 1, 2, and 3

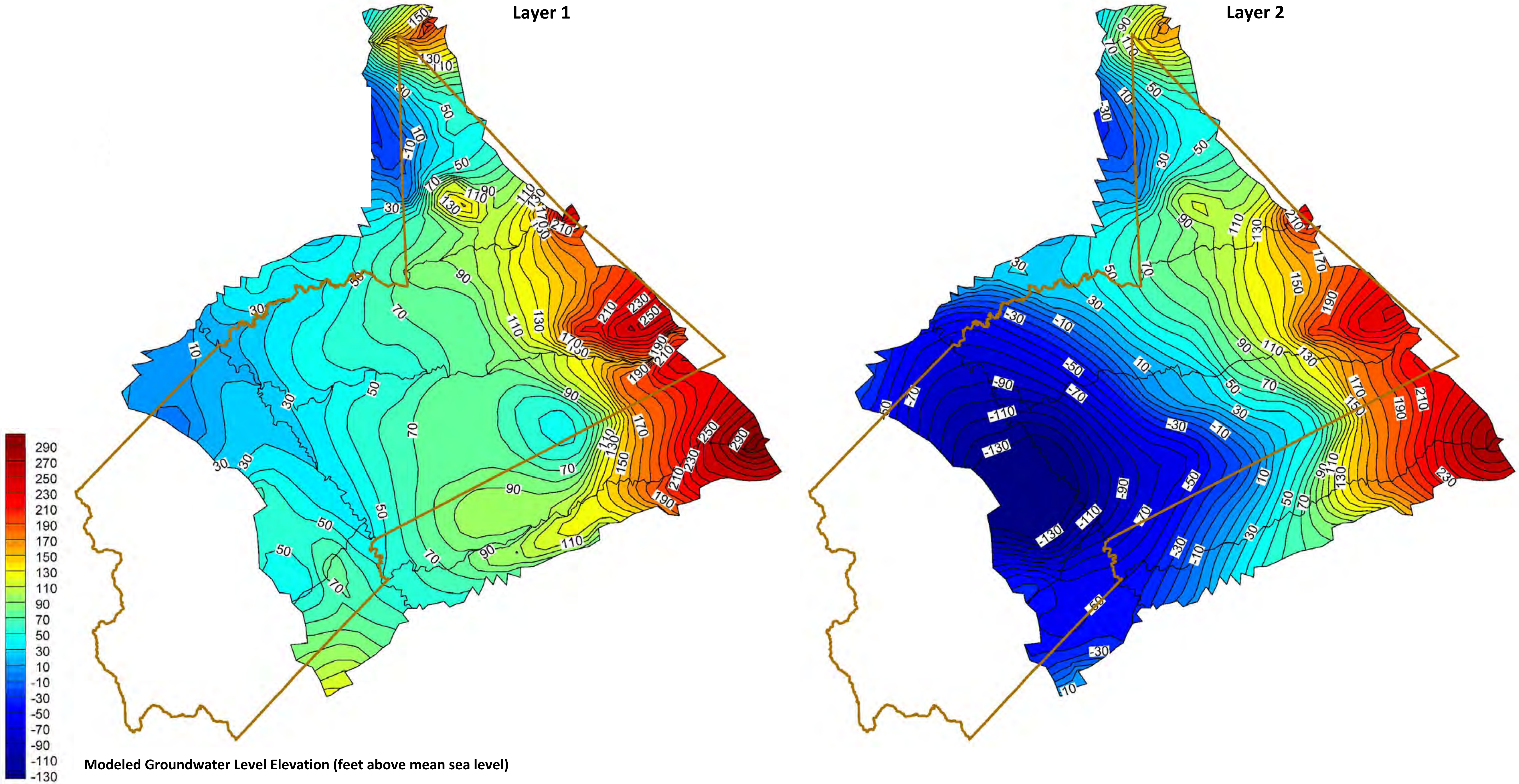

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FIGURE 4-7

Groundwater Level Elevations in SCHM Layers 1 and 2, September 2000

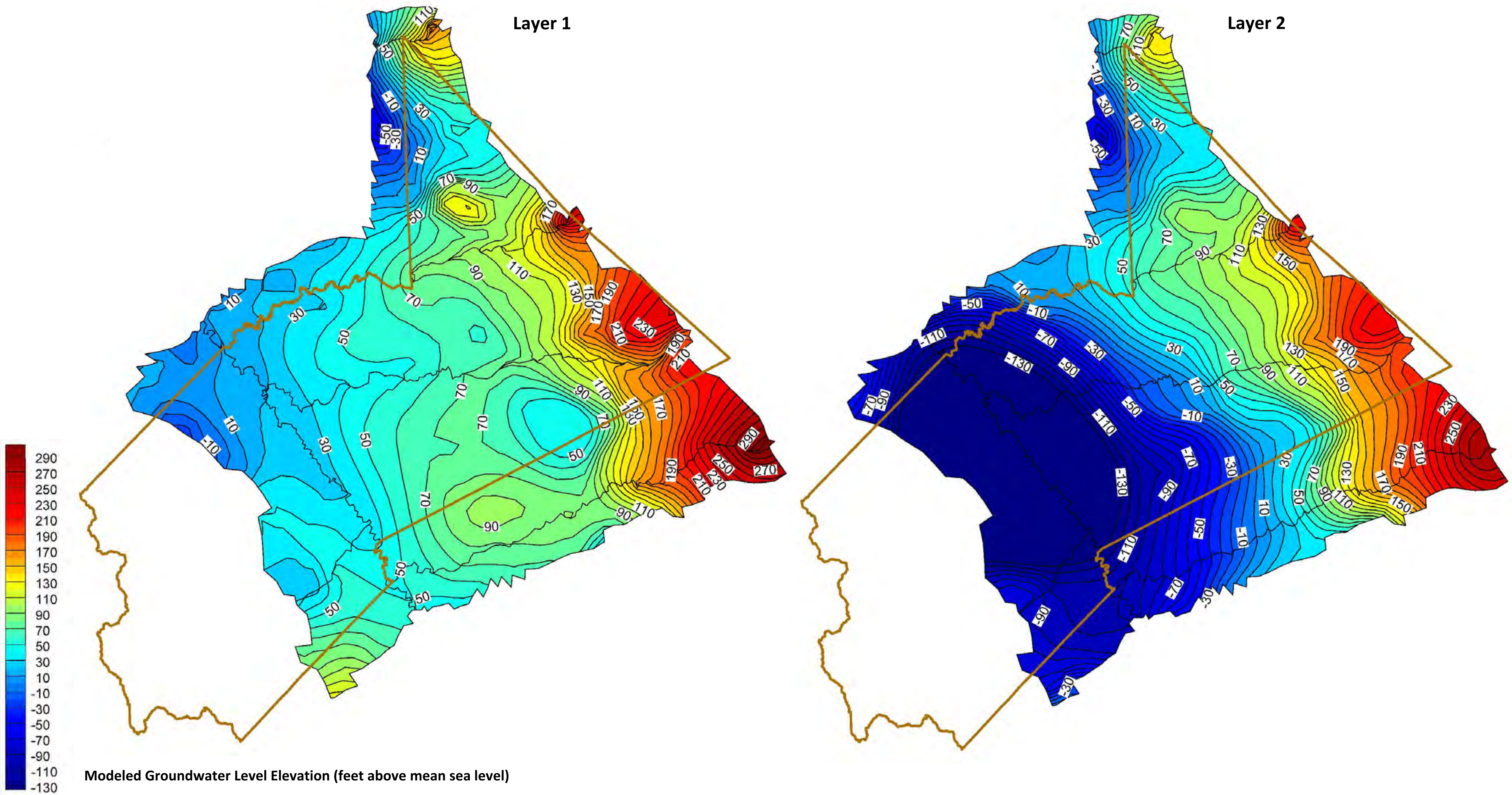

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FIGURE 4-8

Groundwater Level Elevations in SCHM Layers 1 and 2, September 2015

5.0 SENSITIVITY ANALYSIS

In order to investigate the sensitivity of the SCHM to variations in key parameters and inputs, a sensitivity analysis was conducted by varying several key inputs as summarized in Table 5-1 below. The inputs were varied across a range of low and high values, and the resulting simulated heads for September 2015 in Model Layers 1 and 2 were compared the calibrated historical model. The purpose of this analysis was to provide perspective on the significance of potential data gaps in the construction and calibration of the model, and to help inform potential future model refinement efforts.

Table 5-1: Sensitivity Analysis Input Parameters

Model Input	Range of Variation
Aquifer Layer Lateral Hydraulic Conductivity	Existing Value x 0.2; Existing Value x 5
Storage Coefficients - Specific Storage - Specific Yield	 Existing Value x 0.1; Existing Value x 10 Existing Value x 0.1; Existing Value x 2
Evapotranspiration	Existing Value x 0.5; Existing Value x 2
Corcoran Clay Vertical Hydraulic Conductivity	Existing Value x 0.2; Existing Value x 5

It should be noted that the ranges of input values listed above do not necessarily reflect an expected or necessarily even a reasonable range in those parameters, but are a set of values intended to test the sensitivity of the model to potential variations. The results of the analysis are discussed in the following sections.

5.1 Aquifer Lateral Hydraulic Conductivity

The changes in simulated groundwater levels with decreased and increased model lateral hydraulic conductivity are shown in Figures 5-1 and 5-2, respectively. As shown in Figure 5-1, decreasing model lateral hydraulic conductivity has a significant but variable effect on simulated groundwater levels across the model domain, increasing them in some areas while decreasing them in others. These results support the observation that variations in hydraulic conductivity can affect model outcomes through multiple mechanisms. In some areas, the primary effect of decreasing the hydraulic conductivity appears to be to slow the flow of recharge away from an area and retain water in that part of the model, causing groundwater mounding. This is observed in portions of the eastern foothill area of the model near the Stanislaus, Tuolumne and Merced Rivers, as well as in Layer 1 beneath areas east of the San Joaquin River that are irrigated primarily through delivery of surface water. In other areas, lower hydraulic conductivity appears to result in greater drawdown associated with simulated model pumping. In these areas, drawdown may also be increased as a result of a slower rate of lateral groundwater inflow from recharge areas, such as in the cone of depression beneath the eastern Turlock Subbasin, and in most of Layer 2, away from the foothills. In addition, in some areas along the Diablo Range and the northern portion of the northeast model boundary, mountain front recharge from small watersheds appears to be infiltrated less effectively, causing a local decline in simulated groundwater levels.

As shown in Figure 5-2, increasing model lateral hydraulic conductivity also has a varying effect on simulated groundwater levels, which is generally opposite of the effect of decreasing hydraulic conductivity discussed above. With increased hydraulic conductivity, groundwater flows more readily away from recharge areas and to areas where groundwater is extracted, decreasing drawdown in those areas.

These results may be most useful when considering the results of extensive evaluation of sediment texture on hydraulic conductivity for the MERSTAN model (USGS, 2015). Regional adjustment of the end-point scaling used in this analysis could be investigated to provide improvements in regional model calibration during future refinements.

5.2 Storage Coefficients

The changes in simulated September 2015 groundwater level elevations with decreased and increased model storage coefficients (Specific Storage and Specific Yield) are shown in Figures 5-3 and 5-4 respectively. As shown in Figure 5-3, decreasing the model storage coefficients has the general effect of decreasing simulated heads, and can also be a significant effect on model results. This is especially true in Layer 2 in the west central portion of the model, which represents the confined aquifer system, and is consistent with less water being available to be removed from storage for each increment of drawdown. This portion of the model represents the model discharge area and reflects the cumulative effect of these changes throughout the model domain. As shown in Figure 5-4, increasing model lateral storage coefficients has the opposite effect, except in some isolated areas in the northeastern portion of the model domain. The reason for these local effects is not clear.

Local data regarding storage coefficients in the SCHM area are not widely available, and prior modeling efforts have relied largely on generalized information and the results of regional studies. The analysis above illustrates that the model could be refined if future model calibration efforts can rely on additional local field data from aquifer tests.

5.3 Evapotranspiration

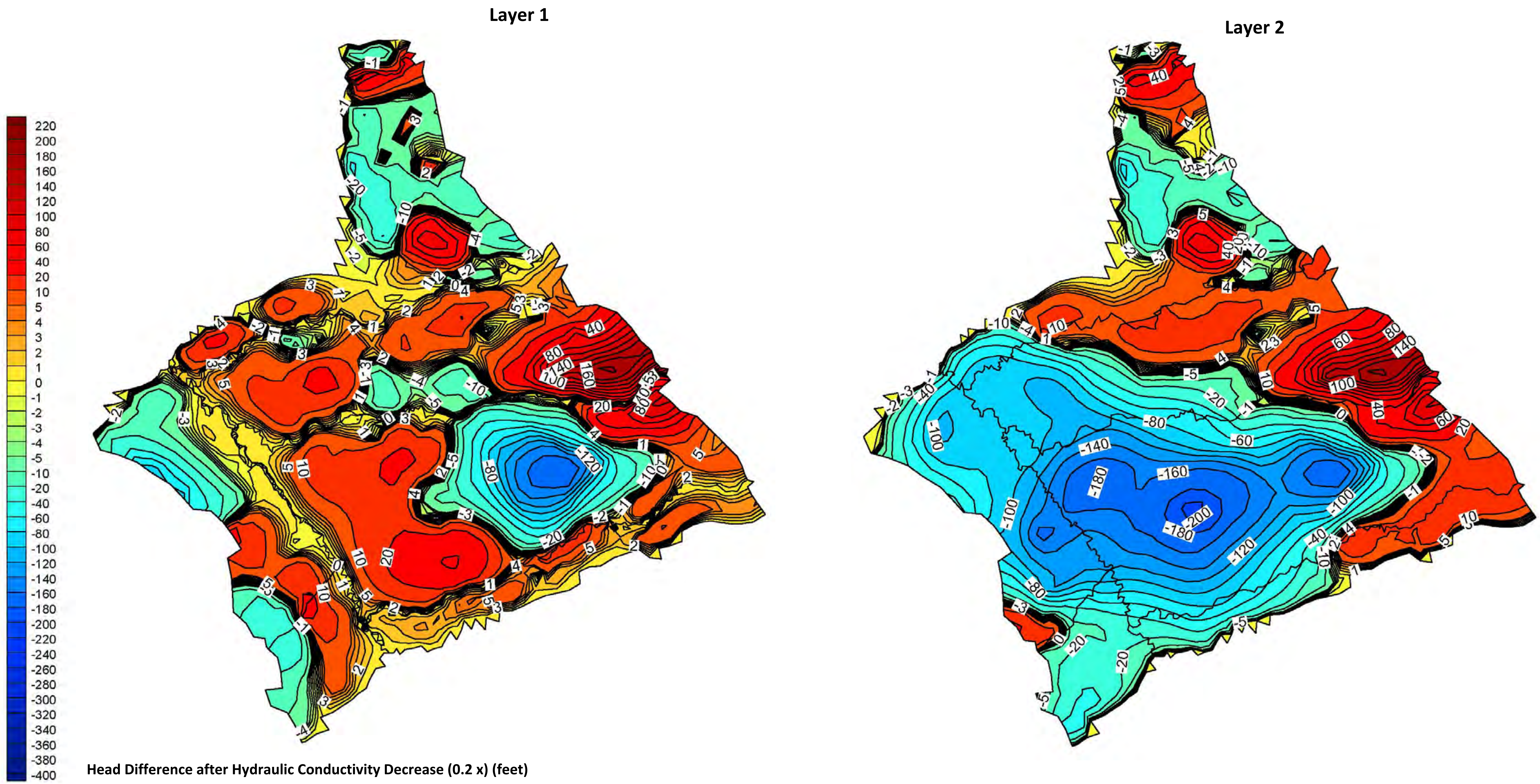
The changes in simulated September 2015 groundwater level elevations with decreased and increased model evapotranspiration are shown in Figures 5-5 and 5-6 respectively. As shown in Figure 5-5, decreasing the model evapotranspiration has the general effect of increasing simulated heads. This is true across the model domain in both Layers 1 and 2, but is most pronounced in the western portion of Layer 2 where the cumulative effects of more water being available for deep percolation throughout the model domain become more pronounced. As shown in Figure 5-6, increasing model evapotranspiration has the opposite effect, resulting in a decrease in heads across the model domain in both Layers 1 and 2. Similar to decreasing evapotranspiration, the cumulative effects of less deep percolation being available throughout the model domain become most pronounced in western portion of Layer 2.

These results reflect the fact that evapotranspiration from crops and natural vegetation is a significant component of the model water budget. DWR is undertaking efforts to refine its understanding of evapotranspiration in cropping in the region through several remote-sensing datasets. The results of these efforts were not available during development of the SCHM, but will be available to inform future modeling efforts.

5.4 Aquitard Vertical Hydraulic Conductivity

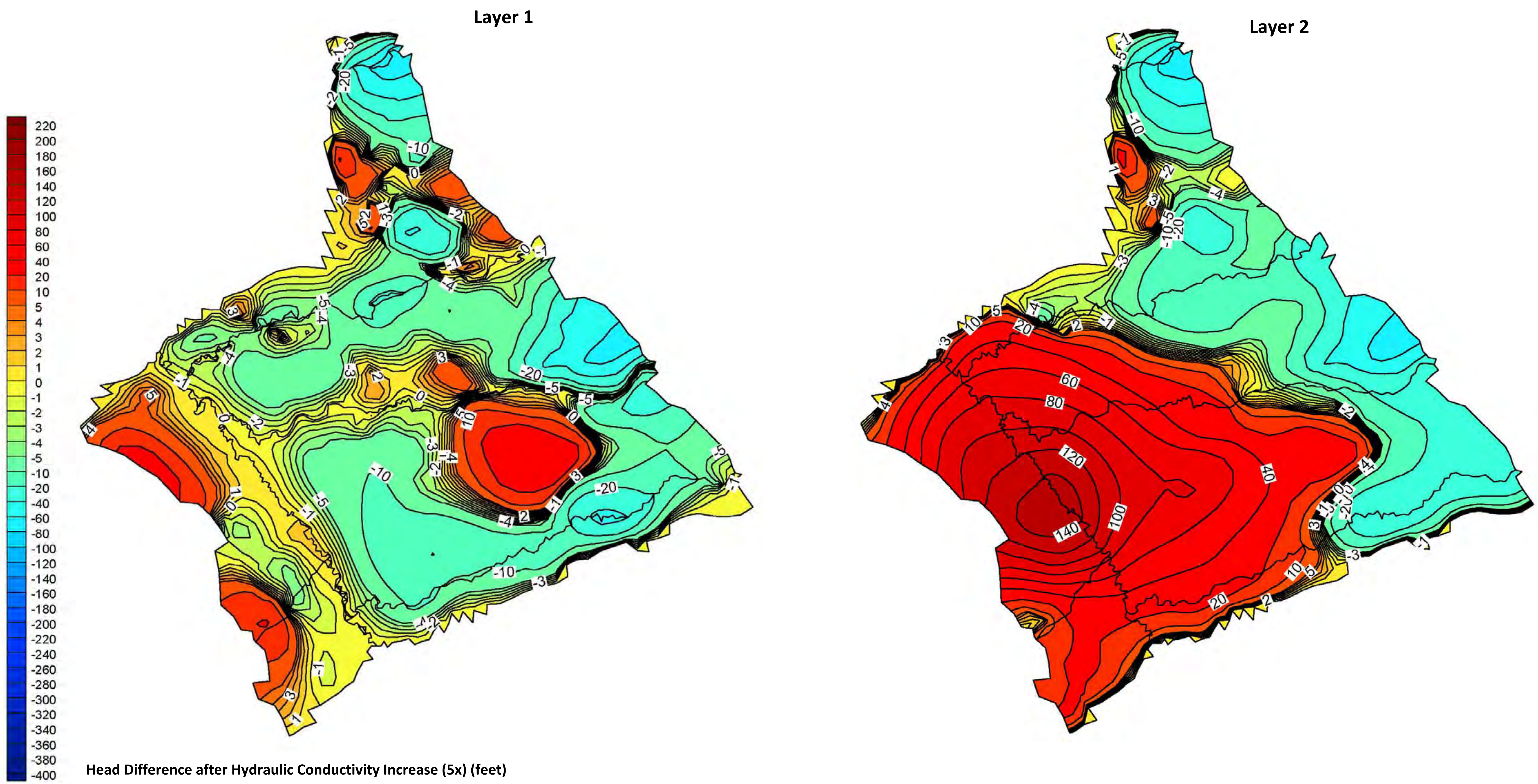
The changes in simulated September 2015 groundwater level elevations with decreased and increased Corcoran Clay vertical hydraulic conductivity are shown in Figures 5-7 and 5-8 respectively. As shown in Figure 5-7, decreasing the Corcoran Clay vertical hydraulic conductivity has the general effect of increasing simulated heads in Layer 1 and decreasing heads in Layer 2 beneath the Corcoran Clay subcrop area. This is because water is retained in the upper aquifer system and vertical leakance into the underlying confined aquifer system if impeded. This is effect is most pronounced in the western portion of the model, west of the San Joaquin River. As shown in Figure 5-8, increasing the vertical hydraulic conductivity has the opposite effect, resulting in a decrease in simulated heads in Layer 1 and an increase in simulated heads in Layer 2 beneath the Corcoran Clay subcrop area. This is because more water is allowed to leak vertically out of Layer 1 and into Layer 2 in this area.

These results illustrate the fact that the Corcoran Clay is a key regional hydrostratigraphic unit that affects not only the aquifer system's response to shallow and deep pumping, but also to the partition of the groundwater budget between the shallow and deep aquifer system. Local data regarding the vertical hydraulic conductivity of this unit are sparse, and prior modeling efforts have relied largely on regional studies or calibration results to assign values to this important parameter. The model could be refined through targeted evaluation of this important input parameter.



Head Difference after Hydraulic Conductivity Decrease (0.2 x) (feet)

JACOBSON | JAMES & associates, inc	*Stanislaus County Hydrologic Model: Development and Forecasts* *Stanislaus County, California*				*FIGURE 5-1* **Sensitivity Analysis Results: Decreased Lateral Hydraulic Conductivity**
	PROJECT NO. *STANCO.002*	DATE *11/22/17*	DRAWN BY *JH*	APPR. BY *MT*	



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Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
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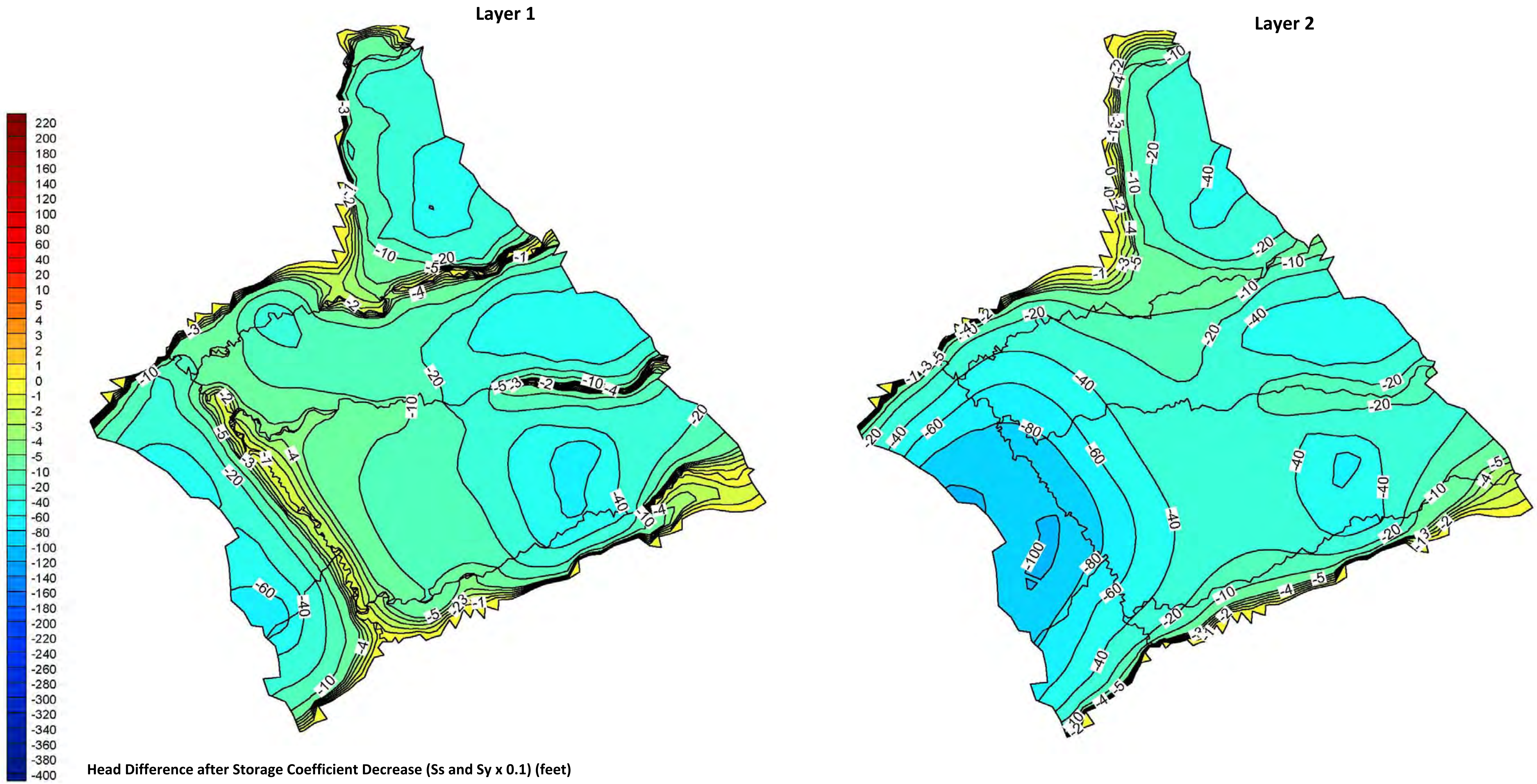
FIGURE 5-2

Sensitivity Analysis Results: Increased Lateral Hydraulic Conductivity



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Stanislaus County Hydrologic Model: Development and Forecasts
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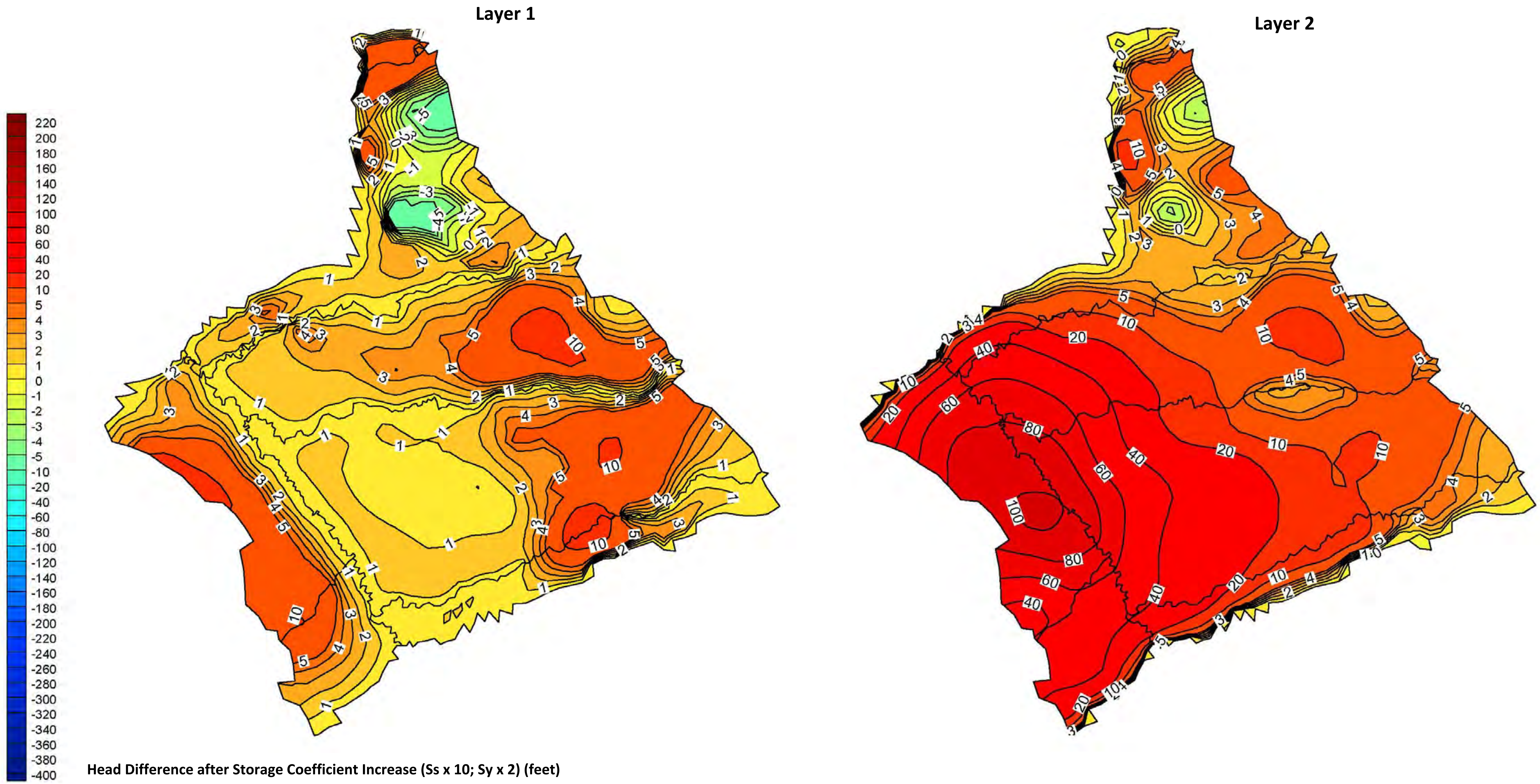
FIGURE 5-3

Sensitivity Analysis Results:
Decreased Storage Coefficients



Head Difference after Storage Coefficient Increase (Ss x 10; Sy x 2) (feet)

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FIGURE 5-4

Sensitivity Analysis Results: Increased Storage Coefficients

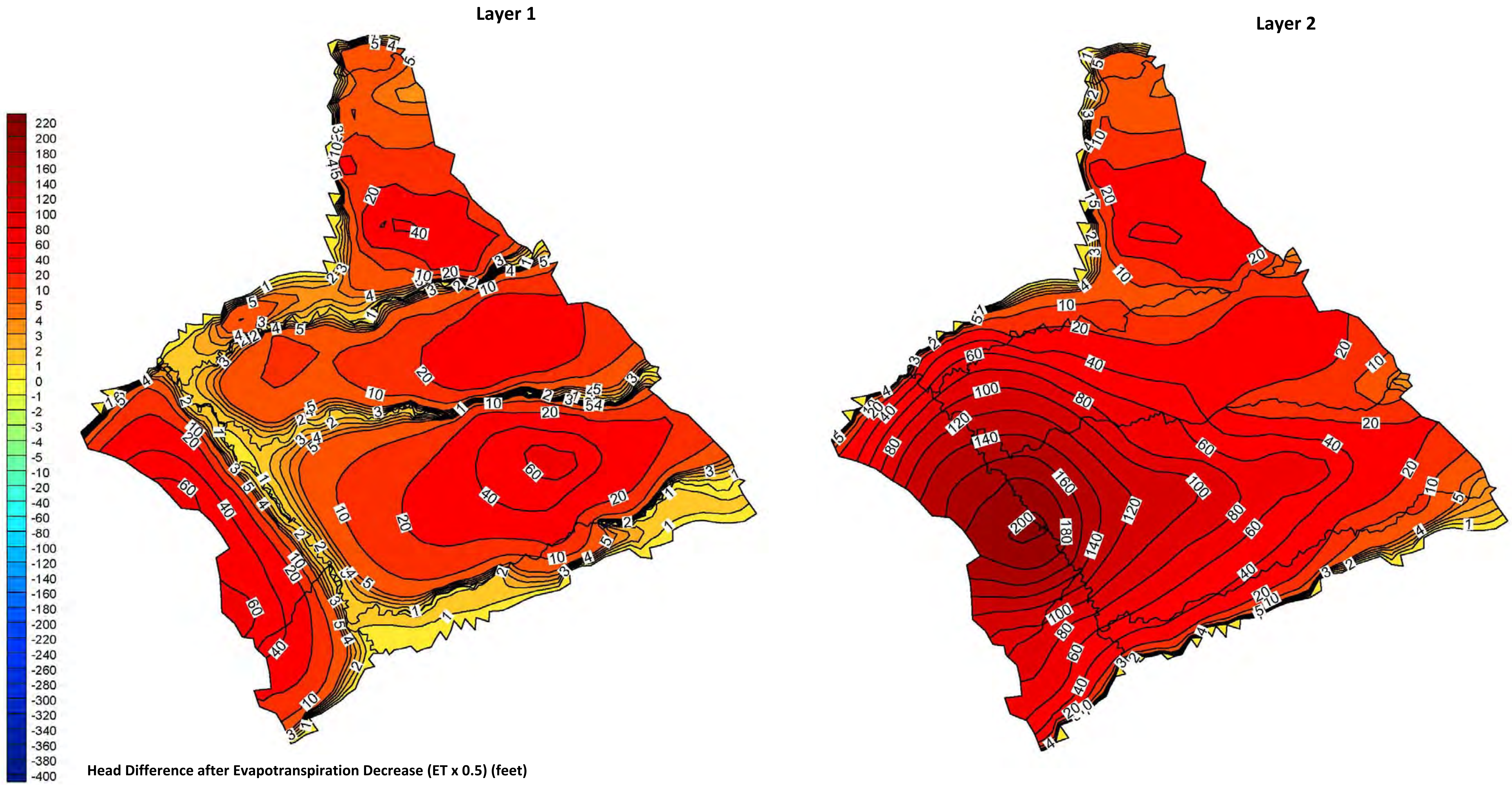

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FIGURE 5-5

Sensitivity Analysis Results: Decreased Evapotranspiration

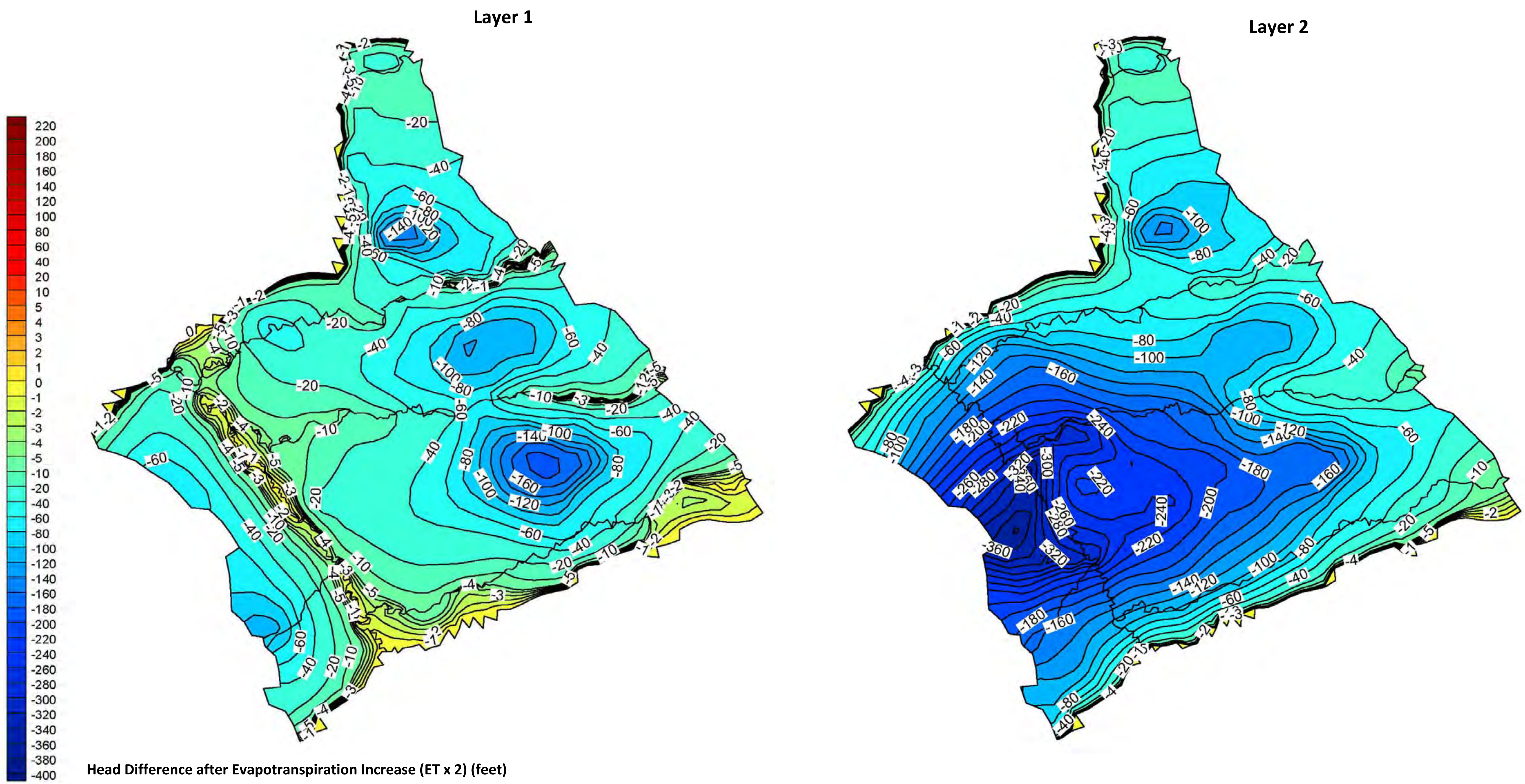

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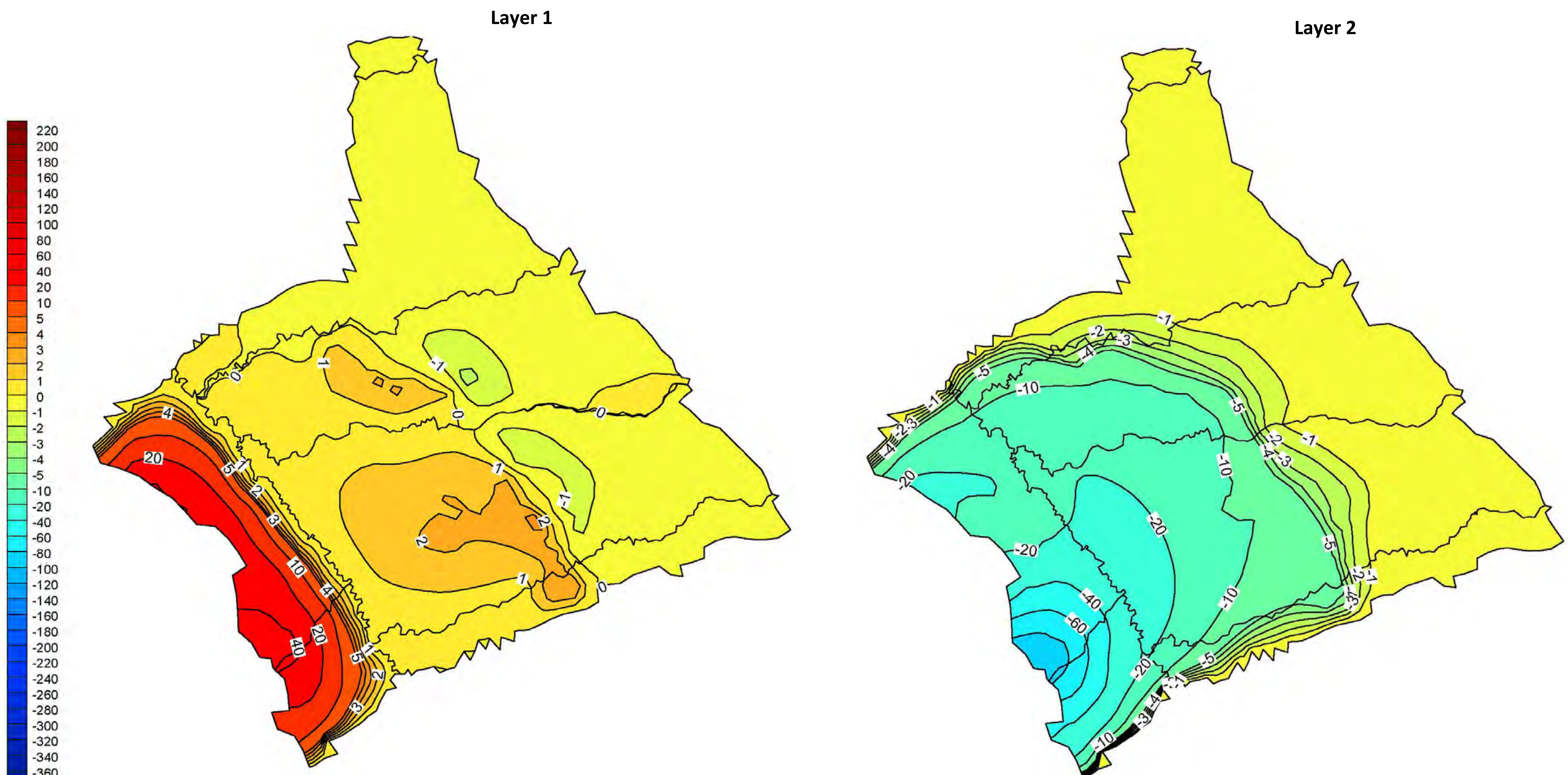
FIGURE 5-6

Sensitivity Analysis Results: Increased Evapotranspiration



Head Difference after Corcoran Clay Hydraulic Conductivity Decrease (Kv x 0.2) (feet)

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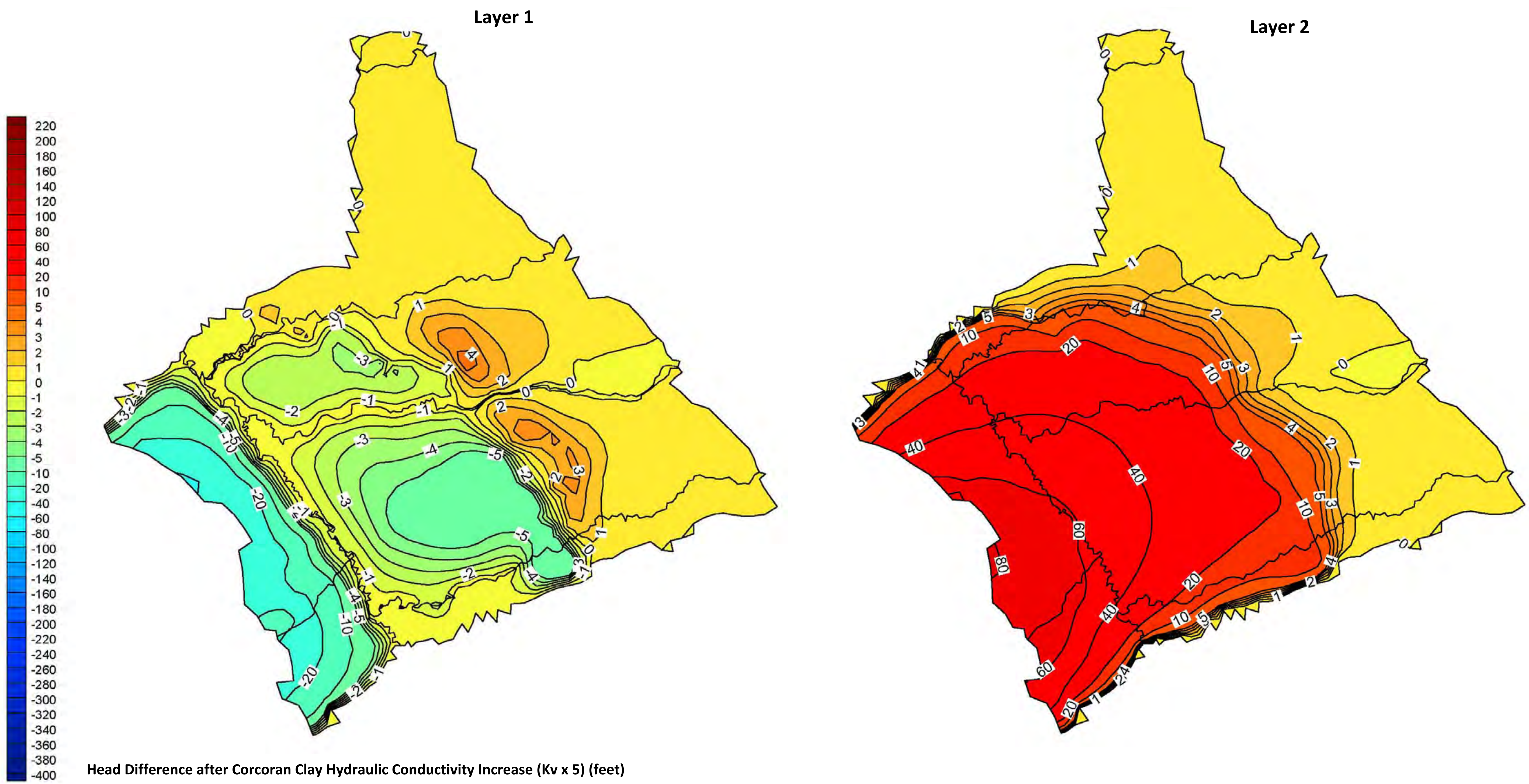
FIGURE 5-7

Sensitivity Analysis Results:
Decreased Aquitard Vertical Hydraulic Conductivity



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Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
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FIGURE 5-8

Sensitivity Analysis Results:
Increased Aquitard Vertical Hydraulic Conductivity

6.0 MODEL FORECASTS

6.1 Approach

Model forecasts were run from 2016 through 2042 to provide perspective on the effects of potential future groundwater management trends, and to evaluate the impacts of discretionary well permitting at a programmatic level. Several key uncertainties underlie these scenarios: (1) GSPs for the subbasins in the Study Area have not yet been prepared and, as such, sustainable yields and management criteria remain to be established; (2) Important water policy decisions that could profoundly affect groundwater management in the region are currently pending (SWRCB, 2016); and, (3) The actual locations of wells that will be permitted under the County's discretionary well permitting program are not known. For these reasons, it is important to note that the simulated scenarios described below are not deterministic, quantitative assessments, but are intended to provide perspective on the reasonable range of potential outcomes, and to inform the evaluation of whether a potential exists for significant impacts to result from the permitting of discretionary wells by the County. The scenarios evaluated in this study are described in Table 6-1. Additional details regarding the approach used and the results of the simulations are presented in Sections 6.2 through 6.6, below.

6.2 Scenario 1 – Baseline

Scenario 1 provides the basic hydrologic conditions for each of the subsequent scenarios, and is the baseline against which Scenarios 2 through 5 are compared to assess the changes produced by the scenario assumptions using a superposition approach. The following approach was used to construct this scenario.

- Scenario 1 includes a sequence of historical hydrologic years assembled to represent a reasonable sequence of future hydrologic conditions. The selected years and their hydrologic year type based on the San Joaquin Valley Water Year Hydrologic Classification Index (DWR, 2017a) are presented on Figure 6-1. The hydrologic data used includes surface water inflows, precipitation and temperature/ evapotranspiration. Gridded PRISM data (Daly et al., 2004) for precipitation, where a mix of real years were associated with corresponding model years, were prepared as input for the SCHM grid.
- Surface water diversions for the forecast hydrologic years were developed for the baseline scenario using the approach summarized in Table 3-2. When the historical hydrologic years used to develop the forecast sequence preceded WY 1991, a representative year between WY 1991 and WY 2015 with a similar hydrology for which diversions were developed was utilized to represent diversions.
- Climate change was incorporated into the baseline scenario by assuming similar precipitation as historical conditions, and allowing for an increase in temperature. The temperature increase was associated with an increase in evapotranspiration that was calculated in input into the model. Evapotranspiration changes resulted from a steady increase in temperature of 0.0355 degrees Celsius (^{o}C) per year from WY 2016 through WY 2042. The selected temperature ramp is based on an extrapolation using recent trends in historical data for California, over 1970-2006, using US Historical Climate Network and National Weather Service Cooperative Network data for the San Joaquin basin

(Cordero et al., 2011). The specific value is the mean statistically significant increase for the daily minimum and daily maximum temperature at individual stations. This temperature change was used to calculate corresponding evapotranspiration changes using a variation of the Penman Equation developed by Makkink (Makkink, 1957),[9] and to develop multipliers to adjust monthly evapotranspiration values in the model Evapotranspiration Data file of C2VSim.

- In order to allow Scenario 1 to be used as a baseline for the evaluation of potential future groundwater management and demand changes, the groundwater demand simulated in this scenario is based on the assumption that WY 2015 urban demand will continue, WY 2015 land use patterns will be maintained throughout the forecast period, and WY 2015 time-dependent boundary conditions will be maintained.

6.3 Scenario 2 – Reasonable Upper Bound Potential Demand Increase

The municipal water demand increase simulated in this scenario was developed using water demand forecasts contained in UWMPs developed for the region as summarized in Table 6-2. As summarized in this table, the average median annual urban water demand increase in the region is approximately 2.7%.[10] This factor was used for all cities except Modesto. For Modesto, the mean forecast demand increase through 2040 is 0.08%; however, this average includes an initial forecast demand decline, and a forecast increase of 0.4% per year was therefore applied. Rural domestic groundwater demand was assumed to increase in proportion to a rural population growth rate of approximately 1 percent per year.

It is reasonable to assume that any increase in urban water demand and delivery would be associated with a corresponding increase in recharge from urban return flows, and from retirement of agricultural demand as parcels are converted for urban use. For this scenario, it was assumed that the projected demand increase represents a reasonable maximum net pumping increase that includes any offsetting agricultural demand reduction, and the associated return flow and deep percolation were not explicitly modeled.

Also simulated in this scenario is an increase in agricultural groundwater demand resulting from the conversion of unincorporated rangeland in the eastern portion of the county to irrigated agricultural land. The forecast rate of agricultural land conversion in Scenario is based on the historical rate of rangeland conversion to permanent crops in the eastern portion of the County between 2000 and 2015 reported by the Stanislaus County Agricultural Commissioner (Appendix A). Based on this information, it is assumed that 3,100 acres per year of rangeland in this area is converted to orchard.

Drawdowns predicted in Layers 1 and 2 in 2022 and 2042 under Scenario 2 are shown graphically in Figures 6-2 and 6-3, and key water budget changes are summarized in Table 6-3. These results are presented as

[9] Tetra Tech performed a study comparing six different methods to calculate evapotranspiration based on changes in temperature alone. The method of Makkink provided the best correlation with measured values and was adopted for use in developing the SCHM.

[10] This average includes data from UWMPs that predate as well as postdate the requirements of SBX7-7 in order to develop a reasonable maximum urban demand growth scenario. As such, the estimate was not developed to explicitly simulate current municipal water conservation/demand reduction requirements.

changes relative to the baseline case (Scenario 1). Changes induced by increasing municipal and agricultural groundwater demand under this scenario include the following:

- Under this scenario, drawdown in Layer 1 (the shallow aquifer system) in the eastern foothills area of the SCHM is predicted to range from approximately 1 to 3 feet by 2022 and approximately 5 to 30 feet by 2042. The lateral expansion of drawdown cones is limited by the major groundwater-connected streams draining the foothills, including the Stanislaus, Tuolumne and Merced Rivers. This is consistent with an increase in the amount of streamflow lost to groundwater as shown in Table 6-3. Drawdown in Layer 2 (the deeper aquifer system) in the eastern portion of the SCHM is predicted to range from approximately 1 to 5 feet in 2022 and approximately 10 to 40 feet in 2042.

- Groundwater levels in Layer 1 beneath Turlock and Patterson are predicted to rise between 1 and 2 feet by 2042. The rise in groundwater levels occurs because municipal pumping in these areas occurs primarily from the deeper aquifer system (Layer 2); whereas deep percolation from urban water use will be a source of recharge to Layer 1. In reality, a greater amount of net recharge to the shallow aquifer system may occur as a result of the conversion of agricultural land to urban land, and the retirement of agricultural water demand.

- Cones of depression are predicted to form in Layer 1 beneath urban areas that rely more extensively on groundwater from the shallow aquifer system (e.g., Modesto, Riverbank, Hughson and Oakdale). Layer 1 groundwater levels are predicted to fall by approximately 1 to 3 feet beneath these cities by 2042.

- A broad cone of depression is predicted to form in Layer 2, centered approximately on the Cities of Turlock and Patterson. Drawdowns beneath Turlock are predicted to range from 1 to 4 feet by 2022, and 10 to 20 feet by 2042. Drawdowns beneath Patterson are predicted to exceed 1 foot by 2022, and to range from 5 to 10 feet by 2042.

- Consistent with the observation above regarding apparent streamflow depletion due to pumping under Scenario 2, forecast water budget data (Table 6-3) indicates net groundwater discharge to streams from the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease several thousand AFY (approximately 0.6 & to 2 %) by 2022 and several tens of thousands AFY (approximately 4% to 13 %) by 2042, relative to the baseline case. Groundwater discharge from the Delta Mendota Subbasin to streams is not predicted to change significantly (less than 0.2 %).

- As summarized in Table 6-3, the cumulative groundwater storage change in the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease several thousand AF (approximately 0.1 %) by 2022 and several tens of thousand AF (approximately 0.4 % to 1.8 %) by 2042, relative to the baseline case. Groundwater storage change in the Delta Mendota Subbasin is not predicted to vary significantly from the baseline change.

6.4 Scenario 3 – Reasonable Lower Bound Potential Demand Increase

The municipal water demand increase simulated in this scenario was developed using 25% of the water demand forecasts contained in UWMPs developed for the region (Table 6-2). Studies indicate that urban water demand forecasts often overestimate the actual amount of demand growth by incorporating conservative assumptions regarding population growth, demographic changes and the effectiveness of water conservation (Woodard, 2015). A demand increase of 0.7% per year was used for municipal pumping, with the exception of Modesto, where a demand increase of 0.1% per year was applied based on the average forecast data. Similar to Scenario 2, it was assumed that net pumping increase that includes any offsetting agricultural demand reduction, and the associated return flow and deep percolation were not explicitly modeled. Rural domestic groundwater demand was assumed to remain constant, consistent with general a general plan policy to discourage additional residential development in agricultural areas of the county.

Scenario 3 also simulated an increase in agricultural groundwater demand resulting from the conversion of unincorporated rangeland in the eastern portion of the county to irrigated agricultural land, at a rate of approximately 20% of the historical rate. In general, the rate of agricultural land conversion in the eastern portion of the County has slowed since adoption of the Groundwater Ordinance in late 2014, and the economic pressures on land conversion have moderated as the price of almonds has stabilized; however, it is reasonable to assume that some agricultural land conversion will continue to occur. Based on this information, it is assumed that 610 acres per year of rangeland in this area is converted to orchard.

Drawdowns predicted in Layers 1 and 2 in 2022 and 2042 under Scenario 3 are shown graphically in Figures 6-4 and 6-5, and key water budget changes are summarized in Table 6-3. These results are presented as changes relative to the baseline case (Scenario 1). Changes induced by increasing municipal and agricultural groundwater demand under this scenario include the following:

- Under this scenario, drawdown in Layer 1 (the shallow aquifer system) in the eastern foothills area of the SCHM is predicted to be less than 1 foot in 2022, and to range from approximately 1 to 5 feet by 2042. Groundwater mounding or drawdown in other areas of the model is not predicted to exceed 1 foot.
- Similar to Scenario 2, the lateral expansion of drawdown cones is limited by the major groundwater-connected streams draining the foothills, including the Stanislaus, Tuolumne and Merced Rivers; however, the amount of stream flow depletion is predicted to be much less (Table 6-3).
- In Layer 2, limited areas with approximately 1 foot of drawdown are predicted to form in the eastern portion of the SCHM by 2022. By 2042, more extensive drawdown ranging from 1 to 5 feet is predicted in this area.
- A broad cone of depression is predicted to form beneath Turlock in Layer 2, and to reach approximately 1 to 4 feet of drawdown by 2042.
- Consistent with the observation above regarding apparent streamflow depletion due to pumping under Scenario 3, forecast water budget data (Table 6-3) indicates net groundwater discharge to

streams from the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 1,000 AFY each (approximately 0.1 % to 0.4 %) by 2022 and several thousand AFY (approximately 0.7 % to 2.5 %) by 2042, relative to the baseline scenario. Groundwater discharge from the Delta Mendota Subbasin to streams is not predicted to change significantly from the baseline.

- As summarized in Table 6-3, the cumulative groundwater storage change in the Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 1,000 AFY each by 2022 and several thousand AFY by 2042. Groundwater storage change in the Delta Mendota Subbasin is not predicted to vary significantly from the baseline.

6.5 Scenario 4 – Discretionary Well Permitting

Scenario 4 was constructed to evaluate the potential effects of permitting new discretionary wells under the County Groundwater Ordinance. This was accomplished by randomly selecting 10 model elements each year starting in 2018 for simulation of pumping from a new well that would theoretically be installed under the Ordinance. Ten wells per year is considered a reasonable maximum for this evaluation, based on the observation that only two discretionary wells have been processed for permitting during the first three years since the Ordinance was adopted in November 2014. Even if the rate of well permitting increases after adoption of the PEIR in early 2018, it appears unlikely that more than 10 wells per year will be permitted on average. Each well is assumed to extract approximately 400 AFY of groundwater from Layer 1 (Scenario 4a) or Layer 2 (Scenario 4b). The wells are assumed to be installed in unincorporated, non-district lands throughout the County from 2018 to 2020, and in unincorporated lands of the Modesto and Turlock Subbasin from 2021 to 2022, based on schedule mandated schedule for adoption of GSPs. The locations and installation years for the simulated wells are shown on Figure 6-6.

Drawdowns induced in Layers 1 and 2 in 2022 and 2042 are shown graphically in Figure 6-7 and 6-8 for Scenario 4a, and Figures 6-9 and 6-10 for Scenario 4b. Key water budget changes for Scenarios 4a and 4b are summarized in Table 6-3. These results are presented as changes relative to the baseline case.

Changes predicted to be induced by discretionary well permitting under Scenarios 4a (shallow wells) include the following:

- Cones of depression are predicted to develop in the eastern portion of the County in Layer 1, with drawdown ranging from 1 to 5 feet by 2022. By 2042 these cones of depression are predicted to expand and deepen to approximately 4 to 10 feet. The lateral expansion of drawdown cones is predicted to be limited by the Stanislaus and Tuolumne Rivers, from which the wells would derive at least some of their extracted groundwater, as summarized in Table 6-3. Smaller, local cones of depression are also predicted to form where wells are located in other areas of the County; however, these cones of are predicted to be more limited in size and depth, remaining between 1 and 2 feet in depth throughout the entire simulation. This distribution of drawdown is consistent with a greater degree of groundwater development and limited recharge in the eastern portion of the County.

- Drawdown in Layer 2 is predicted to be more muted. Predicted drawdown exceeding 1 foot is limited to the eastern portion of the County. In this area, several cones of depression are predicted to reach drawdowns from 1 to 3 feet. Similar to Layer 1, this drawdown is predicted to expend by 2042, and to range from 1 to 5 feet by that time.

- Consistent with the observation above regarding apparent streamflow depletion due to pumping under Scenario 4a, forecast water budget data (Table 6-3) indicates net groundwater discharge to streams from the Delta-Mendota, Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 3,400, 1,400 to 9,000 and 2,900 AFY (approximately 0.6 % to 1.7 %), respectively, by 2022, and 4,000, 2,900, 13,000 and 3,100 AFY (approximately 0.6 % top 1 %), respectively, by 2042, relative to the baseline scenario.

- As summarized in Table 6-3, cumulative groundwater storage change in the Delta-Mendota, Eastern San Joaquin, Modesto and Turlock Subbasins is forecast to decrease by about 1,000 to 4,000 AF (approximately 0.1 % or less) by 2022. Storage depletion rates are forecast to decrease over time. By 2042, cumulative storage depletion in the Eastern San Joaquin Subbasin is predicted to be approximately 1,300 AFY (approximately 0.3 %) less than the baseline, and be essentially unchanged from the baseline in the other subbasins. In addition, the annual rate of storage change in the subbasins is predicted to be low (less than 0.01 %) with the basins remaining relatively stable.

Changes predicted to be induced by discretionary well permitting under Scenarios 4b (deeper wells) include the following:

- As expected, the development of cones of depression in the upper aquifer system (Layer 1) for Scenario 4b (deeper wells) is predicted to be more muted than under Scenario 4a. Cones of depression are predicted to develop in the eastern portion of the County with drawdown ranging from 1 to 3 feet by 2022 and 3 to 5 feet by 2042. As in Scenario 4a, lateral propagation of drawdown appears to be limited by the Stanislaus and Tuolumne Rivers. Smaller cones of depression up to between 1 and 2 feet in depth are predicted to form in the central portion of the County by 2022 but are not predicted to grow further in size.

- In the deeper aquifer system (Layer 2), drawdown is predicted to be somewhat more extensive under Scenario 4b. A series of depression cones under the eastern portion of the County is predicted to reach a depth of 2 to 5 feet by 2022 and 3 to 6 feet by 2042. In addition, a broad area of drawdown is predicted to form in the confined aquifer system beneath the western portion of the County and to reach a depth of approximately 5 feet in 2022. Although the area of drawdown is predicted to grow by 2042, it is not predicted to get deeper.

- As summarized in Table 6-3, streamflow depletion under this scenario is predicted to be similar to, or somewhat less than, streamflow depletion rates under Scenario 4a. Groundwater storage depletion rates are predicted to be generally similar for the two scenarios, although cumulative depletion, on average, is predicted to be higher for Scenario 4b.

6.6 Scenario 5 – Additional Surface Water Delivery

Scenario 5 evaluates the potential effect of additional surface water deliveries to offset municipal demand. This scenario was developed using the demand growth simulated in Scenario 2, and groundwater level changes were evaluated relative to Scenario 1. Additional surface water deliveries were simulated using the currently planned Stanislaus Regional Water Authority (SWRA) project as a surrogate. It should be noted that this evaluation is intended to provide perspective on the potential effects of conjunctive use projects to help meet municipal water demand in the region, but actual evaluation of the impacts and benefits of the SRWA will require more in-depth analysis. To construct the water demand inputs for this scenario, it was assumed that up to 5,700 AFY of Tuolumne River water will be supplied to the City of Ceres and up to 11,100 AFY will be supplied to the City of Turlock, beginning in 2022 (West Yost, 2017). The point of diversion will be just downstream of the Greer Road bridge. The minimum groundwater extraction rates assumed to be needed to maintain the water quality and functionality of existing supply wells is assumed to be 2 million gallons/day (MGD) in Ceres and 6.6 MGD in Turlock (West Yost, 2016). During the winter months (assumed to be December through March), as much of the demand as possible will be supplied from surface water and groundwater pumping will be decreased to minimum levels. During the rest of the year, groundwater pumping may be increased above minimum levels, if needed to meet peak demands.

Scenario 5 maintained an increase in agricultural groundwater demand resulting from the conversion of unincorporated rangeland in the eastern portion of the county to irrigated agricultural land, at a rate of 3,100 acres per year.

Drawdowns predicted in Layers 1 and 2 in 2022 and 2042 under Scenario 5 are shown graphically in Figures 6-11 and 6-12, and key water budget changes are summarized in Table 6-3. These results are presented as changes relative to the baseline case (Scenario 1). Changes induced by increasing municipal and agricultural water demand and adding conjunctive use to meet the municipal demand under this scenario include the following:

- Under this scenario, predicted drawdown in Layer 1 (the shallow aquifer system) and Layer 2 in the eastern foothills area of the SCHM remains essentially unchanged from Scenario 2. Drawdowns predicted in the Delta-Mendota Subbasin near the City of Patterson are somewhat muted compared to Scenario 2, but are generally similar.
- In the western Turlock Subbasin beneath Turlock, groundwater levels are predicted to rise up to 1 to 2 feet by 2022 and up to 5 feet by 2042. Beneath the City of Patterson, groundwater levels are predicted to rise between 1 and 2 feet by 2042. As would be expected, the groundwater level rise under this scenario is greater than under Scenario 2, which simulates reasonable maximum groundwater demand growth.
- Groundwater levels in Layer 2 beneath the western Turlock Subbasin are also predicted to rise initially, reaching up to 4 feet above the baseline case. By 2042, however, groundwater levels are predicted to fall to elevations that are up to 10 feet below the baseline case. This is compared to drawdowns under Scenario 2 in the range of 1 to 4 feet by 2022, and 10 to 20 feet by 2042. As such,

indicate that conjunctive use is predicted to result in less drawdown and greater water level recovery than would occur otherwise, on the order of approximately 5 to 10 feet under the simulated assumptions. In addition, the scenario illustrates that a demand-growth tipping point may exist beyond which drawdown will increase even under a conjunctive use scenario. In the simulation, this tipping point occurs between 2022 and 2042 under demand growth forecasts that are based on regional averages (2.7%), and are less than the demand growth forecasts contained in the Ceres and Turlock UWMPs (4.23 and 3.73% per year, respectively; see Table 6-2).

- Net groundwater discharge to streamflow is predicted to be similar to or decrease less than under Scenario 2. The change in streamflow discharge relative to the baseline case in the Delta-Mendota, Modesto and Turlock Subbasins is predicted to be approximately 1,000, 9,000 and 3,000 AFY (approximately 0.5 % to 0.8 %), respectively (Table 6-3). Net change in groundwater discharge to streamflow in the Eastern San Joaquin Subbasin is similar under both scenarios (approximately 2 %).

- Net annual and cumulative storage change is predicted to be similar under both scenarios for the Delta-Mendota, Eastern San Joaquin and Modesto Subbasins. Annual storage change in the Turlock Subbasin is predicted to be approximately 13,000 AFY less than Scenario 2 in 2022, and 1,000 AFY less in 2042. Under Scenario 5, cumulative storage depletion is predicted to be approximately 74,000 acre-feet (AF) less than Scenario 2 by 2022, and over 1,000,000 AF less by 2042. However, this is only a small change in percentage (0.04 % and 0.2 %, respectively) relative to Scenario 2.

Scenario	Purpose	Description and Assumptions	Approach
Scenario 1 - Baseline	Establishes a baseline against which the other scenarios are compared.	Prepare a sequence years that will represent the hydrology dataset for forecasts. Use historical data to represent a representative sequence of normal, wet and dry years. Maintain 2015 groundwater demand and cropping patterns throughout the baseline forecast period. Incorporate climate change into the hydrology dataset by developing a temperature ramp based on published data and calculating the resulting evapotranspiration increases for input into the model. Use the resulting dataset as a comparison point for all of the subsequent scenarios.	Use the hydrology data series outlined in Figure 6-1 to simulate forecast hydrologic conditions. Use the approach outlined in Table 3-2 develop a diversion dataset. Escalate evapotranspiration using the Makkink method based on a temperature increase of 0.0355 °C/year. Maintain municipal and rural domestic demand at 2015 levels. Maintain 2015 cropping and land use patterns.
Scenario 2 – Reasonable Upper Bound Potential Demand Increase	Provide perspective on potential effects if agricultural groundwater demand grows at historical rates and municipal demand grows at rates forecast in UWMPs. This scenario is to represent an upper bound of reasonable demand growth.	Agricultural water demand is assumed to increase through the continued conversion of rangeland in the eastern foothill region at rates experienced from 2000 to 2015. Urban water demand is assumed to increase in accordance with water demand increases forecast in UWMPs, and to be offset to some degree with the conversion of remaining agricultural land to urban use. Rural domestic water demand is assumed to increase at forecast population growth rates in the Stanislaus County General Plan Housing Element.	Use the baseline data from Scenario 1 as a starting and comparison point. Increase municipal pumping by 2.7 %/year (median average UWMP demand increase) for all cities except Modesto. Increase municipal pumping in Modesto by 0.4%/year. Increase rural domestic pumping by 1%/year. Demand increase offset by land use conversion is captured in pumping rate adjustment. Convert Natural Vegetation land to Agricultural Land (orchards) in unincorporated, non-district areas, EWD and BCWD at a rate of 3,100 acres/year.
Scenario 3 – Reasonable Lower Bound Potential Demand Increase	Provide perspective on the effectiveness of limiting the expansion of groundwater extraction to decrease potential effects of agricultural and municipal groundwater demand increases. This scenarios is to represent a lower bound of reasonable demand growth.	Agricultural conversion in the east foothills is assumed to proceed at a rate that is approximately 20% of historical rates, consistent with recent slowdowns in the planting of new orchards in this area. Urban demand is assumed to increase at a rate that approximately 25% of forecast rates. This assumption assumes that UWMP demand forecasts may be overly conservative, that additional efficiency improvements will be implemented, and that some demand increase will be offset by urban development of agricultural land. In the case of Modesto, it is assumed that unused agricultural deliveries will be made available to meet municipal demand. Rural domestic demand is assumed not to grow, consistent with an existing General Plan policy to limit rural residential development.	Use the baseline data from Scenario 1 as a starting and comparison point. Increase municipal pumping by 0.7 %/year (25 % of median average UWMP demand increase) for all cities except Modesto. Increase municipal pumping in Modesto by 0.1%/year. Demand increase offset by land use conversion is captured in pumping rate adjustment. Convert Natural Vegetation land to Agricultural Land (orchards) in unincorporated, non-district areas, EWD and BCWD at a rate of 610 acres/year (20% of historical rate from 2000 to 2015).
Scenario 4a – Discretionary Well Permitting of Shallow Wells Scenario 4b – Discretionary Well Permitting of Deep Wells	Evaluate the potential effects of permitting new extraction wells subject to the Groundwater Ordinance on unincorporated, non-district lands within the County.	Add 10 new wells per year at randomly selected locations in unincorporated, non-district lands within the County between 2018 and 2020, then continue adding 10 wells per year from 2021 to 2022, but only in the Modesto and Turlock Subbasins. The timing of adding new wells is consistent with the time frame during which discretionary well permitting will occur prior to the adoption of GSPs in 2020 in the Eastern San Joaquin and Delta-Mendota Subbasins, and in 2022 in the Modesto and Turlock Subbasins. Ten wells per year are assumed to be added as an estimated upper bound assuming that the rate of discretionary well permitting will increase after completion of the PEIR. Note that since the Ordinance was adopted in November 2014, only two discretionary well permits have been processed; however, over 1,000 non-discretionary well permits were processed in the same time frame, indicating a back log of demand for well permits may exist.	Use the baseline data from Scenario 1 as a starting and comparison point. Add the wells shown in Figure 6-6, which were selected in the centers of randomly selected elements in unincorporated, non-district lands in the eastern foothills. Add the wells to either Model Layer 1 (Scenario 4a) or Model Layer 2 (Scenario 4b) in the sequence indicated on Figure 6-6. Specify pumping for the wells at a rate of 400 AFY (assuming a typical demand of 4 feet for a typical 100-acre orchard for each well).
Scenario 5 – Additional Surface Water Delivery	Evaluate the potential effectiveness of making additional surface water available to meet municipal water demand in the County.	Model delivery of additional surface water to Turlock and Ceres to simulate the general effect of projects such as the Stanislaus Regional Water Authority project on groundwater levels and budgets. Use Scenario 2 – Reasonable Upper Bound Potential Demand Increase as a starting point to compare effectiveness against.	Use the baseline data from Scenario 2 as a starting point and compare to Scenario 1. Model diversion of up to 5,600 AFY surface water from the Tuolumne River downstream of Geer Road to City of Ceres starting 2022 (West Yost, 2017), and decrease municipal pumping proportionally. Decrease well pumping to no less than 2 mgd and increase well pumping in April-November as needed to meet Scenario 2 demand (West Yost 2016). Model diversion of up to 11,100 AFY surface water from the Tuolumne River downstream of Geer Road to City of Turlock starting 2022 (West Yost, 2017), and decrease municipal pumping proportionally. Decrease well pumping to no less than 6.6 mgd and increase well pumping in April-November as needed to meet Scenario 2 demand (West Yost 2016).

Notes:
AFY = acre foot per year
BCWD = Ballico-Cortez Water District
EWD = Eastside Water District
GSP = Groundwater Sustainability Plan
mgd = million gallon per day
PEIR = Programmatic Environmental Impact Report
UWMP = Urban Water Management Plan
°C = degree Celsius
% = percent

Sources:
West Yost, 2016. *Preliminary Phasing and Water Treatment Plant Sizing for the SRWA Surface Water Supply Project.* June 16.
West Yost, 2017. *Surface Water Supply Project, Initial Project Capacity, Estimated Cost and Rate Impacts.* Presentation for Stanislaus Regional Water Authority. August 3.

TABLE 6-2
FORECAST URBAN WATER DEMANDS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Urban District	Year of UWMP	Total Water Demand (2016-2042)			Groundwater Demand (2016-2042)		Annual Demand Increase per Five Year Increment		Total Average Percent Increase
		Year	MGY	AFY	MGY	AFY	AFY	Percent	Acre Feet
City of Ceres	2015	2015	2,161	6,632	2,161	6,632	--	--	--
		2020	3,505	10,757	1,680	5,156	-295	-4.45%	--
		2025	4,241	13,016	2,416	7,415	452	8.76%	--
		2030	4,973	15,262	3,148	9,661	449	6.06%	--
		2035	6,006	18,432	4,181	12,831	634	6.56%	4.23%
City of Hughson	2006	2015	1,022	3,136	1,022	3,136	--	--	--
		2020	1,314	4,033	1,314	4,033	179	5.72%	--
		2025	1,661	5,097	1,661	5,097	213	5.28%	--
		2030	1,661	5,097	1,661	5,097	0	0.00%	3.67%
City of Livingston	2016	2015	2,191	6,724	2,191	6,724	--	--	--
		2020	2,257	6,927	2,257	6,927	41	0.60%	--
		2025	2,330	7,151	2,330	7,151	45	0.65%	--
		2030	2,413	7,405	2,413	7,405	51	0.71%	--
		2035	2,503	7,682	2,503	7,682	55	0.75%	--
		2040	2,604	7,992	2,604	7,992	62	0.81%	0.70%
City of Modesto	2016	2015	22,645	47,459	10,451	32,058	--	--	--
		2020	22,645	69,464	8,040	24,664	-1,479	-4.61%	--
		2025	24,418	74,902	8,596	26,369	341	1.38%	--
		2030	26,191	80,340	9,152	28,073	341	1.29%	--
		2035	27,964	85,778	9,708	29,778	341	1.21%	--
		2040	29,736	91,216	10,263	31,483	341	1.15%	0.08%
City of Newman	2016	2015	893	2,741	893	2,741	--	--	--
		2020	1,111	3,410	1,111	3,410	134	4.88%	--
		2025	1,234	3,787	1,234	3,787	75	2.21%	--
		2030	1,380	4,235	1,380	4,235	90	2.37%	--
		2035	1,535	4,711	1,535	4,711	95	2.25%	--
		2040	1,705	5,233	1,705	5,233	104	2.21%	2.78%

TABLE 6-2
FORECAST URBAN WATER DEMANDS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Urban District	Year of UWMP	Total Water Demand (2016-2042)			Groundwater Demand (2016-2042)		Annual Demand Increase per Five Year Increment		Total Average Percent Increase
		Year	MGY	AFY	MGY	AFY	AFY	Percent	Acre Feet
City of Oakdale	2015 (Water Master Plan)	2015	1,532	4,700	1,532	4,700	--	--	--
		2020	1,369	4,200	1,369	4,200	-100	-2.13%	--
		2025	1,467	4,500	1,467	4,500	60	1.43%	--
		2030	1,549	4,750	1,549	4,750	50	1.11%	--
		2035	1,614	4,950	1,614	4,950	40	0.84%	0.31%
City of Patterson	2016	2015	1,048	3,216	1,048	3,216	--	--	--
		2020	2,079	6,376	2,079	6,376	632	19.65%	--
		2025	2,627	8,058	2,627	8,058	336	5.28%	--
		2030	2,941	9,020	2,941	9,020	192	2.39%	--
		2035	3,254	9,982	3,254	9,982	192	2.13%	--
		2040	3,568	10,944	3,568	10,944	192	1.93%	6.28%
City of Riverbank	2014	2015	1,662	5,098	1,662	5,098	--	--	--
		2020	1,786	5,478	1,786	5,478	76	1.49%	--
		2025	2,007	6,157	2,007	6,157	136	2.48%	--
		2030	2,229	6,837	2,229	6,837	136	2.21%	--
		2035	2,451	7,517	2,451	7,517	136	1.99%	2.04%
City of Turlock	2016	2015	5,675	17,417	5,675	17,417	--	--	--
		2020	8,462	25,970	8,462	25,970	1,711	9.82%	--
		2025	9,394	28,830	9,394	28,830	572	2.20%	--
		2030	10,432	32,016	10,432	32,016	637	2.21%	--
		2035	11,586	35,557	11,586	35,557	708	2.21%	--
		2040	12,870	39,498	12,870	39,498	788	2.22%	3.73%
City of Waterford	2016 (Water Master Plan)	2015	456	1,400	456	1,400	--	--	--
		2020	548	1,680	548	1,680	56	4.00%	--
		2025	639	1,960	639	1,960	56	3.33%	--
		2030	694	2,128	694	2,128	34	1.71%	--

TABLE 6-2
FORECAST URBAN WATER DEMANDS
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

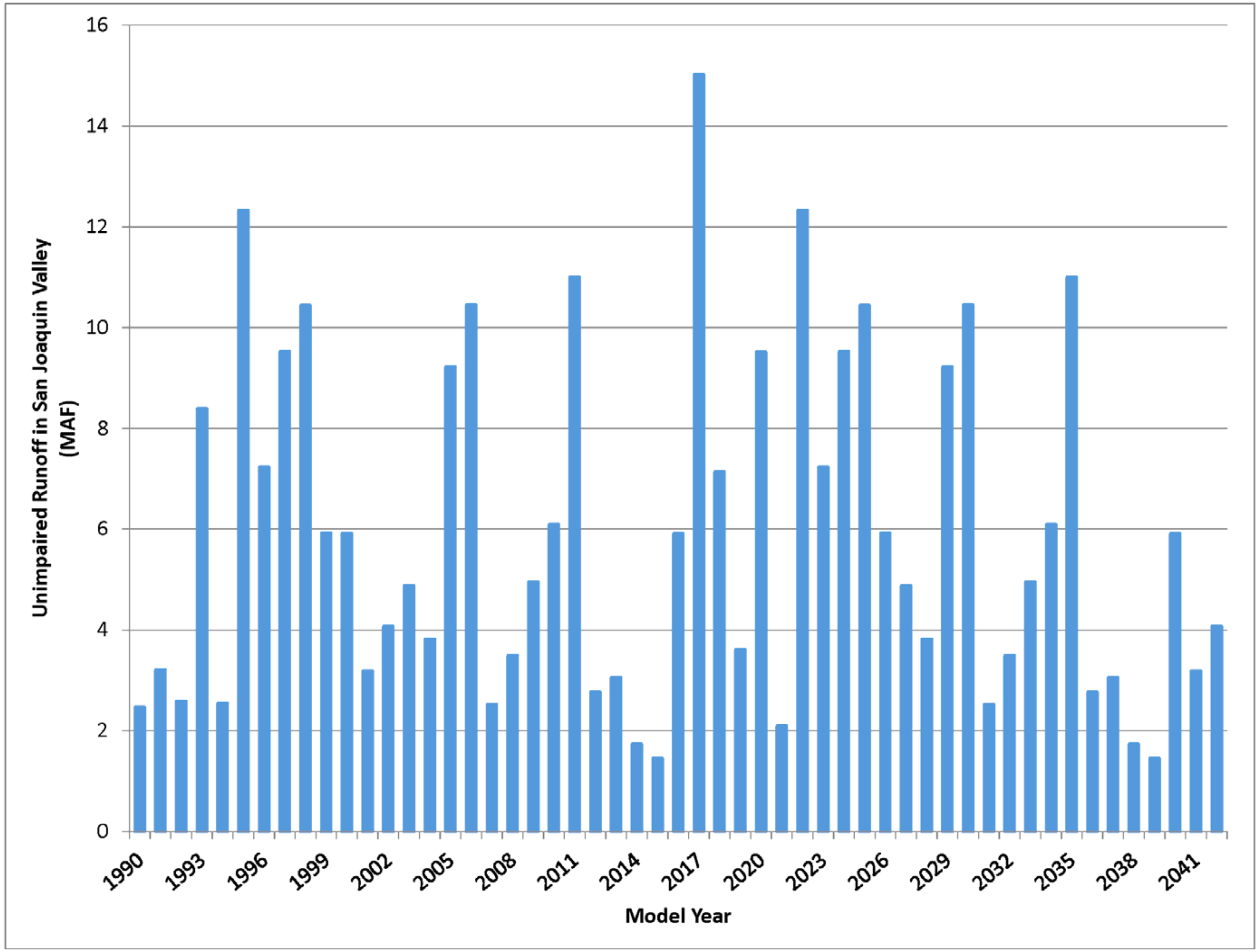
Urban District	Year of UWMP	Total Water Demand (2016-2042)			Groundwater Demand (2016-2042)		Annual Demand Increase per Five Year Increment		Total Average Percent Increase
		Year	MGY	AFY	MGY	AFY	AFY	Percent	Acre Feet
City of Waterford (continued)	2016 (Water Master Plan)	2035	767	2,352	767	2,352	45	2.11%	--
		2040	840	2,576	840	2,576	45	1.90%	2.61%
								Average	2.64%
								Median Average	2.70%

Notes:
AFY = acre foot per year
MGY = million gsllon per year
UWMP = Urban Water Management Plan
% = percent

TABLE 6-3
FORECAST SCENARIO GROUNDWATER BUDGET COMPARISON
Stanislaus County Hydrologic Model: Development and Forecast Modeling
Stanislaus County, California

Subbasin	Water Budget Component	Groundwater Budget Change Relative to Baseline in WY 2022					Groundwater Budget Change Relative to Baseline in WY 2042				
		Scenario 2	Scenario 3	Scenario 4a	Scenario 4b	Scenario 5	Scenario 2	Scenario 3	Scenario 4a	Scenario 4b	Scenario 5
Delta-Mendota	Change in Stream Gain from GW (AC-FT)	72	39	(3,390)	(1,525)	86	682	174	(3,964)	(1,948)	1,528
	Cumulative Storage Change (AC-FT)	(7,612)	(1,044)	(135,676)	(138,058)	(7,057)	(35,935)	(4,967)	(155,574)	(171,005)	(12,131)
	Annual Storage Change (AC-FT)	(63)	(7)	(837)	(1,031)	95	(479)	(52)	29	52	(469)
Eastern San Joaquin	Change in Stream Gain from GW (AC-FT)	(2,809)	(556)	(1,419)	(1,714)	(2,799)	(18,649)	(3,519)	(2,923)	(3,182)	(18,428)
	Cumulative Storage Change (AC-FT)	(255,244)	(48,244)	(175,725)	(162,065)	(255,201)	(3,433,006)	(627,837)	(636,517)	(549,882)	(3,430,237)
	Annual Storage Change (AC-FT)	(5,600)	(1,021)	(2,861)	(2,417)	(5,591)	(21,772)	(4,005)	(1,306)	(1,115)	(21,766)
Modesto	Change in Stream Gain from GW (AC-FT)	(9,413)	(1,851)	(8,963)	(7,163)	(6,714)	(57,614)	(10,973)	(13,068)	(11,411)	(48,206)
	Cumulative Storage Change (AC-FT)	(337,180)	(64,877)	(266,959)	(273,856)	(334,436)	(2,952,544)	(562,514)	(644,028)	(654,576)	(2,905,847)
	Annual Storage Change (AC-FT)	(6,690)	(1,277)	(4,420)	(4,597)	(6,203)	(17,992)	(3,422)	(268)	(245)	(17,970)
Turlock	Change in Stream Gain from GW (AC-FT)	(5,057)	(924)	(2,853)	(2,434)	(5,027)	(26,372)	(4,982)	(3,066)	(2,782)	(23,579)
	Cumulative Storage Change (AC-FT)	(331,978)	(62,373)	(315,628)	(340,189)	(257,691)	(2,217,507)	(425,147)	(363,417)	(417,594)	(1,191,660)
	Annual Storage Change (AC-FT)	(4,678)	(947)	(853)	(1,407)	8,202	(11,682)	(2,346)	(50)	(64)	(10,887)

Notes:
AC-FT = acre feet
GW = groundwater
WY = water year



Model Year (1990 – 2042)	Hydrology Data Year	Data Year Unimpaired Runoff in San Joaquin Valley (MAF)	Data Year Type	Climate Adjustment 2016 - 2042 (Temperature °C)
1990	1990	2.46	C	--
1991	1991	3.2	C	--
1992	1992	2.58	C	--
1993	1993	8.38	W	--
1994	1994	2.54	C	--
1995	1995	12.32	W	--
1996	1996	7.22	W	--
1997	1997	9.51	W	--
1998	1998	10.43	W	--
1999	1999	5.91	AN	--
2000	2000	5.9	AN	--
2001	2001	3.18	D	--
2002	2002	4.06	D	--
2003	2003	4.87	BN	--
2004	2004	3.81	D	--
2005	2005	9.21	W	--
2006	2006	10.44	W	--
2007	2007	2.51	C	--
2008	2008	3.49	C	--
2009	2009	4.94	BN	--
2010	2010	6.08	AN	--
2011	2011	10.99	W	--
2012	2012	2.76	D	--
2013	2013	3.05	C	--
2014	2014	1.72	C	--
2015	2015	1.44	C	--
2016	2000	5.9	AN	0.0355
2017	1983	15.01	W	0.0710
2018	1984	7.13	AN	0.1065
2019	1985	3.6	D	0.1420
2020	1986	9.5	W	0.1775
2021	1987	2.08	C	0.2130
2022	1995	12.32	W	0.2485
2023	1996	7.22	W	0.2840
2024	1997	9.51	W	0.3195
2025	1998	10.43	W	0.3550
2026	1999	5.91	AN	0.3905
2027	2003	4.87	BN	0.4260
2028	2004	3.81	D	0.4615
2029	2005	9.21	W	0.4970
2030	2006	10.44	W	0.5325
2031	2007	2.51	C	0.5680
2032	2008	3.49	C	0.6035
2033	2009	4.94	BN	0.6390
2034	2010	6.08	AN	0.6745
2035	2011	10.99	W	0.7100
2036	2012	2.76	D	0.7455
2037	2013	3.05	C	0.7810
2038	2014	1.72	C	0.8165
2039	2015	1.44	C	0.8520
2040	2000	5.9	AN	0.8875
2041	2001	3.18	D	0.9230
2042	2002	4.06	D	0.9585

Notes:
AN = above normal BN = below normal C = critically dry D = dry MAF = million acre foot °C = degree Celsius
Source: California Department of Water Resources, California Data Exchange Center. California Cooperative Snow Surveys.
Website: http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST.

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Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

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FIGURE 6-1

SCHM Forecast Hydrologic Data, 2016 - 2042

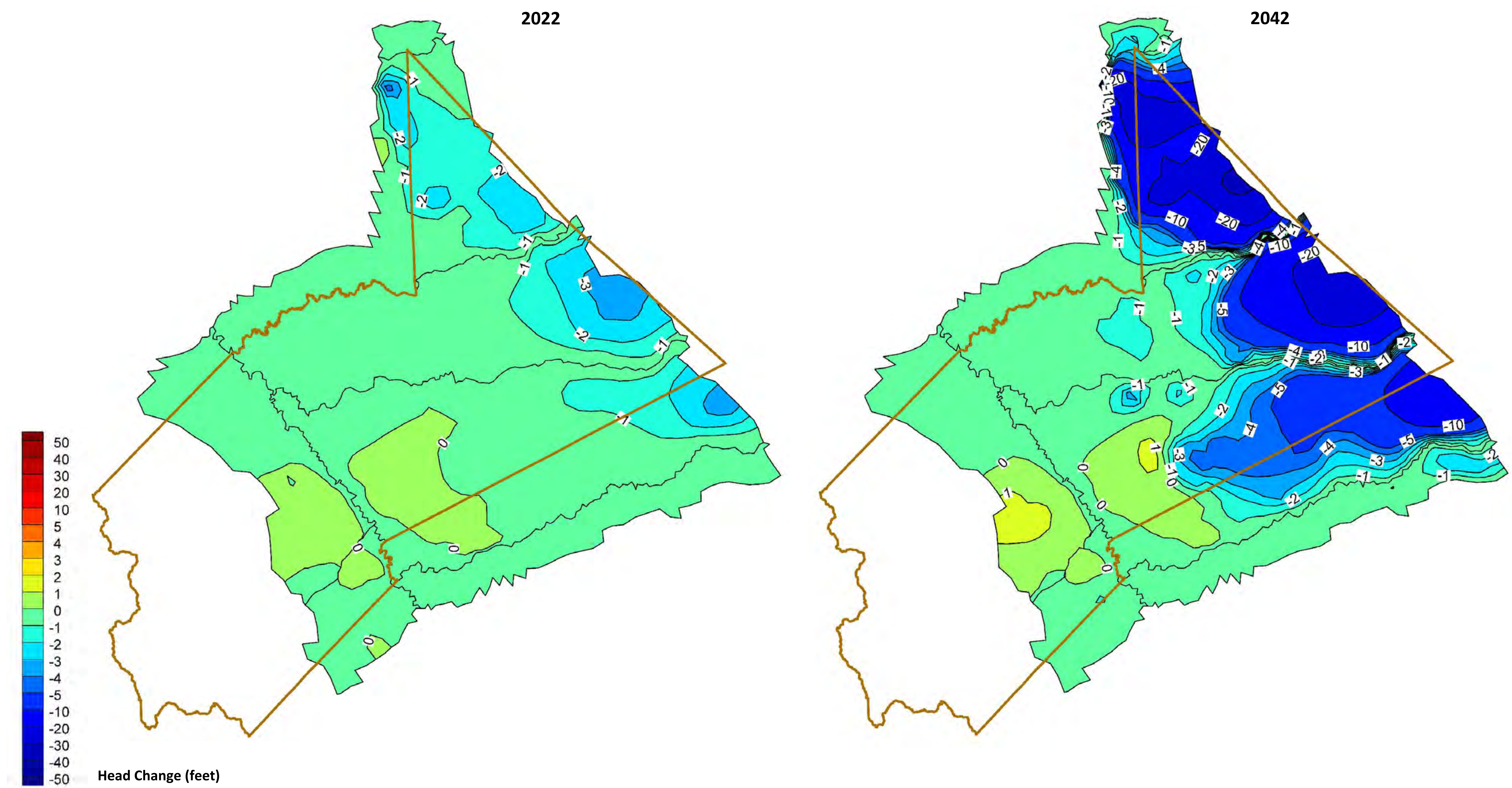

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FIGURE 6-2

Scenario 2 Head Change Predictions in SCHM Layer 1

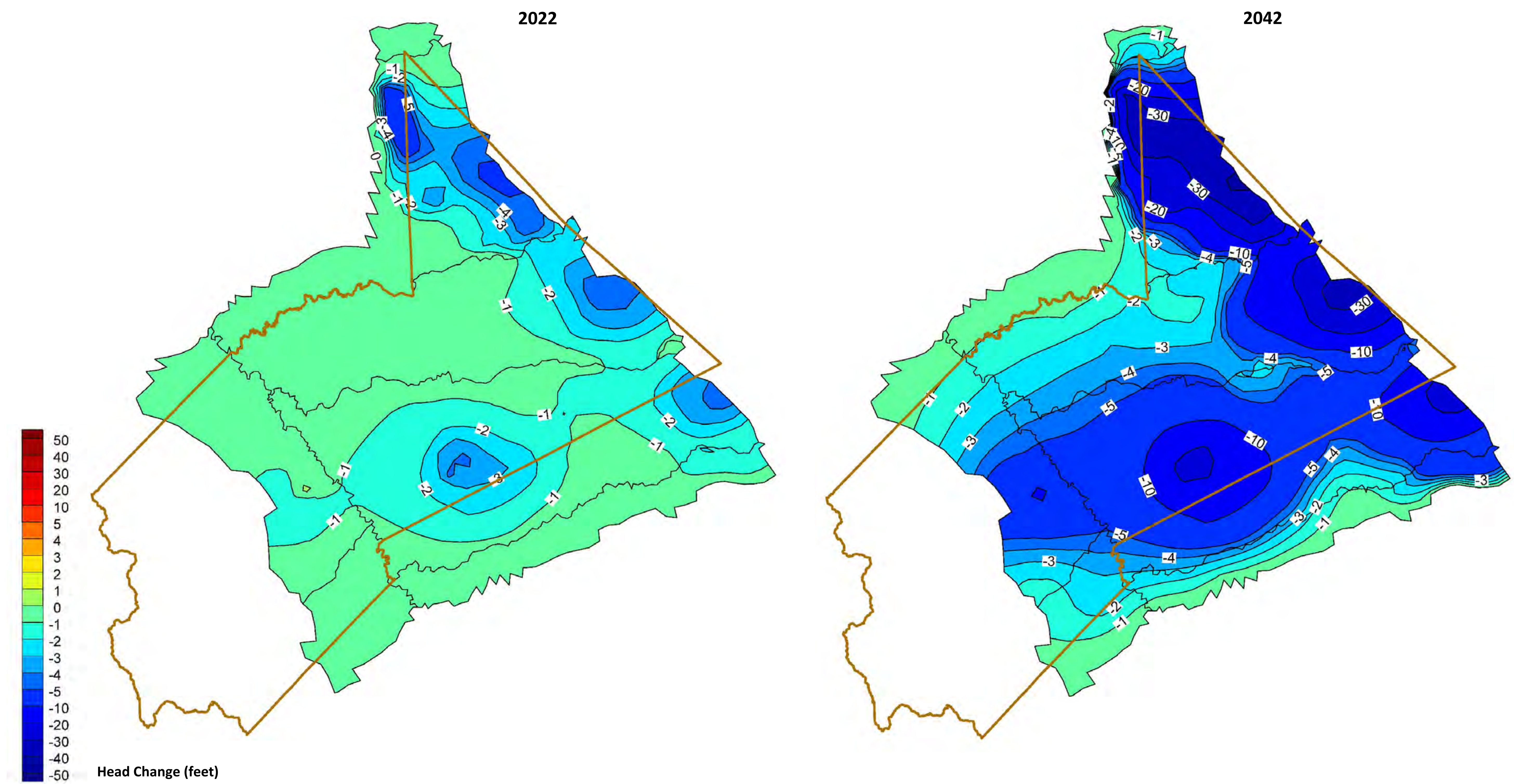

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FIGURE 6-3

Scenario 2 Head Change Predictions in SCHM Layer 2

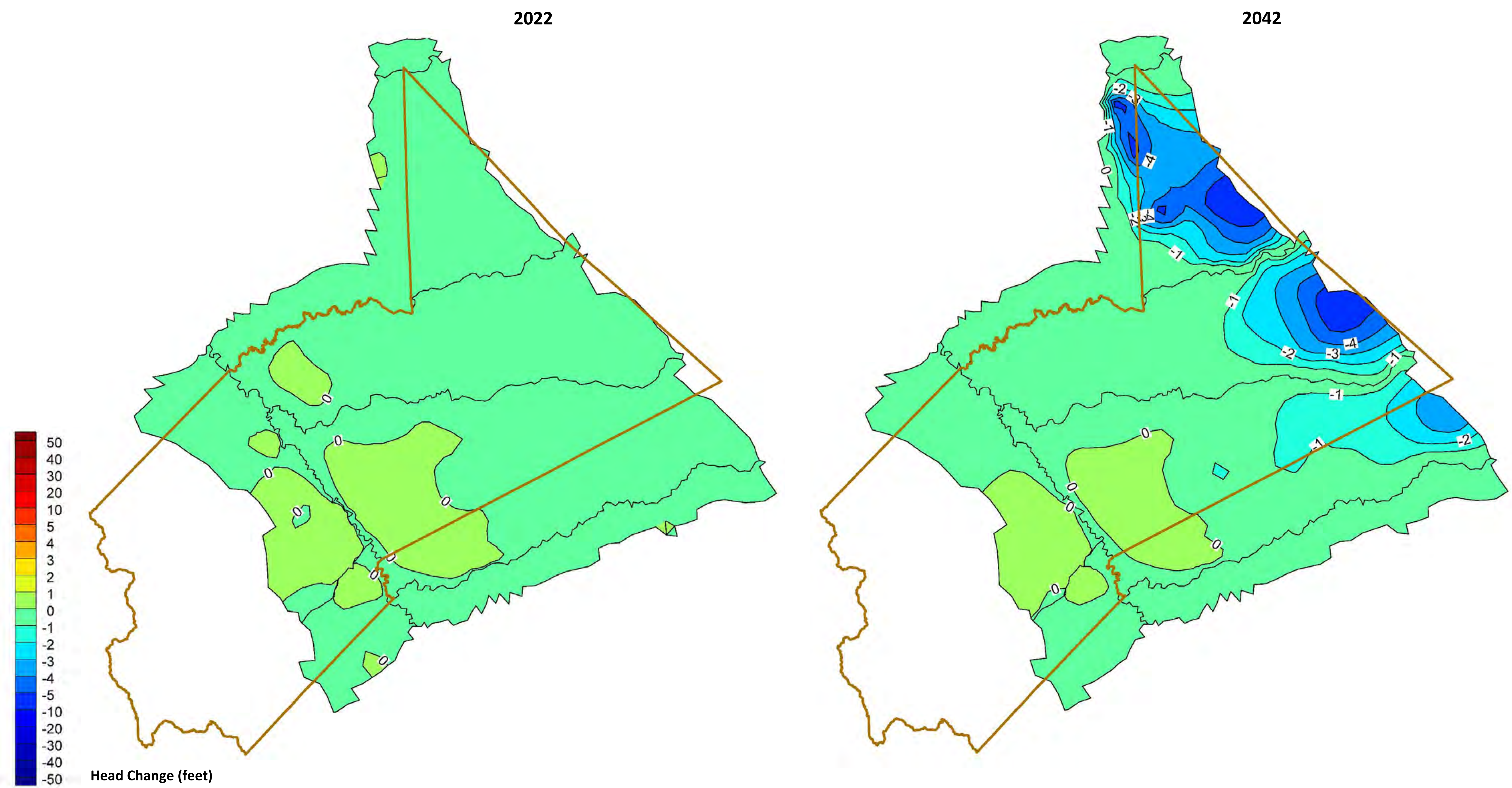

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FIGURE 6-4

Scenario 3 Head Change Predictions for SCHM Layer 1

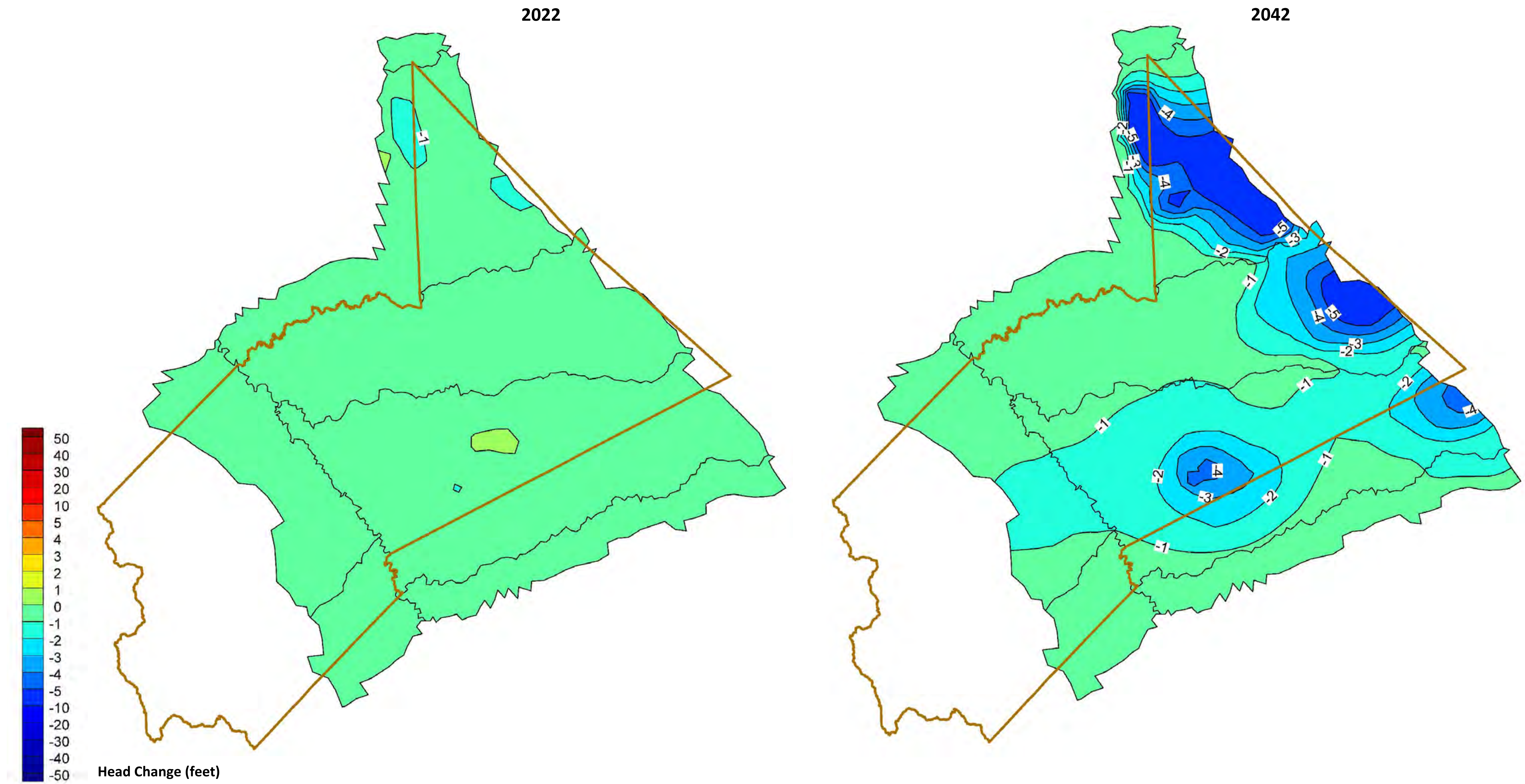

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FIGURE 6-5

Scenario 3 Head Change Predictions for SCHM Layer 2

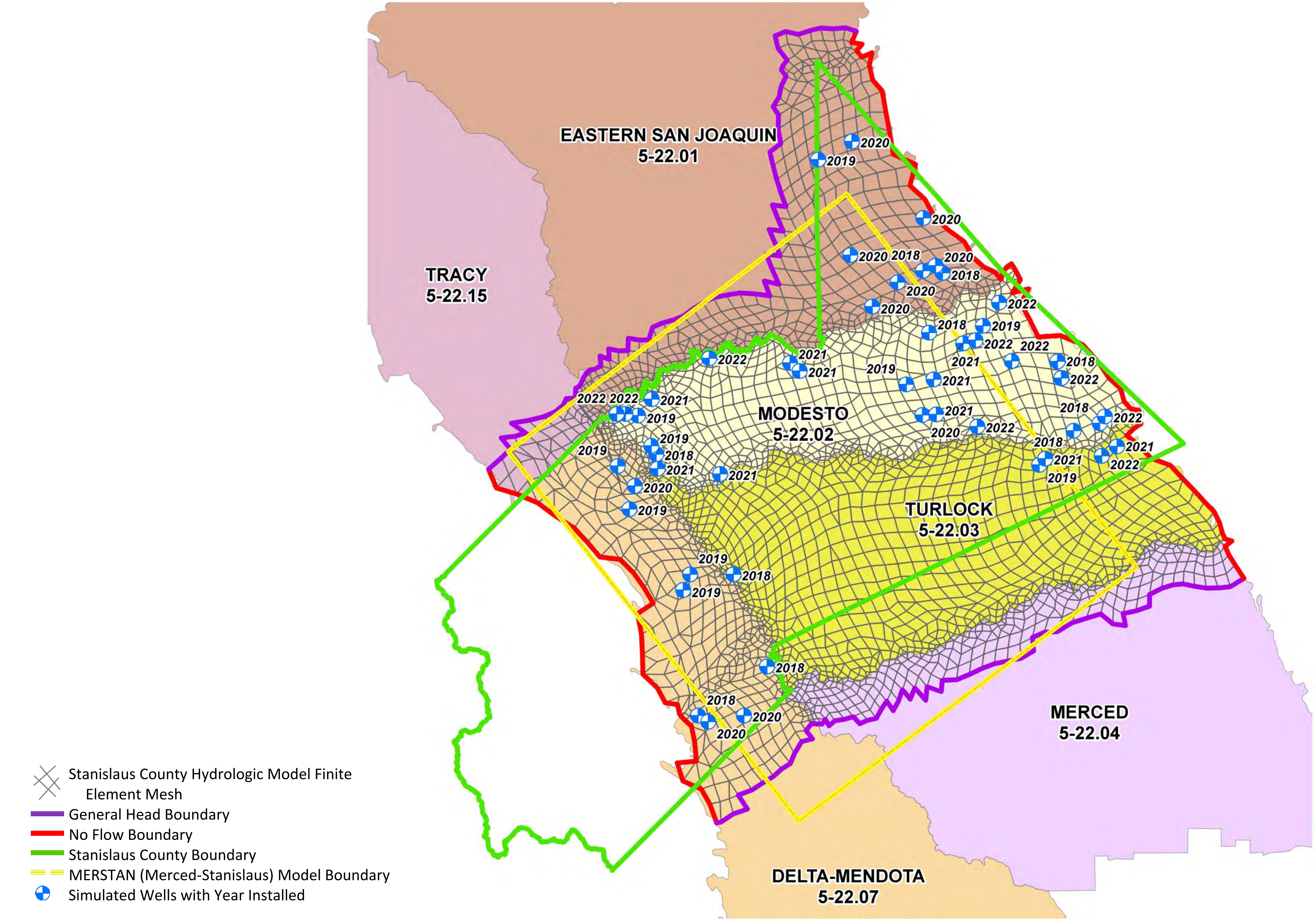

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FIGURE 6-6

Scenario 4a and 4b:
Location of Simulated Wells and Year Installed

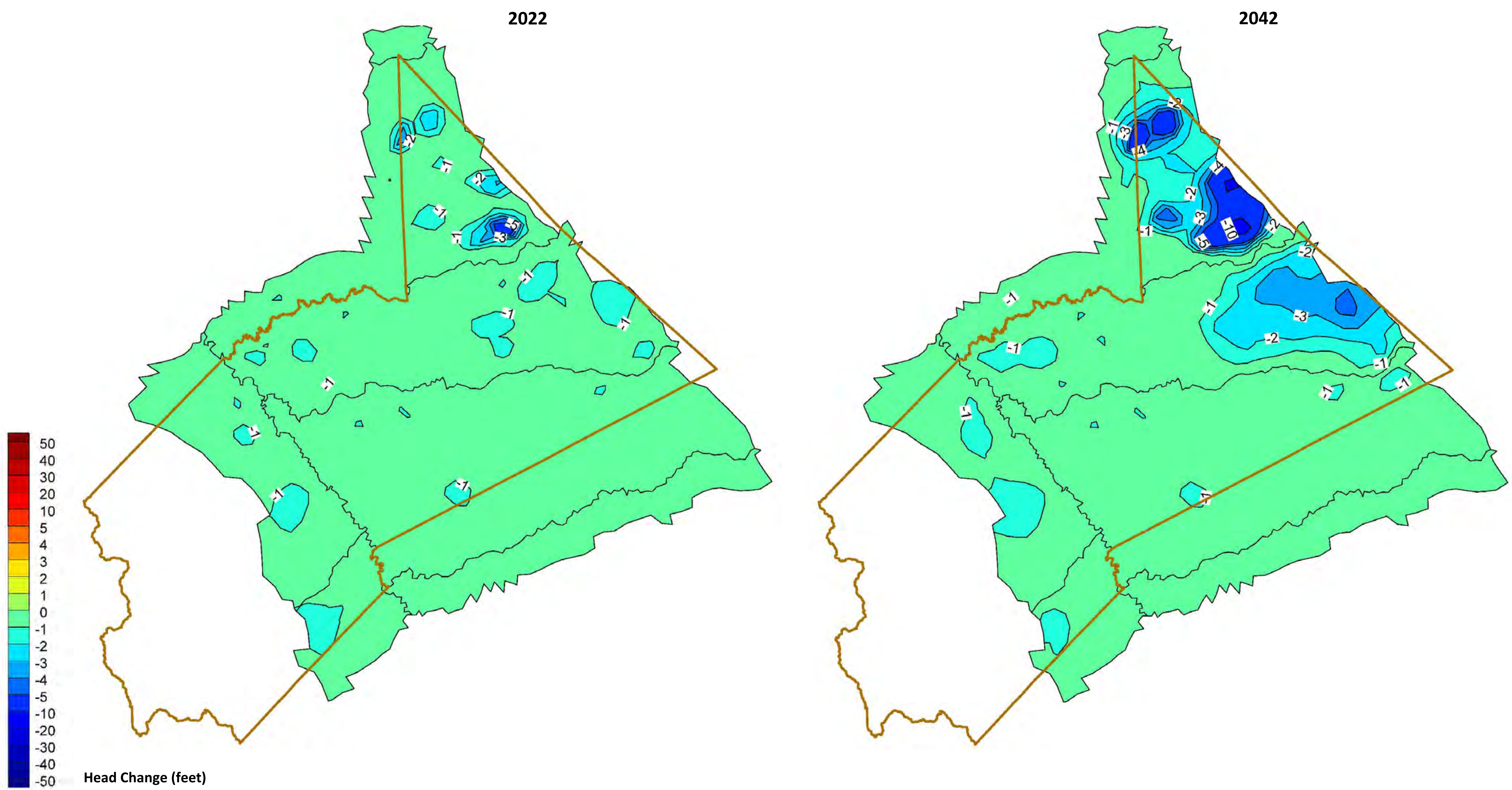

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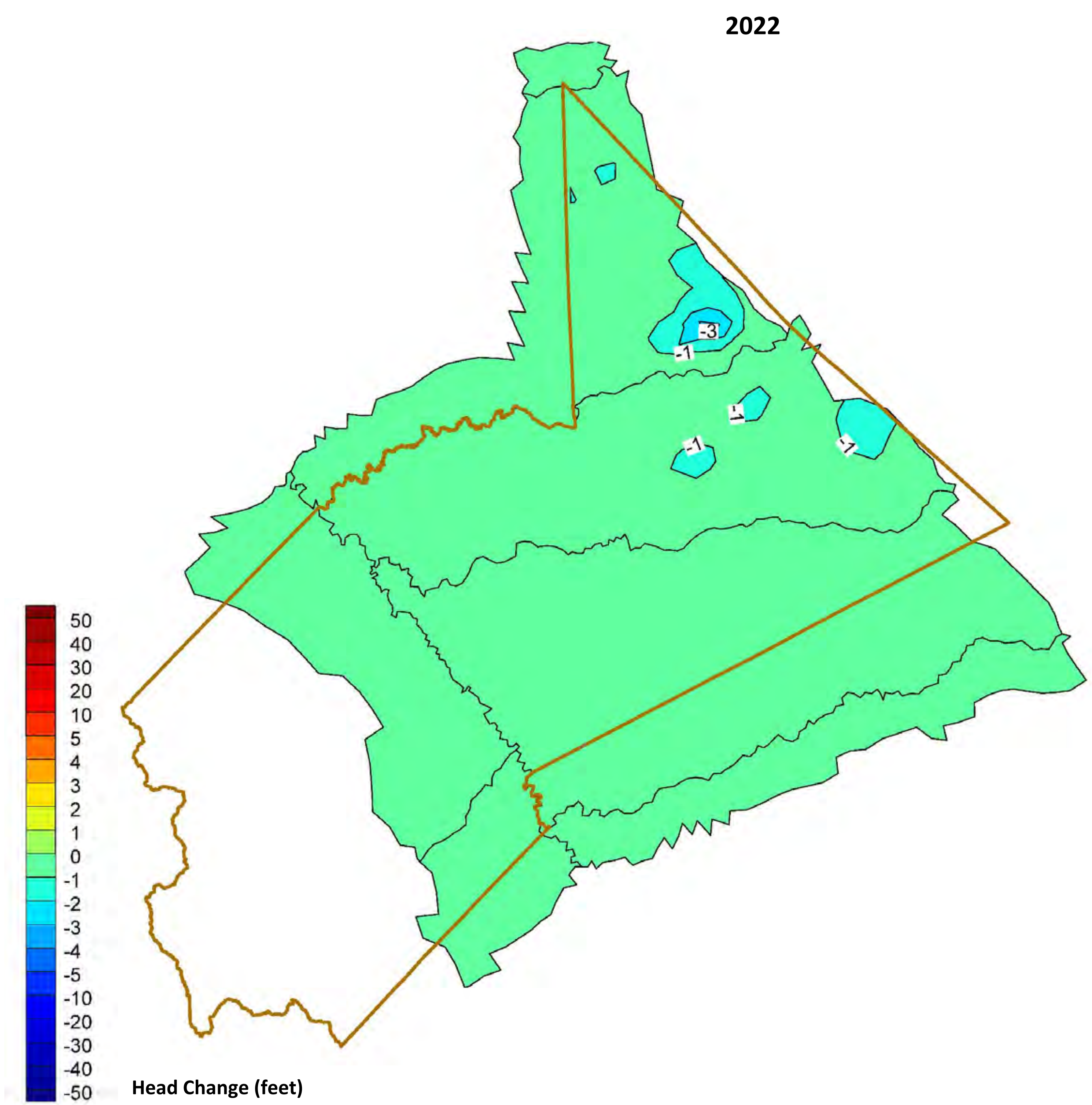
FIGURE 6-7

Scenario 4a Head Change Predictions for SCHM Layer 1



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Stanislaus County Hydrologic Model: Development and Forecasts
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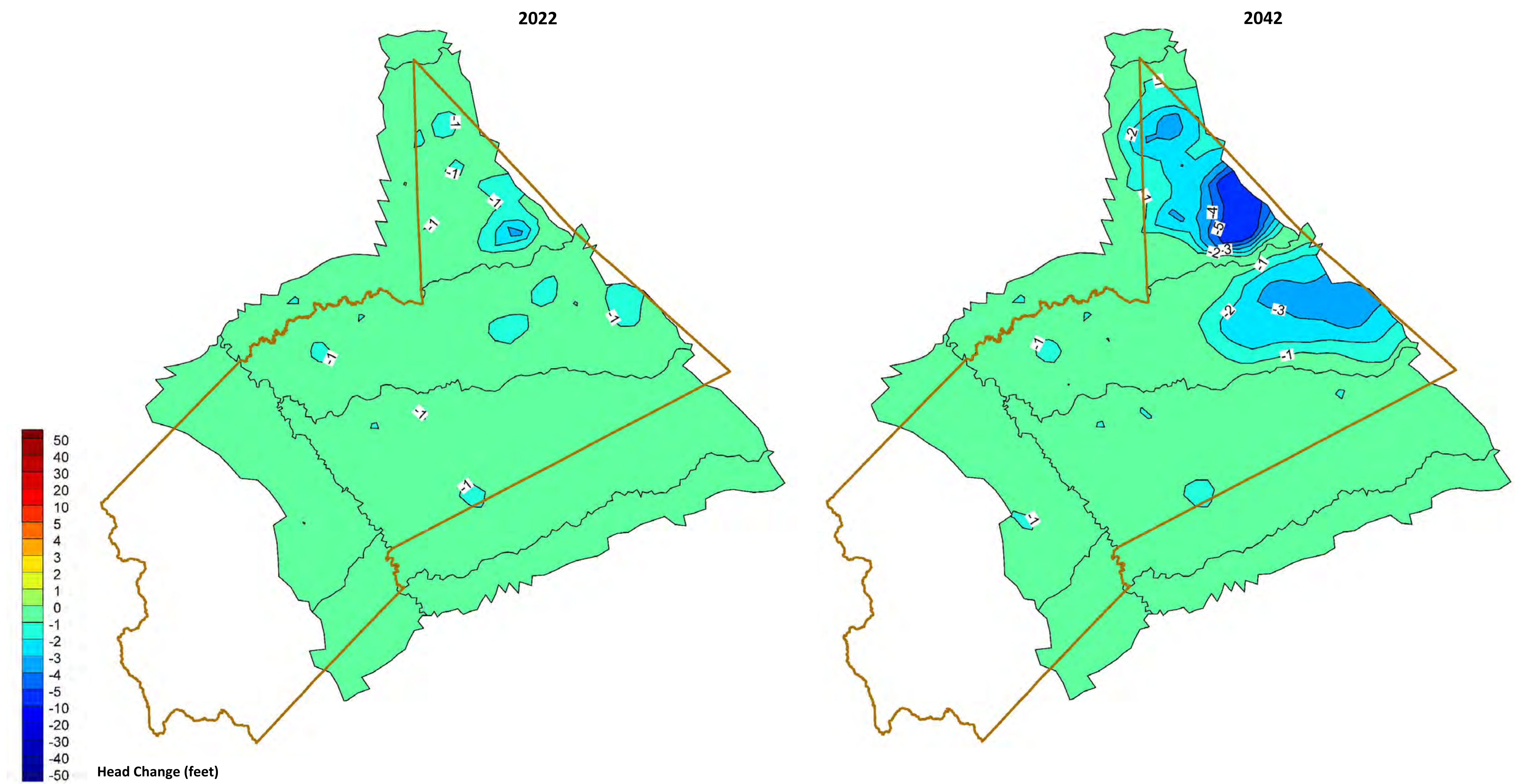
FIGURE 6-8

Scenario 4a Head Change Predictions for SCHM Layer 2



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Stanislaus County Hydrologic Model: Development and Forecasts
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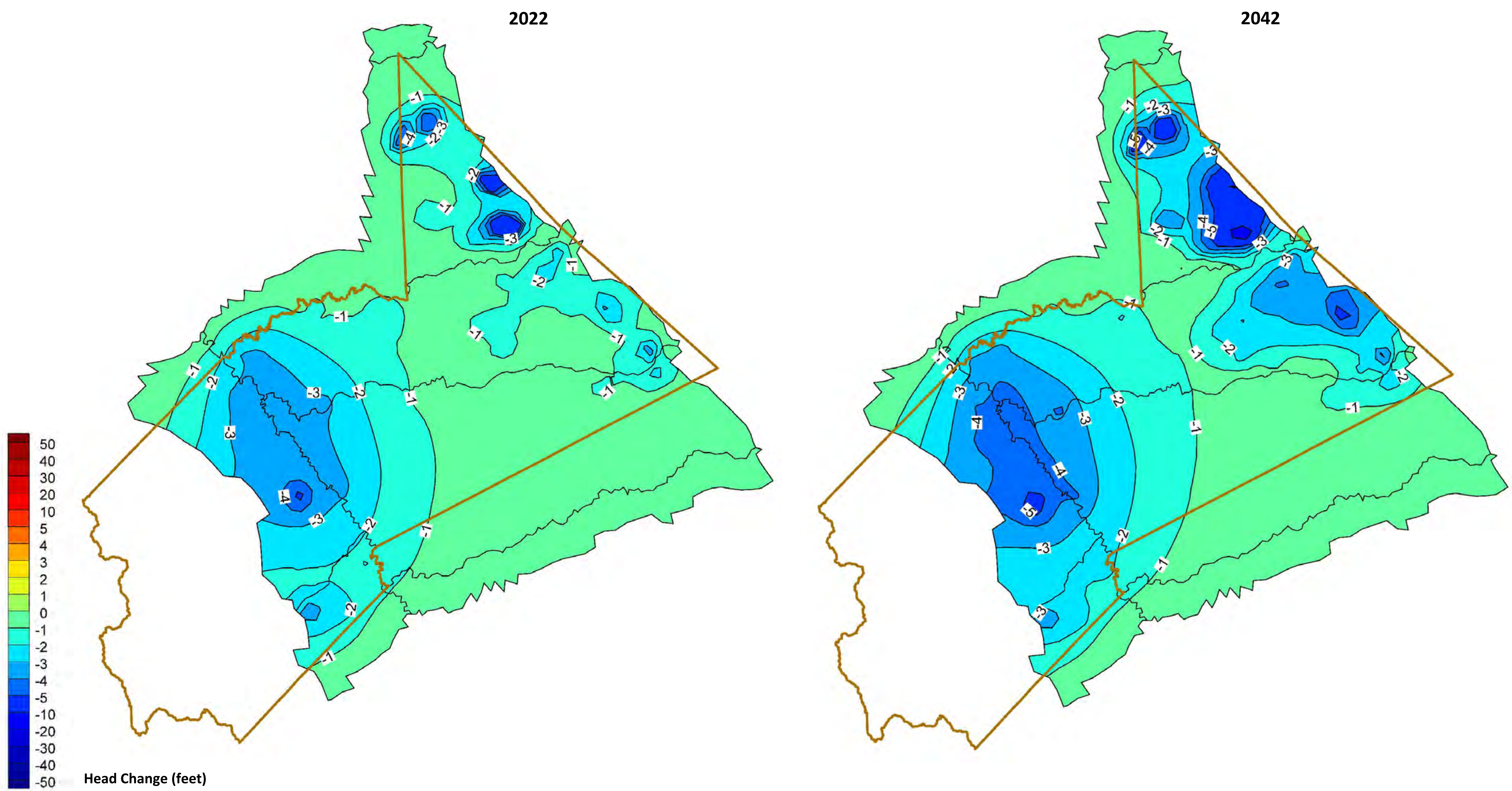
FIGURE 6-9

Scenario 4b Head Change Predictions for SCHM Layer 1



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Stanislaus County Hydrologic Model: Development and Forecasts
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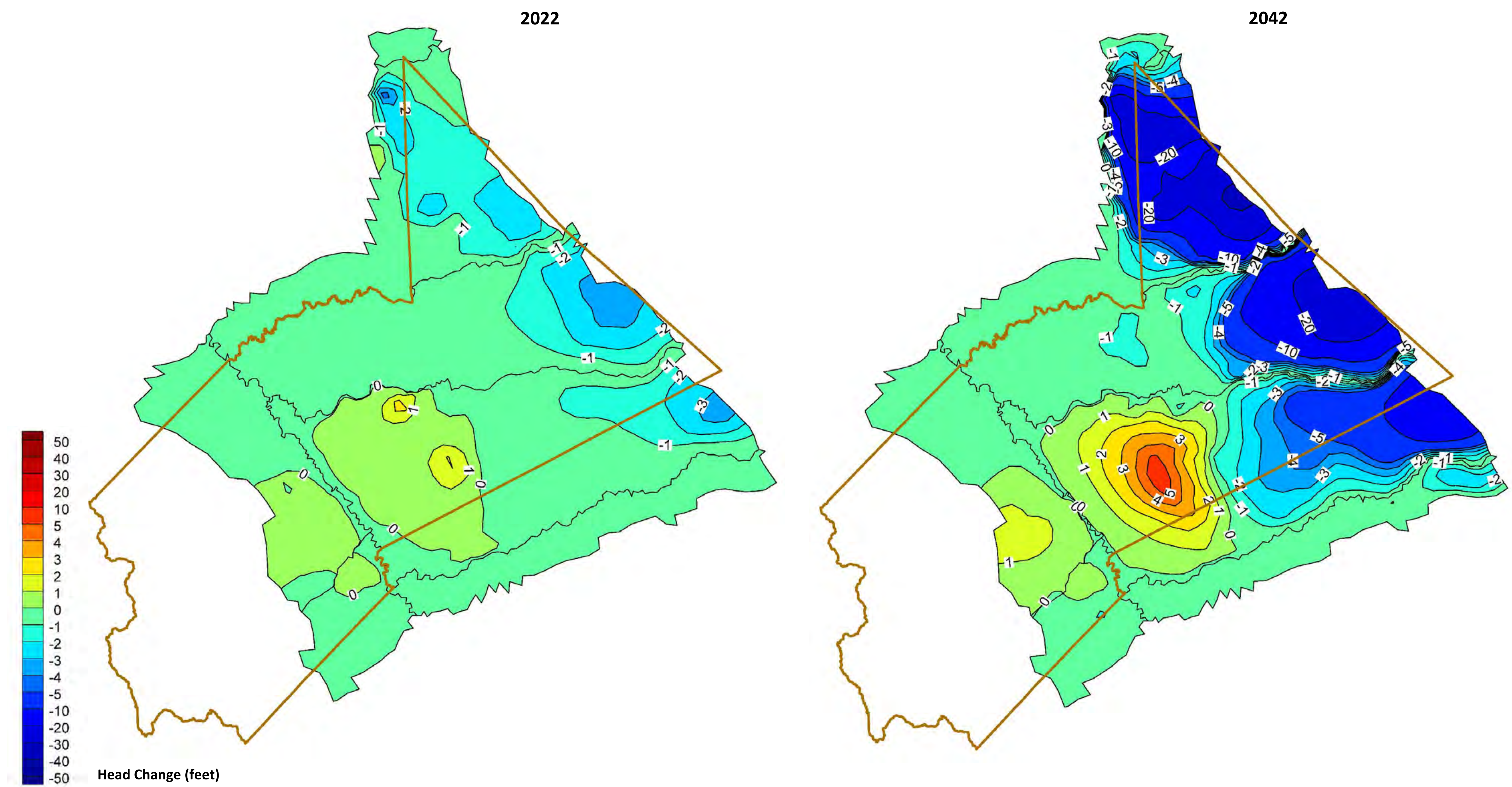
FIGURE 6-10

Scenario 4b Head Change Predictions for SCHM Layer 2



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Stanislaus County Hydrologic Model: Development and Forecasts
Stanislaus County, California

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FIGURE 6-11

Scenario 5 Head Change Predictions for SCHM Layer 1

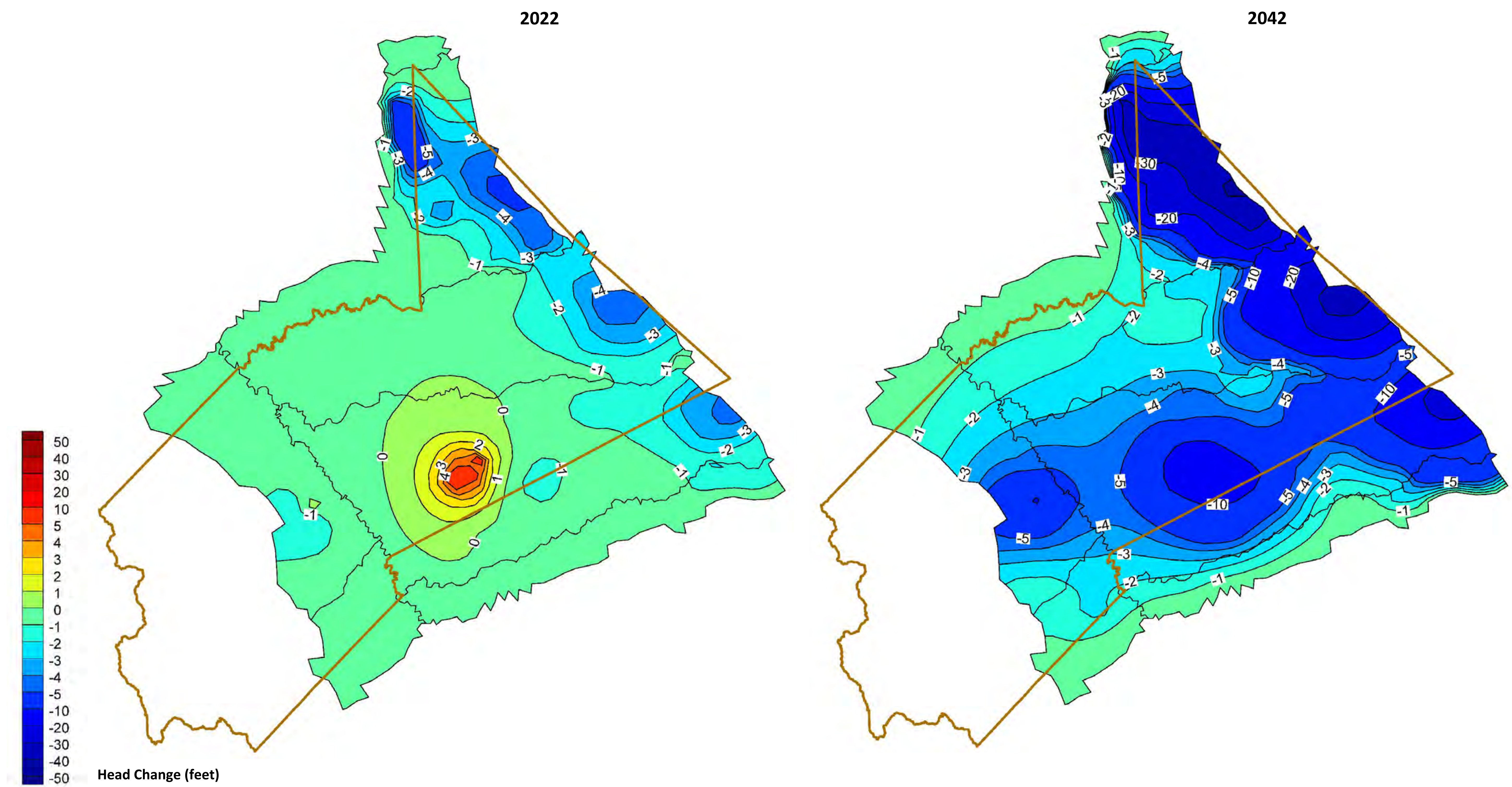

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FIGURE 6-12

Scenario 5 Head Change Predictions for SCHM Layer 2

7.0 CONCLUSIONS AND RECOMMENDATIONS

The primary objectives of developing the SCHM were to provide a tool that may be used for evaluation of program-level impacts of implementing the County's discretionary well permitting program, and producing an incremental improvement in understanding and modeling of regional hydrogeologic conditions that builds on past efforts and can help inform future studies leading up to development of GSPs. The groundwater budget, cross boundary flow, and some head data produced by the SCHM should be considered preliminary and indicative; however, the forecast data are produced using a superposition approach that is adequate for the evaluation of program-level impacts to groundwater resources. As noted in the preceding sections, further refinement of groundwater modeling in the area will be needed to produce subbasin-scale models that can support the preparation of GSPs, or that are suitable for evaluation of groundwater and other hydrologic impacts associated with specific projects. This can be accomplished through the construction of new models, by updating the SCHM, or by creating more detailed "child" models within the SCHM domain that incorporate sufficient refinements to meet future modeling objectives. The construction, calibration and sensitivity testing of the SCHM, as well as its use to evaluate historical conditions and forecast future conditions, provides key information to identify and prioritize data needs and opportunities to support such activities. Key findings and recommendations are discussed below.

7.1 Principal Findings of Forecast Analysis

The modeling forecast analysis provided insights into changes in water budgets and groundwater levels that could occur throughout the County under a variety of scenarios and stresses. Both water budgets and groundwater levels are discussed in Section 6 and principal findings are summarized below. Table 7-1 provides a summary of the model forecast water budgets for the entire model area.

Table 7-1a Modeling Forecast Water Budget Summary

Combined All Subbasins	Groundwater Budget Change Relative to Baseline in WY 2022				
	Scenario 2 Upper Bound Demand Increase	Scenario 3 Lower Bound Demand Increase	Scenario 4a Discretionary Well Permitting Shallow Aquifer	Scenario 4b Discretionary Well Permitting Deep Aquifer	Scenario 5 Additional Surface Water Delivery
Change in Stream Gain from GW (AC-FT)	(17,207)	(3,292)	(16,625)	(12,835)	(14,454)
Cumulative Storage Change (AC-FT)	(932,014)	(176,538)	(893,987)	(914,168)	(854,385)
Annual Storage Change (AC-FT)	(17,031)	(3,252)	(8,972)	(9,452)	(3,498)

Table 7-1b Modeling Forecast Water Budget Summary

Combined All Sub-Basins	**Groundwater Budget Change Relative to Baseline in WY 2042**				
	Scenario 2 Upper Bound Demand Increase	**Scenario 3 Lower Bound Demand Increase**	**Scenario 4a Discretionary Well Permitting Shallow Aquifer**	**Scenario 4b Discretionary Well Permitting Deep Aquifer**	**Scenario 5 Additional Surface Water Delivery**
Change in Stream Gain from GW (AC-FT)	(101,954)	(19,299)	(23,021)	(19,323)	(88,685)
Cumulative Storage Change (AC-FT)	(8,638,993)	(1,620,466)	(1,799,536)	(1,793,056)	(7,539,876)
Annual Storage Change (AC-FT)	(51,925)	(9,825)	(1,595)	(1,372)	(51,091)

Principal conclusions from the SCHM forecast analysis include the following.

- Comparing water budgets over the short term (Table 7-1a through WY 2022), the reasonable lower bound demand increase scenario (Scenario 3) results in the least stream depletion and removes the least water from storage (cumulative and annual). Over the long term (Table 7-1b through WY 2042), decreased demand and the discretionary well permitting program (with wells in either the shallow aquifer [Scenario 4a] or deep aquifer [Scenario 4b] zones), water budget are similar and have significantly less impacts to stream depletion and groundwater storage compared to Scenario 2 (the reasonable upper bound demand increase scenario. The difference in streamflow and aquifer depletion simulated in Scenario 5 (additional surface water) decreases the effects of Scenario 2, and would compensate for a large percentage of Scenario 3 impacts.
- In all of the forecast scenarios except Scenario 4b (discretionary well permitting with addition of new wells in the deeper aquifer), increases in groundwater demand led to a greater drawdown response in the eastern foothills area of the model than in other locations. This was generally true in both Model Layer 1 and 2 (the shallow aquifer system and the deeper aquifer system), and appears to reflect a greater relative sensitivity of this area to groundwater stresses. Greater sensitivity to drawdown stresses in this area may result from less local recharge being available due to local soil conditions and a lack of surface water availability.
- A second area of the model where groundwater stresses appeared to result in greater drawdown is the north central area of the model in Model Layer 2 beneath the Corcoran Clay. This area displayed the greatest amount of drawdown in Scenario 4b, which evaluated the effects of permitting discretionary wells in the deeper aquifer. The area may be more susceptible to drawdown because it represents a terminal outflow point of the model, where water budget effects become cumulative, and because the strongly confined nature of the deeper aquifer system beneath the Corcoran Clay

results in greater drawdown per unit volume of water extracted. The historical model simulates a broad cone of depression in this area (Figures 4-7 and 4-8), as does C2VSim.

- Groundwater extraction in the western portion of the model and from the shallow aquifer system resulted in higher amounts of streamflow depletion than groundwater withdrawal from the deeper aquifer or in other areas. Nevertheless, the increases in streamflow depletion resulting from higher groundwater demand were relatively modest, and the amount of total streamflow depletion that was forecast was relatively modest and below the typical range of error of stream gaging stations (typically about +/- 5 %).
- Groundwater level drawdown from municipal pumping was greatest in cities that rely primarily on wells completed in the deeper aquifer system, such as Turlock. Increase in municipal demand in these areas were accompanied by a slight increase in shallow groundwater levels resulting from deep percolation of return flows, while groundwater extraction from the confined, deep aquifer system led to higher rates of drawdown than in other areas.
- The greatest amount of drawdown was predicted under Scenario 2 (reasonable upper bound potential demand increase), which is based on worst case assumptions regarding municipal, rural domestic and agricultural demand growth. Demand growth at the simulated rates has a low likelihood of ever being realized, but coupled with Scenario 3 (reasonable lower bound potential demand increase), which incorporates a more realistic demand growth scenario, provides a useful preliminary perspective for investigating the relationship between demand growth, drawdown, and sustainable yield.
- Scenario 5 (Scenario 2 with additional surface water delivery) illustrates the effectiveness of conjunctive use projects to help alleviate local drawdown. For perspective, the surface water supply rates simulated in this scenario appear capable of moderating the drawdown resulting from worst case demand growth (Scenario 2), and more than offset the drawdown associated with a more reasonable demand growth rate (Scenario 3). However, the volumes of surface water assumed to be supplied under Scenario 5 are relatively small compared to regional demand, and did little to offset streamflow or storage depletion at a subbasin level.

7.2 Principal Findings and Recommendations from Model Construction and Calibration

7.2.1 Selected Model Code and Scheduled Improvements

Updates to the DWR's C2VSim are being developed using the IWFM 2015 modeling code, which features an improved ability to apply water budget data, simulate demand, route deep percolation, and other key features. The USGS is also working to refine the CVHM and MERSTAN models. In addition, efforts are underway to develop improved cropping and evapotranspiration datasets. These efforts, which were in progress as the SCHM was being developed, will be available for use by future subbasin-scale modeling efforts needed to support GSP development. Finally, subbasin scale modeling efforts were in progress in the Eastern San Joaquin Subbasin to the north and west of the SCHM domain, and to the south of the SCHM in the Merced Subbasin. It is expected that the results of these efforts will be useful to better understanding water budget processes in the region and cross boundary flows into and out of these respective modeling areas.

7.2.2 Water Budgets

Efforts during construction of the SCHM focused on refinement of water budgets to a greater degree than refinement of model lithology or model calibration. Nevertheless, significant data needs and opportunities for further refinement of local and regional water budgets remain that were beyond of the scope of the current project to address. These include the following.

- Additional data likely exist regarding urban and agricultural water demand, well completions, surface water deliveries, system losses, tile drainage, return flows and system "spill", that were not provided by water districts or available from published plans. These data could be used as an input to improve understanding of regional, subbasin and local water budgets, and would serve as a primary data source to help guide future model calibration and refinement efforts.
- Refined datasets regarding historical cropping patterns and evapotranspiration based on improvements in remote sensing data application are being developed by DWR. As was stated in Section 4.5.3, agricultural pumping accounts for 80 to 89% of groundwater pumping in the County. Therefore, these data, coupled with comparison to data from the Agricultural Commissioner and field-level verification, provide a significant and necessary opportunity for model refinement. As illustrated by the results of the sensitivity analysis for evapotranspiration, accurate data regarding these key agricultural water budget inputs are essential to model accuracy and to producing meaningful calibration results. These data should be incorporated into future modeling efforts based on codes (such as IWFM 2015) with an improved capability of applying and simulating agricultural water budget processes.
- Urban water budgets in the SCHM were refined using updated historical demand data and well completion information, but urban water budget processes in the SCHM are based largely on *ad hoc* assumptions incorporated into the C2VSim that may be appropriate for regional modeling, but can be substantially refined for more local application. This includes information regarding system leakage, wastewater return flow, indoor vs. outdoor water use, storm drainage and urban evapotranspiration, among others. Refinements to the processes are available in IWFM 2015, and should be applied in tandem with investigation of refined urban water budgets.
- Industrial groundwater pumping data were not provided for the development of the SCHM. The approach taken to developing rural domestic groundwater demand inputs for the SCHM around urban fringes may compensate for this deficiency somewhat by estimating higher rural domestic demand in areas where the model water budget subregions overlap with both urban and rural census tracts. Industrial groundwater users in the region tend to be located in these urban fringe areas.

However, the extent of this effect has not been evaluated. If provided in the future, industrial groundwater demand data would be useful for developing a refined understanding of urban water budgets.

- Recharge from offstream storage reservoirs in eastern Stanislaus County is an important water budget component. C2VSim does not include these reservoirs, and recharge rates incorporated into MERSTAN were based on rough estimates. Recharge rates were developed for SCHM based on district-provided water balance data, but could likely be refined. A disparity existed between the recharge rates estimated for Woodward and Modesto Reservoir, and those estimated based on data provided for Turlock Lake, with the rates for Turlock Lake being several times higher even though the reservoirs are all of fairly similar size and located in similar geologic settings. During the calibration process, high water levels were noted in the vicinity of Turlock Lake and the recharge rate for this lake was therefore adjusted downward. It would be desirable to further investigate the actual recharge rates for these reservoirs, as the most complete water balance dataset among the three reservoirs was provided for Turlock Lake, and this adjustment was not based on a comparison to the other reservoir for which data was more limited, and local groundwater levels.

7.2.3 Measured and Simulated Groundwater Levels

Development of groundwater level calibration datasets and calibration of the SCHM revealed that the current CASGEM dataset, which does not differentiate monitoring data from different hydrostratigraphic zones, may lead to an overly simplified understanding of groundwater levels and flow. In many cases, we found that wells completed to total depths within Model Layer 2 had measured water levels that were more consistent with simulated and measured water levels in Model Layer 1. When considered together with data from other nearby wells, in many cases it appeared that this was a function of the well construction rather than an inaccuracy in the modeling results. Theoretically this is possible when deep wells cross-connect the upper and lower aquifer systems mixing water from the two zones due to annular flow, cross screening or damaged well casings, and vertical flow in the wells causes water levels within the well to be dominated by higher groundwater levels in the upper aquifer system. Further work is warranted to investigate groundwater levels in the shallow and confined aquifer systems, especially in the area underlain by the Corcoran Clay.

Historical groundwater level data in the eastern foothill region of the SCHM is, at present, relatively sparse, but efforts are underway by Stanislaus County and the Agricultural Preservation Alliance (APA) to compile additional data that can help inform future modeling efforts.

Based on the above observation and the simulate historical SCHM model results for Model Layer 1 and Model Layer 2, groundwater levels in the confined aquifer system beneath the Corcoran Clay may be deeper than has previously be recognized on a regional basis. However, the calibration data also indicate that the model has a bias toward underpredicting water levels in Model Layer 2. Model Layer 2 beneath the Corcoran Clay in the north-central portion of the County represents the most downgradient portion of the model domain, and be subject to the cumulative effects of all upstream model inputs, including any errors. Investigation of groundwater levels at discrete hydrostratigraphic intervals will be key to making meaningful improvements in model calibration and refining model accuracy.

7.2.4 Model Aquifer Parameters

The most sophisticated lithology dataset in the SCHM region stems from extensive work completed by the USGS for the MERSTAN model. Care was taken during calibration of the SCHM not to disregard this dataset and make widespread hydraulic conductivity adjustments in this area when other model inputs are not constrained at a similar level of detail. Outside the active MERSTAN domain to the east and to the west, a limited dataset of specific capacity and aquifer tests was utilized to update model hydraulic conductivity. Additional specific capacity test data are being compiled by Stanislaus APA for the eastern foothills area of the SCHM and will be available to help inform future modeling efforts. Similar data may be available for the Delta-Mendota Subbasin portion of the SCHM. Alternatively, well log data for these areas could be compiled and analyzed geostatistically to expand the MERSTAN geostatistical lithology model the edges of the groundwater basin.

The model sensitivity analysis indicates that lateral hydraulic conductivity, vertical hydraulic conductivity, and storage coefficients are all sensitive parameters, and the model could be improved through their refinement. The greatest variation noted in the sensitivity analysis was in response due to decreases in lateral hydraulic conductivity, which produced the greatest head decline below the Corcoran Clay in Layer 2, although Layer 1 was also sensitive to this parameter to a lesser degree. An unexpected result was the variation in effect from one location to another, especially in Layer 1. The same change produced increases and declines in groundwater levels in adjacent areas. The source of this variability should be further investigated in order to facilitate future changes to the model inputs.

Aquifer storage coefficients had a more uniform effect on groundwater levels, which was most pronounced in Layer 2. Relatively few data sources for aquifer storage coefficients exist within the SCHM domain. Additional data from aquifer tests may exist that were not considered in constructing the SCHM, and deriving additional data from future aquifer tests would help to constrain this important parameter and support more refined and meaningful model calibration.

The vertical hydraulic conductivity of the Corcoran Clay is a key parameter in terms of its influence on groundwater flow and levels, especially in Layer 2, yet little direct data exist to substantiate this property within the SCHM domain. Focused studies to help constrain this property on a subregional basis, laboratory analysis of cores, and/or carefully constructed aquifer testing would help to constrain this parameter and support more refined and meaningful model calibration.

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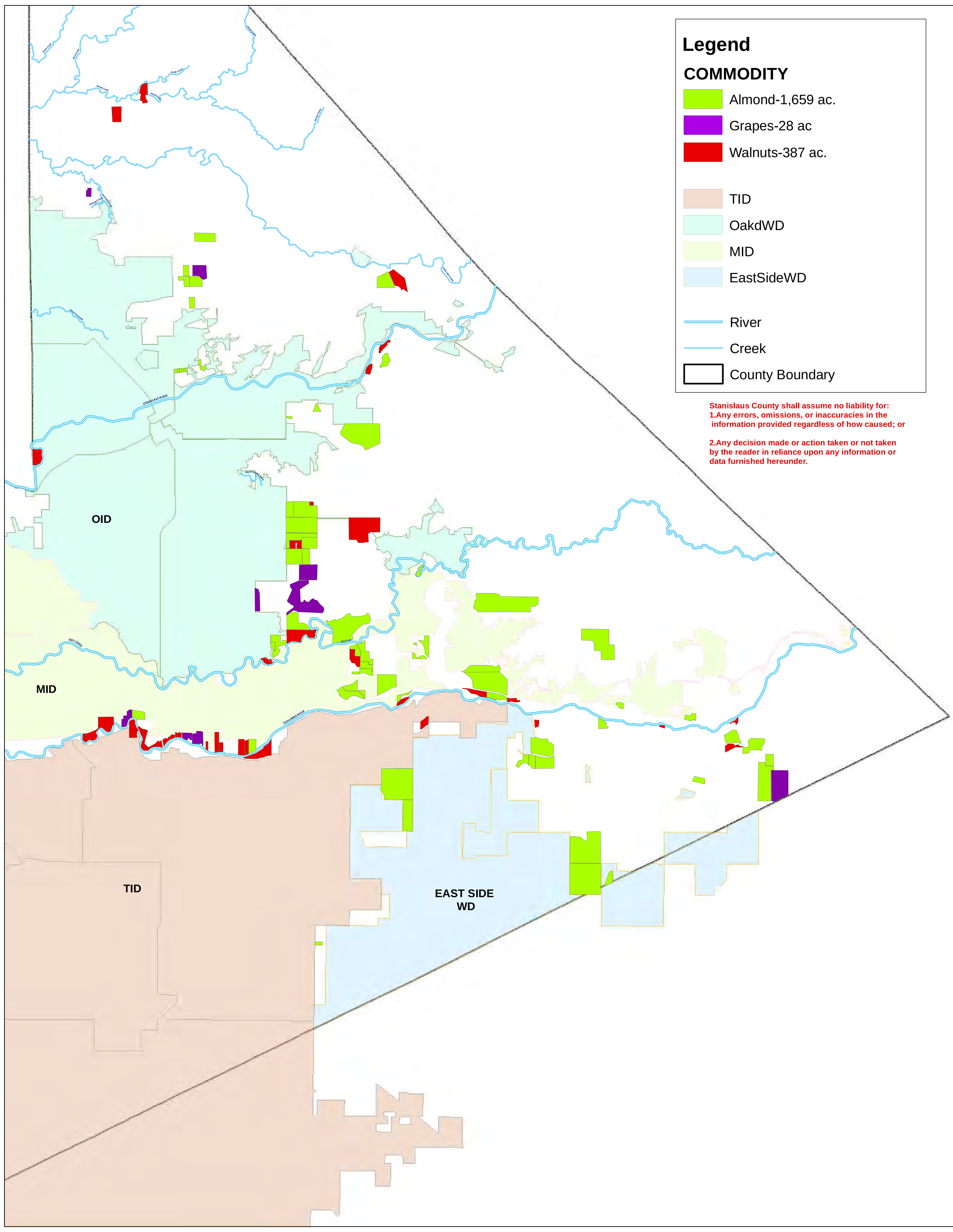
APPENDIX A

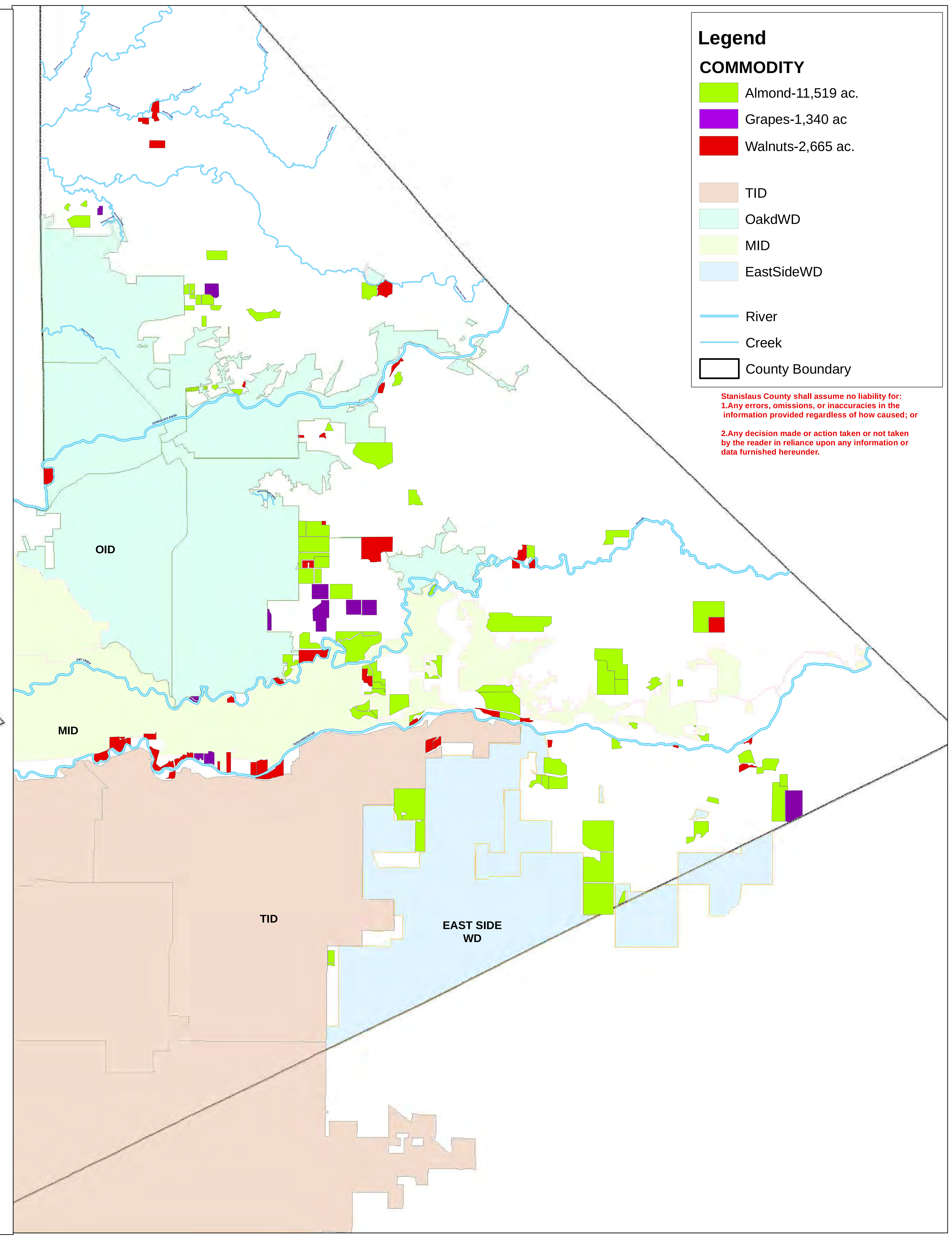
DATA REGARDING CONVERSION OF NON-DISTRICT RANGELAND IN EASTERN STANISLAUS COUNTY TO PERMANENT CROPS FROM 2000 TO 2015

2001

DRAFT Copy

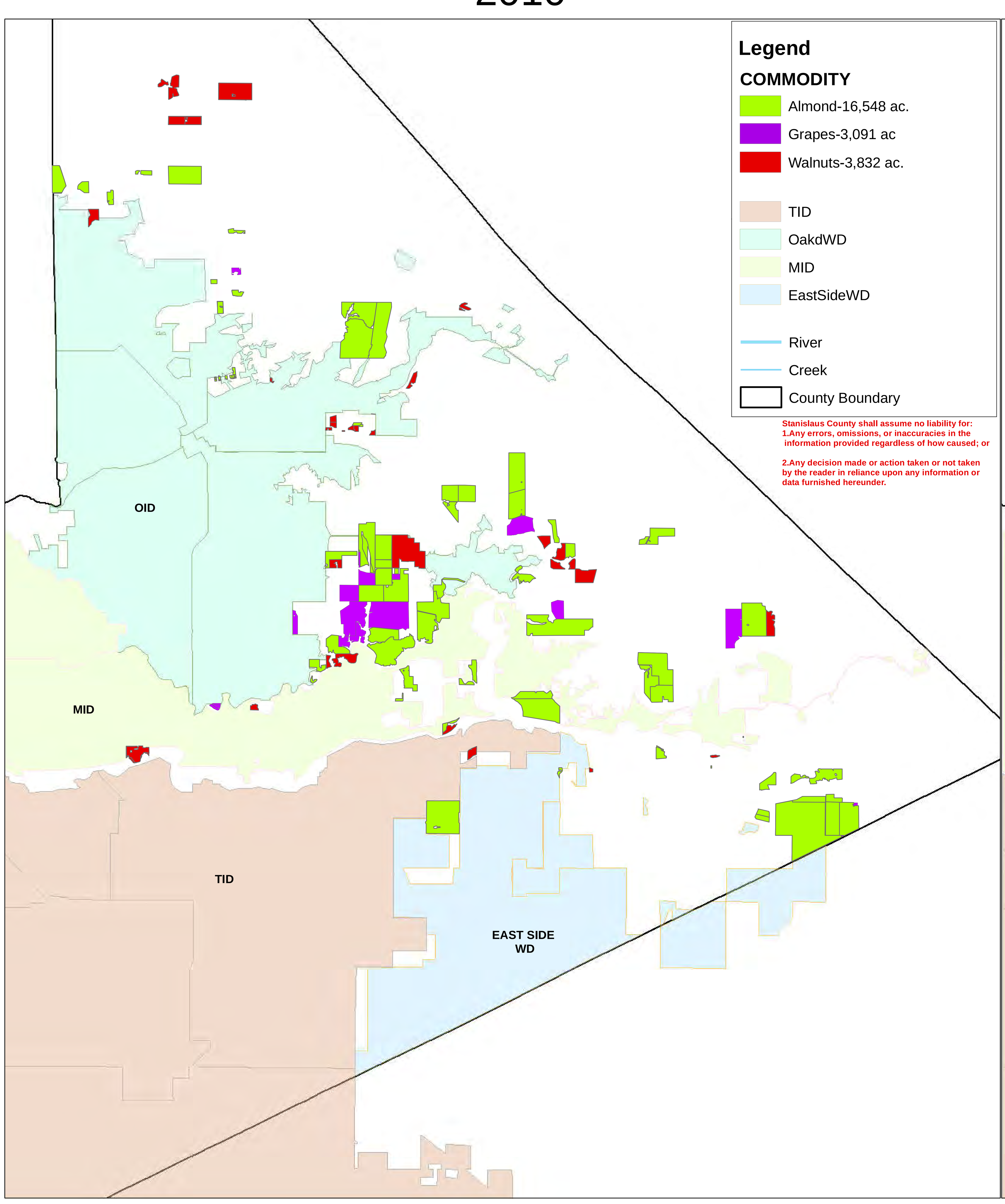


2005/2006

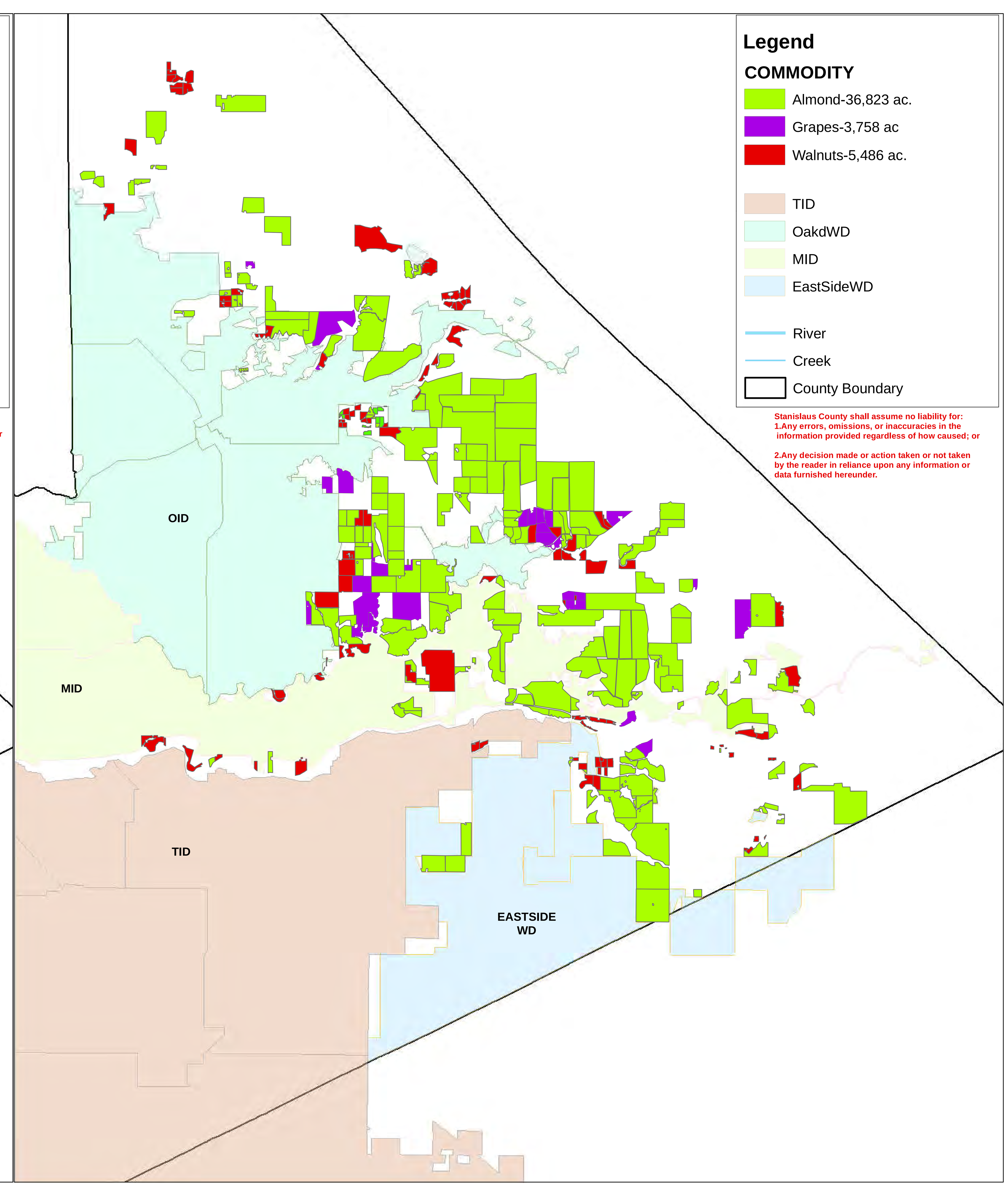


2010

DRAFT Copy



2015



APPENDIX E

CALEEMOD MODELING RESULTS

Typical Groundwater Well

Stanislaus County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	0.15	0.00	0

1.2 Other Project Characteristics

Urbanization Rural **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 46

Climate Zone 4 **Operational Year** 2016

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Disturbance footprint

Construction Phase - Applicant Supplied construction schedule

Off-road Equipment - Construction contractor

Off-road Equipment - Construction contractor

Trips and VMT - Construction contractor

Vehicle Trips - Only occasional trips required to maintain equipment. not daily trip generator

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	100.00	15.00

tblConstructionPhase	NumDays	100.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	7.00
tblConstructionPhase	PhaseStartDate	7/16/2016	7/18/2016
tblLandUse	LotAcreage	0.00	0.15
tblOffRoadEquipment	HorsePower	205.00	81.00
tblOffRoadEquipment	HorsePower	78.00	174.00
tblOffRoadEquipment	HorsePower	84.00	100.00
tblOffRoadEquipment	HorsePower	84.00	100.00
tblOffRoadEquipment	HorsePower	78.00	89.00
tblOffRoadEquipment	HorsePower	84.00	89.00
tblOffRoadEquipment	LoadFactor	0.50	0.73
tblOffRoadEquipment	LoadFactor	0.48	0.41
tblOffRoadEquipment	LoadFactor	0.74	0.29
tblOffRoadEquipment	LoadFactor	0.74	0.29
tblOffRoadEquipment	LoadFactor	0.48	0.20
tblOffRoadEquipment	LoadFactor	0.74	0.20
tblOffRoadEquipment	OffRoadEquipmentType	Concrete/Industrial Saws	Bore/Drill Rigs
tblOffRoadEquipment	OffRoadEquipmentType	Graders	Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType	Cranes	Pumps
tblOffRoadEquipment	OffRoadEquipmentType	Forklifts	Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType	Forklifts	Generator Sets
tblProjectCharacteristics	OperationalYear	2014	2016
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
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tblTripsAndVMT	HaulingTripNumber	0.00	1.00
tblTripsAndVMT	VendorTripNumber	0.00	1.00
tblTripsAndVMT	VendorTripNumber	0.00	1.00

tblTripsAndVMT	WorkerTripNumber	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	0.00	1.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2016	3.9607	37.0721	27.8037	0.0417	0.0339	2.4828	2.5167	9.1300e-003	2.3520	2.3611			4,182.4841	0.9639	0.0000	4,202.7256
Total	**3.9607**	**37.0721**	**27.8037**	**0.0417**	**0.0339**	**2.4828**	**2.5167**	**9.1300e-003**	**2.3520**	**2.3611**			**4,182.4841**	**0.9639**	**0.0000**	**4,202.7256**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2016	3.9607	37.0721	27.8037	0.0417	0.0339	2.4828	2.5167	9.1300e-003	2.3520	2.3611			4,182.4841	0.9639	0.0000	4,202.7256
Total	**3.9607**	**37.0721**	**27.8037**	**0.0417**	**0.0339**	**2.4828**	**2.5167**	**9.1300e-003**	**2.3520**	**2.3611**			**4,182.4841**	**0.9639**	**0.0000**	**4,202.7256**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Soil Boring	Building Construction	7/1/2016	7/15/2016	7	15	
2	Well Construction	Building Construction	7/18/2016	7/25/2016	5	6	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Soil Boring	Generator Sets	1	24.00	100	0.29
Well Construction	Pumps	1	8.00	100	0.29
Soil Boring	Bore/Drill Rigs	1	24.00	81	0.73
Soil Boring	Air Compressors	1	24.00	89	0.20
Well Construction	Generator Sets	1	8.00	89	0.20
Soil Boring	Cranes	1	4.00	226	0.29
Well Construction	Air Compressors	1	8.00	174	0.41
Well Construction	Cranes	1	4.00	226	0.29
Soil Boring	Forklifts	2	6.00	89	0.20
Well Construction	Forklifts	2	6.00	89	0.20
Soil Boring	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Well Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Soil Boring	8	2.00	1.00	2.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT
Well Construction	8	1.00	1.00	1.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Soil Boring - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.9374	36.9380	27.5250	0.0410		2.4804	2.4804		2.3498	2.3498			4,123.9981	0.9624		4,144.2077
Total	**3.9374**	**36.9380**	**27.5250**	**0.0410**		**2.4804**	**2.4804**		**2.3498**	**2.3498**			**4,123.9981**	**0.9624**		**4,144.2077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.5300e-003	0.0339	0.0249	1.0000e-004	2.3300e-003	5.5000e-004	2.8800e-003	6.4000e-004	5.0000e-004	1.1400e-003			10.0294	7.0000e-005		10.0309
Vendor	0.0105	0.0883	0.1048	2.2000e-004	6.0200e-003	1.5800e-003	7.6000e-003	1.7200e-003	1.4500e-003	3.1700e-003			21.7535	1.9000e-004		21.7575
Worker	0.0102	0.0119	0.1491	3.3000e-004	0.0256	1.9000e-004	0.0257	6.7700e-003	1.7000e-004	6.9500e-003			26.7031	1.2600e-003		26.7295
Total	**0.0232**	**0.1341**	**0.2787**	**6.5000e-004**	**0.0339**	**2.3200e-003**	**0.0362**	**9.1300e-003**	**2.1200e-003**	**0.0113**			**58.4860**	**1.5200e-003**		**58.5179**

3.2 Soil Boring - 2016

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.9374	36.9380	27.5250	0.0410		2.4804	2.4804		2.3498	2.3498			4,123.9981	0.9624		4,144.2077
Total	**3.9374**	**36.9380**	**27.5250**	**0.0410**		**2.4804**	**2.4804**		**2.3498**	**2.3498**			**4,123.9981**	**0.9624**		**4,144.2077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.5300e-003	0.0339	0.0249	1.0000e-004	2.3300e-003	5.5000e-004	2.8800e-003	6.4000e-004	5.0000e-004	1.1400e-003			10.0294	7.0000e-005		10.0309
Vendor	0.0105	0.0883	0.1048	2.2000e-004	6.0200e-003	1.5800e-003	7.6000e-003	1.7200e-003	1.4500e-003	3.1700e-003			21.7535	1.9000e-004		21.7575
Worker	0.0102	0.0119	0.1491	3.3000e-004	0.0256	1.9000e-004	0.0257	6.7700e-003	1.7000e-004	6.9500e-003			26.7031	1.2600e-003		26.7295
Total	**0.0232**	**0.1341**	**0.2787**	**6.5000e-004**	**0.0339**	**2.3200e-003**	**0.0362**	**9.1300e-003**	**2.1200e-003**	**0.0113**			**58.4860**	**1.5200e-003**		**58.5179**

3.3 Well Construction - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.5334	22.4790	15.1433	0.0238		1.4786	1.4786		1.4034	1.4034			2,362.681 4	0.4591		2,372.322 2
Total	**2.5334**	**22.4790**	**15.1433**	**0.0238**		**1.4786**	**1.4786**		**1.4034**	**1.4034**			**2,362.681 4**	**0.4591**		**2,372.322 2**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.1700e-003	0.0423	0.0311	1.2000e-004	2.9200e-003	6.8000e-004	3.6000e-003	8.0000e-004	6.3000e-004	1.4300e-003			12.5367	9.0000e-005		12.5387
Vendor	0.0105	0.0883	0.1048	2.2000e-004	6.0200e-003	1.5800e-003	7.6000e-003	1.7200e-003	1.4500e-003	3.1700e-003			21.7535	1.9000e-004		21.7575
Worker	5.1000e-003	5.9400e-003	0.0745	1.6000e-004	0.0128	1.0000e-004	0.0129	3.3900e-003	9.0000e-005	3.4700e-003			13.3516	6.3000e-004		13.3647
Total	**0.0187**	**0.1366**	**0.2104**	**5.0000e-004**	**0.0217**	**2.3600e-003**	**0.0241**	**5.9100e-003**	**2.1700e-003**	**8.0700e-003**			**47.6417**	**9.1000e-004**		**47.6609**

3.3 Well Construction - 2016

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.5334	22.4790	15.1433	0.0238		1.4786	1.4786		1.4034	1.4034			2,362.6814	0.4591		2,372.3222
Total	**2.5334**	**22.4790**	**15.1433**	**0.0238**		**1.4786**	**1.4786**		**1.4034**	**1.4034**			**2,362.6814**	**0.4591**		**2,372.3222**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.1700e-003	0.0423	0.0311	1.2000e-004	2.9200e-003	6.8000e-004	3.6000e-003	8.0000e-004	6.3000e-004	1.4300e-003			12.5367	9.0000e-005		12.5387
Vendor	0.0105	0.0883	0.1048	2.2000e-004	6.0200e-003	1.5800e-003	7.6000e-003	1.7200e-003	1.4500e-003	3.1700e-003			21.7535	1.9000e-004		21.7575
Worker	5.1000e-003	5.9400e-003	0.0745	1.6000e-004	0.0128	1.0000e-004	0.0129	3.3900e-003	9.0000e-005	3.4700e-003			13.3516	6.3000e-004		13.3647
Total	**0.0187**	**0.1366**	**0.2104**	**5.0000e-004**	**0.0217**	**2.3600e-003**	**0.0241**	**5.9100e-003**	**2.1700e-003**	**8.0700e-003**			**47.6417**	**9.1000e-004**		**47.6609**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	14.70	6.60	6.60	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.437050	0.065508	0.158240	0.182207	0.055035	0.007893	0.018726	0.062660	0.001794	0.001177	0.006242	0.000671	0.002796

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

ATTACHMENT 2

COPIES OF PUBLIC COMMENTS

Comment Letter 1

CHIEF EXECUTIVE OFFICE

Jody L. Hayes
Chief Executive Officer

Patricia Hill Thomas
Chief Operations Officer/
Assistant Executive Officer

Keith D. Boggs
Assistant Executive Officer

Patrice M. Dietrich
Assistant Executive Officer

STANISLAUS COUNTY ENVIRONMENTAL REVIEW COMMITTEE

April 24, 2018

Walter Ward, Water Resources Manager
Stanislaus County Department of Environmental Resources
3800 Cornucopia Way, Suite C
Modesto, CA 95358

SUBJECT: ENVIRONMENTAL REFERRAL – STANISLAUS COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES – NOTICE OF AVAILABILITY – DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM – DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT (PEIR)

Mr. Ward:

Thank you for the opportunity to review the above-referenced project.

The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has no comments at this time.

The ERC appreciates the opportunity to comment on this project.

Sincerely,

Patrick Cavanah

Patrick Cavanah, Sr. Management Consultant
Environmental Review Committee

PC:ss

cc: ERC Members

Comment Letter 2

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

May 8, 2018

Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

Subject: Discretionary Well Permitting and Management Program
SCH#: 2016102005

Dear Walter Ward:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. The review period closed on May 7, 2018, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Document Details Report
State Clearinghouse Data Base

SCH# 2016102005
Project Title Discretionary Well Permitting and Management Program
Lead Agency Stanislaus County

Type **EIR** Draft EIR

Description Stanislaus County is implementing a Discretionary Well Permitting and Management Program pursuant to its Groundwater Ordinance, which was adopted in November 2014 to promote sustainable groundwater management in the unincorporated areas of the County. The project consists of continued discretionary well permitting and regulation activities that will be implemented after the PEIR is adopted to assure that groundwater extraction complies with the Groundwater Ordinance's prohibition against unsustainable groundwater extraction. The purpose of the PEIR is to streamline the environmental review process for subsequent individual well permit applications, and to help refine the program and make it more robust through environmental analysis and assignment of program level mitigation, as needed.

Lead Agency Contact

Name Walter Ward
Agency Stanislaus County
Phone (209) 525-6710 ***Fax***
email
Address 3800 Cornucopia Way, Suite C
City Modesto ***State*** CA ***Zip*** 95358

Project Location

County Stanislaus
City
Region
Lat / Long
Cross Streets
Parcel No.
Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways
Airports
Railways
Waterways
Schools
Land Use N/A

Project Issues Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Economics/Jobs; Flood Plain/Flooding; Forest Land/Fire Hazard; Geologic/Seismic; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Schools/Universities; Septic System; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Growth Inducing; Landuse

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Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 4; Central Valley Flood Protection Board; Department of Parks and Recreation; Department of Water Resources; Caltrans, District 10; State Water Resources Control Board, Division of Drinking Water, District 10; State Water Resources Control Board, Divison of Financial Assistance; State Water Resources Control Board, Division of Water Rights; Regional Water Quality Control Bd., Region 5 (Sacramento); Delta Stewardship Council; Native American Heritage Commission

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Date Received 03/23/2018 ***Start of Review*** 03/23/2018 ***End of Review*** 05/07/2018

Note: Blanks in data fields result from insufficient information provided by lead agency.

ATTACHMENT 3

DOCUMENTATION OF PUBLIC PARTICIPATION AND COPIES OF NOTIFICATIONS

Attachment 3.A

NOTICE OF PREPARATION
PROGRAM ENVIRONMENTAL IMPACT REPORT

Project Title: Discretionary Well Permitting and Management Program
Project Location: Stanislaus County

Project Description
Stanislaus County is implementing a Discretionary Well Permitting and Management Program pursuant to its Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code), adopted in November 2014 to promote sustainable groundwater management. This program applies to the unincorporated portions of the County and issues discretionary permits for new wells after the County makes a determination that operation of these wells would comply with the Groundwater Ordinance's prohibition against unsustainable groundwater extraction. The County makes this determination based on review of substantial evidence required to be provided by the applicant, and can apply permit conditions to help assure that groundwater will be extracted sustainably from the well, and to support its groundwater management goals under the Groundwater Ordinance.

The Groundwater Ordinance specifies several exemptions from discretionary well permitting. These include: (1) wells for public water agencies and their rate payers where the agency is in compliance with an existing Groundwater Management Plan or Groundwater Sustainability Plan (because they are presumed to be managing groundwater sustainably); (2) *"de minimis"* wells that will be used to extract less than 2 acre-feet of water per year; and (3) in-kind replacement wells that represent no increase in groundwater extraction. For these exempt wells, ministerial permits are issued as they were prior to adoption of the Groundwater Ordinance.

As an additional requirement of the Groundwater Ordinance, after Groundwater Sustainability Plans are adopted for the groundwater basins underlying the County pursuant to the Sustainable Groundwater Management Act, the prohibition against unsustainable extraction will apply to any existing or proposed well in the unincorporated areas of the County from which the County reasonably concludes groundwater extraction is unsustainable. When such a determination is made, the affected party will be notified and required to demonstrate, based on substantial evidence, that extraction of groundwater from the well will not violate the prohibition.

The project that will be evaluated in the Program Environmental Impact Report (PEIR) consists of continued discretionary well permitting and regulation activities that will be implemented under the Groundwater Ordinance after the PEIR is adopted. The purpose of the PEIR is to streamline the environmental review process for individual discretionary decisions, to help refine the well permitting and management program through the development of mitigation measures, if needed, and to provide a more robust environmental basis for implementation of the program.

Agency Review and Comments
In compliance with the State Guidelines for implementation of the California Environmental Quality Act (CEQA), this Notice of Preparation is hereby sent to inform you that Stanislaus

County is preparing a PEIR for the discretionary well permitting and management program. The PEIR will provide program-level analysis of the program across its implementation period through 2042, at which time all groundwater subbasins in Stanislaus County are required to be operated sustainably under the Sustainable Groundwater Management Act.

As Lead Agency, Stanislaus County needs to know the views of your agency as to the scope and content of the environmental information that is germane to your agency's statutory responsibilities in connection with the proposed project (anticipated areas of analysis are identified in the attached Initial Study). Please designate a contact person in your agency and send your response to the address below.

Environmental Review Process
Stanislaus County will be the Lead Agency and will prepare a PEIR to evaluate and disclose the potential environmental effects of continuing to implement the discretionary well permitting and management program under the Groundwater Ordinance.

An Initial Study was prepared to identify the environmental issues that will be addressed in the PEIR. The Initial Study includes the project description and project location, and identifies potential environmental effects. The Initial Study is attached to this Notice of Preparation. Copies of the Initial Study are available for review at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, Modesto, CA 95358. In addition, the Initial Study may be downloaded from the County's groundwater resources web page at the following internet address: http://www.stancounty.com/er/groundwater/.

Due to time limits mandated by State law, your response should be sent at the earliest possible date, and no later than 30 days from transmittal of this notice. This Notice of Preparation initiates a 30-day comment period that extends from October 4, 2016 to November 3, 2016. Comments must be received before 5:00 PM on November 3, 2016, to be considered in the preparation of the PEIR. They may be e-mailed to wward@envres.org or mailed to:

Walter Ward
Water Resources Manager
Stanislaus County Department of Environmental Resources
3800 Cornucopia Way, Suite C
Modesto, CA 95358

Two public scoping meetings will be held for the PEIR: (1) Stanislaus County Technical Advisory Committee meeting at 1:30 to 3:00 PM on October 6 at the Stanislaus County Farm Bureau, 1201 L Street, Modesto; and (2) from 7:00 to 9:00 PM on October 13 at Harvest Hall, 3800 Cornucopia Way #B, Modesto. Persons wishing to comment on the scope of the PEIR at these meetings will be given the opportunity to fill out comment cards and/or to speak publically.

Walter P. Ward

Walter Ward
Water Resources Manager
(209) 525-6710

October 3, 2016
Date

Attachment B, Exhibit 1b

INITIAL STUDY

Discretionary Well Permitting and Management Program
Stanislaus County, California

October 3, 2016

Prepared for:

Stanislaus County
Department of Environmental Resources
3800 Cornucopia Road
Modesto, California 95358

Prepared by:

Jacobson James & Associates, Inc.
9083 Foothills Boulevard, Suite 370
Roseville, California 95747

and

Tetra Tech, Inc.
1999 Harrison Street, Suite 500
Oakland, California 94612

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LIST OF ACRONYMS AND ABBREVIATIONS

ADT	Average Daily Trips
amsl	Above mean sea level
APE	Area of potential effects
AQMP	Air Quality Management Plan
BMP	Best Management Practice
BPS	Best Performance Standard
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CH_4	Methane
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CO	Carbon Monoxide
CO_2	Carbon dioxide
CO2e	Carbon Dioxide equivalents
dB	Decibels
dBA	A-weighted decibels
DOT	Department of Transportation
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ESA	Endangered Species Act
FPMP	Fugitive PM_{10} Management Plan
GDE	Groundwater dependent ecosystem
gpm	Gallons per minute
GHG	Greenhouse Gas
GMP	Groundwater Management Plan
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
H_2O	Water (vapor)
H_2S	Hydrogen sulfide

LIST OF ACRONYMS AND ABBREVIATIONS

HFC	Hydrofluorocarbon
MBTA	Migratory Bird Treaty Act
MCL	Maximum contaminant level
MND	Mitigated Negative Declaration
MRZ	Mineral Resource Zone
MSDS	Material Safety Data Sheet
MTBE	Methyl tertiary-butyl ether
NAAQS	National Ambient Air Quality Standards
ND	Negative Declaration
N_2O	Nitrous Oxide
NO_2	Nitrogen dioxide
NOP	Notice of Preparation
NSR	New source review
OPR	Office of Planning and Research
Pb	Lead
PFC	Perfluorocarbon
PEIR	Program Environmental Impact Report
$PM_{2.5}$	Airborne particulate matter with a diameter of less than 2.5 microns
PM_{10}	Airborne particulate matter with a diameter of less than 10 microns
RWQCB	Regional Water Quality Control Board
SCHM	Stanislaus County Hydrologic Model
SF_6	Sulfur hexafluoride
SGMA	Sustainable Groundwater Management Act
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SJVGB	San Joaquin Valley Groundwater Basin
SLDMWMA	San Luis and Delta-Mendota Water Management Authority
SMARA	Surface Mining and Reclamation Act
SO_2	Sulfur Dioxide
STRGBA	Stanislaus and Tuolumne Rivers Groundwater Basin Association
TGBA	Turlock Groundwater Basin Association

LIST OF ACRONYMS AND ABBREVIATIONS

U.S. EPA	U.S. Environmental Protection Agency
VdB	Vibration decibels

1.0 INTRODUCTION

1.1 Project Background

Stanislaus County adopted a Groundwater Ordinance in November 2014 (Chapter 9.37 of the County Code, hereinafter, the "Ordinance") that codifies requirements, prohibitions, and exemptions intended to help promote sustainable groundwater extraction in unincorporated areas of the county. The Ordinance prohibits the unsustainable extraction of groundwater and makes issuing permits for new wells that are not exempt from this prohibition discretionary. Applications for non-exempt wells must include substantial evidence that they will not withdraw groundwater unsustainably. In addition, after an unincorporated area adopts a Groundwater Sustainability Plan (GSP) pursuant to California's Sustainable Groundwater Management Act (SGMA), the county can require holders of permits for wells it reasonably concludes are withdrawing groundwater unsustainably to provide substantial evidence that continued operation of such wells does not constitute unsustainable extraction, and has the authority to regulate future groundwater extraction.

As the lead agency under the California Environmental Quality Act (CEQA), Stanislaus County is preparing a Program Environmental Impact Report for Discretionary Well Permitting and Management under the Stanislaus County Groundwater Ordinance (the PEIR) to evaluate the broad-scale environmental impacts of issuing discretionary well permits and regulating potentially unsustainable wells under the Ordinance. The purpose of the PEIR is to develop a more robust basis for managing these discretionary programs and streamline the application and review process for new well permits. CEQA provides a lead agency with the flexibility to prepare different types of EIRs and to employ different procedural means to focus environmental analysis on the issues appropriate for decision at each level of environmental review (Public Resources Code § 21093[a]).[1] In this case, the county will prepare a Tier 1 PEIR that can be referenced by CEQA documents prepared for the issuance of subsequent discretionary well permits at the Tier 2 level.[2] The PEIR may also identify policy alternatives and, if necessary, mitigation measures.

1.2 Lead Agency

The Stanislaus County Department of Environmental Resources is the Lead Agency for this project pursuant to the California Environmental Quality Act (CEQA) and implementing regulations.[3] The Lead Agency has the principal responsibility for implementing and approving a project that may have a significant effect on the environment.

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[1] CEQA provides that the "degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity which is described in the EIR" (State CEQA Guidelines Section 15146).

[2] State CEQA Guidelines Sections 15168(b) and (c)

[3] Public Resources Code §§ 21000 - 21177 and California Code of Regulations Title 14, Division 6, Chapter 3.

1.3 CEQA Overview

1.3.1 Purpose of CEQA

All discretionary projects within California are required to undergo environmental review under CEQA. A project is defined in CEQA Guidelines § 15378 as the whole of the action having the potential to result in a direct physical change or a reasonably foreseeable indirect change to the environment and is any of the following:

- An activity directly undertaken by any public agency, including, but not limited to, public works construction and related activities, clearing or grading land, improvements to existing public structures, enactment and amendment of zoning ordinances, and adoption and amendment of local General Plans or elements. An activity undertaken by a person that is supported in whole or in part through public agency contacts, grants, subsidies, loans, or other forms of assistance from one or more public agencies.
- An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

CEQA Guidelines § 15002 lists the basic purposes of CEQA as follows:

- To inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities;
- To identify the ways that environmental damage can be avoided or significantly reduced;
- To prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; and
- To disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

1.3.2 Authority to Mitigate

CEQA establishes a duty for public agencies to avoid or minimize environmental damage where feasible. Under CEQA Guidelines § 15041, a Lead Agency for a project has authority to require feasible changes in any or all activities involved in the project to substantially lessen or avoid significant effects on the environment, consistent with applicable constitutional requirements such as the "nexus"[4] and "rough proportionality"[5] standards.

[4] A nexus (connection) must be established between the mitigation measure and a legitimate governmental interest.
[5] The mitigation measure must be "roughly proportional" to the impacts of the project.

CEQA allows a Lead Agency to approve a project even though the project would cause a significant effect on the environment if the agency makes a fully informed and publicly disclosed decision that there is no feasible way to lessen or avoid the significant effect. In such cases, the Lead Agency must specifically identify expected benefits and other overriding considerations from the project that outweigh the policy of reducing or avoiding significant environmental impacts of the project.

1.4 Purpose of Initial Study

The purposes of an Initial Study as listed in § 15063(c) of the CEQA Guidelines are to:

- Provide the Lead Agency with information necessary to decide if an Environmental Impact Report (EIR), Negative Declaration (ND), or Mitigated Negative Declaration (MND) should be prepared;
- Enable a Lead Agency to modify a project to mitigate adverse impacts before an EIR is prepared, thereby enabling the project to qualify for an ND or MND;
- Assist in the preparation of an EIR, if required, by focusing the EIR on adverse effects determined to be significant, identifying the adverse effects determined not to be significant, explaining the reasons for determining that potentially significant adverse effects would not be significant, and identifying whether a program EIR, or other process, can be used to analyze adverse environmental effects of the project;
- Facilitate an environmental assessment early during project design;
- Provide documentation in the ND or MND that a project would not have a significant effect on the environment;
- Eliminate unnecessary EIRs; or
- Determine if a previously prepared EIR could be used for the project.

The purpose of this Initial Study is to support the Notice of Preparation (NOP) for the PEIR. The Initial Study provides information to help focus the environmental analysis proposed in the PEIR. Specifically, the Initial Study identifies resources that could experience significant adverse impacts as a result of implementing the Discretionary Well Permitting and Management Program under the Ordinance and that warrant further evaluation in the PEIR. Similarly, resources and issues that are reasonably expected to experience no impacts, or impacts that are less than significant, will not warrant further evaluation in the PEIR.

1.5 Other Agencies

Other public agencies are provided the opportunity to review and comment on the Initial Study. Each of these agency types is described briefly below.

- A Responsible Agency (14 California Code of Regulations [CCR] § 15381) is a public agency, other than the Lead Agency, that has discretionary approval power over the project, such as permit issuance or plan approval authority.

- A Trustee Agency[6] (14 CCR § 15386) is a state agency having jurisdiction by law over natural resources affected by a project that are held in trust for the people of the State of California.
- Agencies with Jurisdiction by Law (14 CCR § 15366) are any public agencies that have authority (1) to grant a permit or other entitlement for use; (2) to provide funding for the project in question; or (3) to exercise authority over resources that may be affected by the project. Furthermore, a city or county will have jurisdiction by law with respect to a project when the city or county having primary jurisdiction over the area involved is: (1) the site of the project; (2) the area which the major environmental effects will occur; or (3) the area where those citizens most directly concerned by any such environmental effects reside.

1.6 Organization of Initial Study

This Initial Study is organized to satisfy CEQA Guidelines § 15063(d), and includes the following sections:

- Chapter 1, Introduction, which identifies the purpose and scope of the Initial Study.
- Chapter 2, Project Description, which provides an overview of the program objectives.
- Chapter 3, Environmental Setting, which describes location, existing site conditions, land uses, zoning designations, topography, and vegetation associated with the program location and surrounding area.
- Chapter 4, Environmental Checklist, which presents checklist responses for each resource topic to briefly assess the impacts associated with the proposed program and to identify which topics require review in the Program EIR (PEIR).
- Chapter 5, References, which includes a list of documents cited in the Initial Study.
- Chapter 6, List of Preparers, which identifies the persons who participated in preparing the Initial Study.

1.7 Incorporation by Reference

As permitted by CEQA Guidelines § 15150, this Initial Study references several technical studies, analyses, and previously certified environmental documentation contained in the Stanislaus County General Plan and Environmental Impact Report, which were adopted in August 2016 and are incorporated by reference. Information that has been incorporated by reference has been briefly discussed in the appropriate section(s).

[6] The four Trustee Agencies in California listed in CEQA Guidelines § 15386 are California Department of Fish and Wildlife, State Lands Commission, State Department of Parks and Recreation, and University of California.

2.0 PROJECT DESCRIPTION

2.1 Background and Overview

Stanislaus County is underlain by the Delta-Mendota, Eastern San Joaquin, Modesto, and Turlock groundwater subbasins of the San Joaquin Valley Groundwater Basin. Groundwater in most of the county has been sustainably managed for many years through conjunctive use with surface water under groundwater management plans that are being implemented by the San Luis and Delta-Mendota Water Management Authority (SLDMWMA), the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), and the Turlock Groundwater Basin Association (TGBA). Nevertheless, all four subbasins are experiencing storage depletion and other stresses resulting from the current drought. Particular concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to the drought and changing surface water allocations. In addition, the Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the county, have been designated as critically overdrafted[7] by the Department of Water Resources (DWR) as a result of overdraft conditions outside the county.

To address these evolving water supply challenges, Stanislaus County prepared and adopted the Ordinance to be deliberately aligned with sustainable groundwater management concepts defined in the Sustainable Groundwater Management Act (SGMA). Implementation guidelines for well permitting under the new Ordinance were adopted in August 2015. These guidelines and the Ordinance are incorporated by reference into this project description and are provided in Appendix A.

2.2 Program Requirements to be Evaluated

The following clauses in the Ordinance form the basis of the "program" to be addressed in the PEIR:

- ***Stanislaus County Code §9.37.040.*** *Except as otherwise provided in this Chapter, the following actions are prohibited:*

  A. The unsustainable extraction of groundwater within the unincorporated areas of the County.

- ***Stanislaus County Code §9.37.045 A.*** *The prohibition set forth in Paragraph A of Section 9.37.040 is applicable to the extraction from any groundwater well for which an application for a new Well Construction Permit pursuant to Chapter 9.36 is filed after November 25, 2014. Applications for a Well Construction Permit submitted after that date shall demonstrate, based on substantial evidence, that either (1) one or more of the exemptions set forth in Section 9.37.050 apply, or (2)*

[7] SGMA includes the following definition of critical overdraft: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."

that extraction of groundwater from the proposed well will not constitute unsustainable extraction of groundwater. This paragraph shall not apply to a well designed to replace an existing well that has been permitted under Chapter 9.36 prior to November 25, 2014 if the replacement well has no greater capacity than the well it is replacing.

- ***Stanislaus County Code §9.37.050 A.*** *The following water management practices are exempt from the prohibitions in Section 9.37.040:*
    1. *Water resources management practices of public water agencies that have jurisdictional authority within the County, and their water rate payers, that are in compliance with and included in groundwater management plans and policies adopted by that agency in accordance with applicable state law and regulations, as may be amended, including but not limited to the California Groundwater Management Act (Water Code Sections 10750 et seq.), or that are in compliance with an approved Groundwater Sustainability Plan.*
    2. *De minimis extractions as set forth in Section 9.37.030 (10) of this Chapter.*
- ***Stanislaus County Code §9.37.045 B.*** *Effective upon adoption of an applicable groundwater sustainability plan, the prohibition set forth in Paragraph A of Section 9.37.040 shall be applicable to the extraction from any groundwater well for which the County reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In the event of such determination by the County, the affected holder or holders of a Well Construction Permit issued pursuant to Chapter 9.36 for such well shall be notified and shall be required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in Paragraph 6 of Section 9.37.030.*
- ***Stanislaus County Code §9.37.040.*** *Except as otherwise provided in this Chapter, the following actions are prohibited: A. The unsustainable extraction of groundwater within the unincorporated areas of the County.*

Based on the above, the Ordinance divides the county into the following areas for application of discretionary well permitting and management requirements, which are shown on Figure 2-1:

- **Incorporated Areas**. The Ordinance does not apply to the incorporated areas of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford.
- **Exempt Areas.** Groundwater management in these areas occurs under the authority of a public water agency in compliance with a Groundwater Management Plan (GMP) or a GSP. Before GSPs are adopted under SGMA, the county's groundwater management authority in these areas is generally limited to issuing ministerial[8] well permits that are exempt from the prohibition against

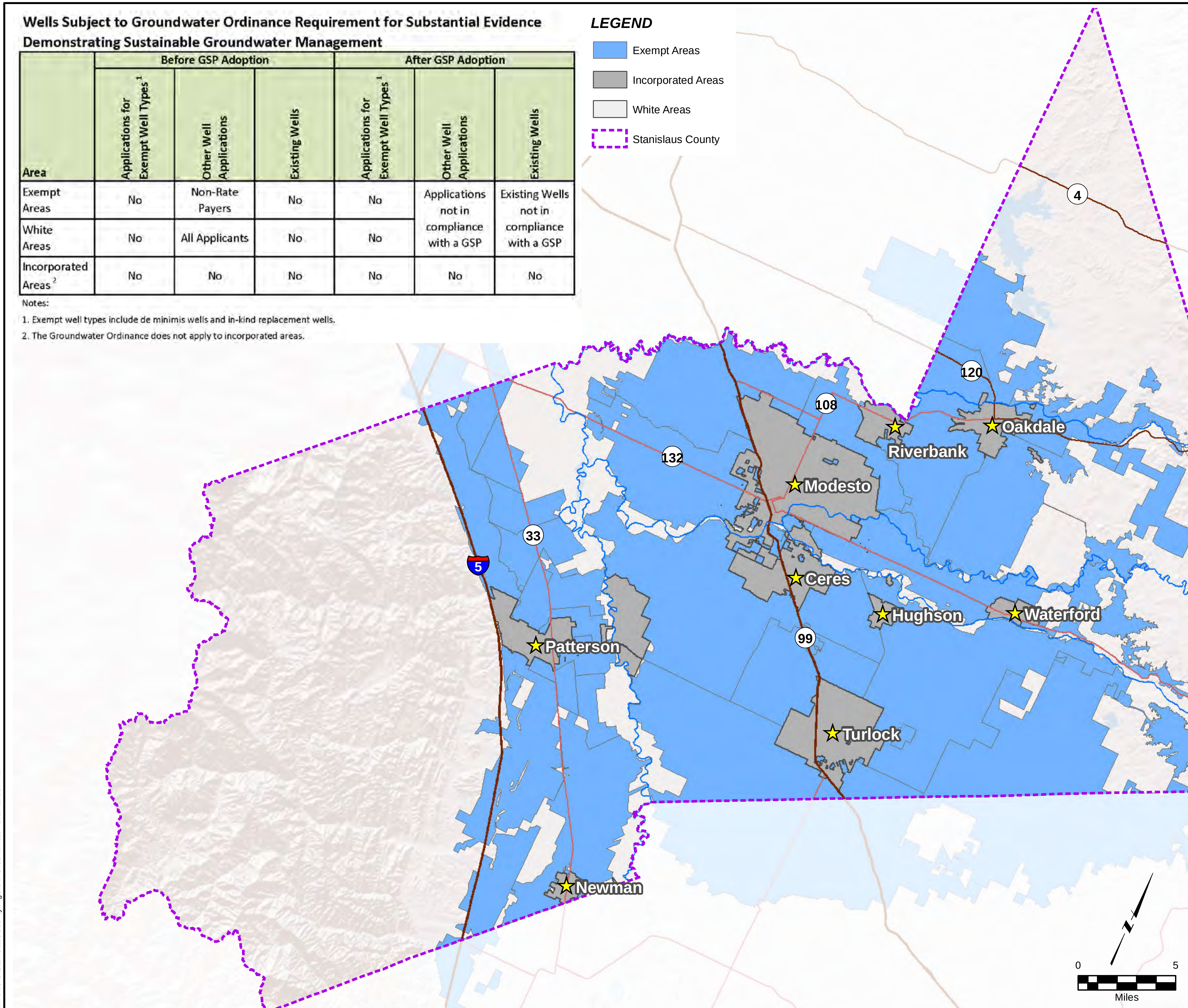
[8] A ministerial decision involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out. (State CEQA Guidelines Section 15369). By themselves, ministerial actions are not subject to CEQA.

Wells Subject to Groundwater Ordinance Requirement for Substantial Evidence Demonstrating Sustainable Groundwater Management

<table>
<tr><th rowspan="2">Area</th><th colspan="3">Before GSP Adoption</th><th colspan="3">After GSP Adoption</th></tr>
<tr><th>Applications for Exempt Well Types [1]</th><th>Other Well Applications</th><th>Existing Wells</th><th>Applications for Exempt Well Types [1]</th><th>Other Well Applications</th><th>Existing Wells</th></tr>
<tr><td>Exempt Areas</td><td>No</td><td>Non-Rate Payers</td><td>No</td><td>No</td><td rowspan="2">Applications not in compliance with a GSP</td><td rowspan="2">Existing Wells not in compliance with a GSP</td></tr>
<tr><td>White Areas</td><td>No</td><td>All Applicants</td><td>No</td><td>No</td></tr>
<tr><td>Incorporated Areas [2]</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
</table>

Notes:

1. Exempt well types include de minimis wells and in-kind replacement wells.
2. The Groundwater Ordinance does not apply to incorporated areas.



Map Showing Applicability of Groundwater Ordinance

INITIAL STUDY, GROUNDWATER ORDINANCE IMPLEMENTATION
STANISLAUS COUNTY CALIFORNIA

JACOBSON | JAMES & associates, inc

DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	MT	10/03/16	2-1

Path: J:\GIS\StanislausCounty\Figure 1 Groundwater Ordinance.mxd unsustainable extraction.[9] After GSPs are adopted, the Ordinance prohibition against unsustainable groundwater extraction will apply to any well (including new and existing wells) from which the county reasonably concludes that groundwater is being unsustainably withdrawn. Issuing permits for new wells for which such a determination is made would therefore become discretionary.[10] In addition, the county would determine whether continued groundwater extraction from existing wells for which such a determination is made is unsustainable, and therefore prohibited.

- **"White Areas."** These include unincorporated areas that are not within the jurisdictional boundaries of a public water agency covered by a GMP or GSP. The county has primary authority for groundwater management in these areas and is responsible for issuing discretionary permits for new wells that are subject to the Ordinance prohibition. Note that SGMA requires the formation of Groundwater Sustainability Agencies (GSAs) in all areas of the county by mid-2017 and the adoption of GSPs by 2020 or 2022. After this time, applications for new well permits will be exempt from the Ordinance prohibition[11] and will be issued on a ministerial basis, unless the county reasonably concludes that groundwater extraction from the proposed well will be unsustainable. In addition, existing wells for which the county reasonably concludes groundwater extraction is unsustainable would be subject to the prohibition.

The program to be evaluated in the PEIR consists of the following actions that are implemented under the ordinance in the unincorporated areas of the county:

- ***Issuing discretionary well permits before a GSP is adopted for proposed new wells that are subject to the Ordinance prohibition against unsustainable extraction.*** The county is responsible to implement a discretionary well permitting program for new wells that are subject to the Ordinance prohibition against unsustainable extraction. The applicant must provide substantial evidence that the proposed groundwater extraction will be sustainable, as defined under the Ordinance, for new wells to be constructed in the White Areas before the GSP is adopted or in the exempt areas if the applicant is not a rate payer. The well permitting guidelines developed under the Ordinance outline the requirements for substantial evidence that must accompany non-exempt well permit applications and the criteria for their evaluation and prescribe well permit conditions for new wells as needed to assure they are operated sustainably as defined under the Ordinance.
- **Issuing discretionary well permits after adoption of GSPs for any new well that the county reasonably concludes is not in compliance with a GSP.** After GSPs have been adopted, the

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[9] Because the exemption applies to the water management actions of public water agencies and their rate payers, applications for permits to construct new wells from non-rate payers would still be subject to the prohibition in the Ordinance because such wells are not subject regulation under GMPs. Permits for such wells would be discretionary.

[10] "Discretionary project" means a project which requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular activity. (State CEQA Guidelines Section 15357).

[11] After GSP adoption, the primary groundwater management authority in these areas will be vested with GSAs, which will manage and regulate groundwater resources in compliance with their GSP. Groundwater extractors (except *de minimis* extractors) will be required to pay rates to the GSAs for their extraction.

prohibition against unsustainable extraction will no longer presumptively apply to all new wells that are not exempt, but will apply to any new well in the unincorporated areas of the county from which the county reasonably concludes groundwater would be unsustainably withdrawn. In essence, these are proposed wells that do not appear to be in compliance with a GSP. In the event such a determination is made, the affected applicant will be notified and must provide substantial evidence that the proposed groundwater extraction will be sustainable, as defined under the Ordinance. Well permitting would then proceed under the county's discretionary program developed for non-exempt wells.

- **Regulating groundwater extraction after adoption of GSPs from any existing well that the county reasonably concludes is not in compliance with a GSP.** After GSPs have been adopted, the prohibition against unsustainable extraction will apply to any existing well in the unincorporated areas of the county from which the County reasonably concludes groundwater is being unsustainably withdrawn. In essence, these are existing wells that do not appear to be operated in compliance with a GSP. In the event such a determination is made, the affected holder of a Well Construction Permit for the well will be notified and required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in the Ordinance.[12] If the county determines that continued groundwater extraction from such a well is not sustainable, it will be subject to the prohibition in the Ordinance.

For perspective, since the adoption of the Ordinance in November 2014, more than 100 ministerial well permits have been issued for wells found to be exempt from the Ordinance, but only one discretionary well permit has been processed for a non-exempt well. It is anticipated that as the discretionary well permitting program matures, the number of discretionary permits issued will increase. However, based on experience to date, it is reasonable to assume that the rate at which discretionary permits are issued will not exceed 10 percent of the ministerial permitting rate. In addition, the time period during which most of these permits would be issued extends only until 2022. After this time, most well permitting is expected to be in compliance with adopted GSPs, and to be performed on a ministerial basis.

As noted above, the county will issue discretionary well permits under the Implementation Guidelines developed per the requirements of the Ordinance. These implementation guidelines include thresholds that trigger requirements for implementation of certain investigations, monitoring, well design standards, or mitigation measures that are intended to assure the new wells will comply with the prohibition in the Ordinance against unsustainable groundwater extraction. The implementation guidelines are embodied in several documents that are included as Appendix A. The guidelines include the following requirements:

[12] This "Look Back Provision" is intended to serve as a continuing safeguard against unsustainable extraction from new and existing wells in the both the exempt and non-exempt areas of the county after GSPs are adopted.

Groundwater Levels and Storage:

- Predicted drawdown induced by new non-exempt wells may not exceed 10 percent of the pumped aquifer thickness.
- If predicted interference drawdown exceeds 5 feet at an existing domestic well, or 20 feet at an existing irrigation, municipal, or industrial well, the applicant must implement a Well Interference Drawdown Monitoring and Mitigation Program to identify and ameliorate any significant adverse impacts to these wells.
- If the proposed well is located in an area designated by the county as a Groundwater Level Management Zone, the applicant must (1) provide and implement a Groundwater Extraction Offset plan that demonstrates the well will not result in a net increase in groundwater demand, or (2) complete a Groundwater Resources Investigation that demonstrates the proposed groundwater extraction will not result in adverse critical overdraft conditions as defined by DWR; and (3) provide and implement a groundwater level monitoring program.

Water Quality:

- If the proposed well is located in a county-designated Groundwater Quality Protection Zone (within an area underlain by the Corcoran Clay), well construction standards must be implemented that prevent potential water quality degradation caused by cross connecting the confined and unconfined aquifer systems.
- If the proposed well is located in a county-designated Groundwater Quality Study Zone (within 1 mile of a well that produces water with solute concentrations that exceed primary or secondary maximum contaminant levels [MCLs] or other applicable Water Quality Objectives), or within 1 mile of a reported contamination incident, the applicant must submit a Groundwater Quality Investigation that demonstrates the proposed groundwater extraction will not result in the capture or migration of contaminated or poor quality groundwater.

Subsidence:

- If the proposed well is located in a county-designated Subsidence Study Zone (within 2 miles of an area underlain by the Corcoran Clay), and the well is predicted to draw down groundwater levels in the confined aquifer system to an elevation below historical low levels or subsidence has been reported nearby, the applicant must submit a Geotechnical Subsidence Investigation to assess subsidence that may be induced by the proposed groundwater extraction and provide recommendations for monitoring and mitigation, as appropriate.

Surface Water Depletion:

- If the proposed well is located in a county-designated Surface Water Protection Zone (within 1 mile of groundwater-connected streams, tributaries, or reservoirs associated with the Calaveras, San Joaquin, Stanislaus, or Tuolumne Rivers if the well screen and gravel pack are completed within 200 feet vertically of the streambed elevation, and within 2,500 feet if the well screen and gravel pack are completed at least 200 feet below the streambed elevation), the applicant must perform a

Surface-Groundwater Interaction Study that demonstrates the proposed groundwater extraction will not cause depletion of surface water that unreasonably affects beneficial surface water uses.

Groundwater-Dependent Ecosystems (GDEs):

- If predicted drawdown of the shallow aquifer exceeds 1 foot at any groundwater dependent ecosystem (GDE), a GDE Impact Assessment must be performed, including identification and mitigation of any potentially significant adverse impacts to GDEs.

2.3 Hydrologic Modeling for Program Evaluation

Evaluation of the potential environmental effects associated with the program requires modeling of program implementation using a hydrologic computer model (the Stanislaus County Hydrologic Model, or SCHM). This evaluation will include development of projections regarding future groundwater demand, including the installation and general location of new wells, to represent implementation of the Groundwater Ordinance, as described in the previous section. Projected groundwater demand will be assessed by simulating groundwater extraction from a set of hypothetical wells, added to the SCHM in areas where expanded extraction is expected or planned. The number, depth and capacity of these hypothetical wells will be based on known groundwater supply projects that are expected to be implemented, anticipated groundwater demand trends based on information in planning documents, historical well permitting trends in the areas exempt from the prohibitions in the Ordinance, and historical well permitting trends in the unincorporated areas of the county that are subject to the prohibitions in the Ordinance. Regarding the latter category, it is anticipated that the rate of non-exempt well installation will increase over time as the program matures, and the PEIR is completed.

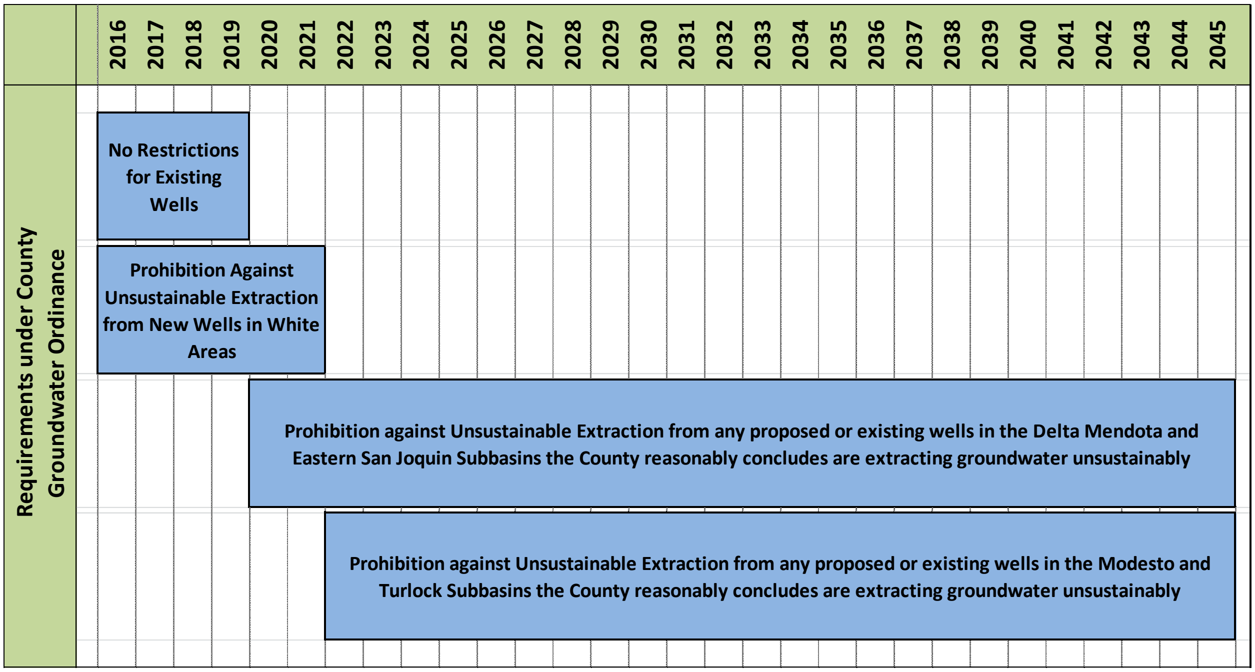
The Ordinance requirements applicable to wells in the county over the implementation horizon evaluated in this PEIR are shown graphically in Figure 2-2, below. These requirements coincide with the adoption and implementation of GSPs in the Delta Mendota and Eastern San Joaquin Subbasins beginning in 2020 and in the Modesto and Turlock Subbasins beginning in 2022, with achievement of sustainable groundwater management throughout the basins within 20 years after the GSP is adopted.

2.4 Evaluation of Indirect Actions

CEQA requires that an environmental analysis include the whole of an action and its potential consequences. This includes off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts, as long as they are reasonably foreseeable.[13] The primary impacts that will be evaluated in the PEIR (and this Initial Study) are the direct and indirect impacts associated with the primary action – construction and operation of groundwater extraction wells. Indirect actions that will be considered include the secondary actions resulting from issuing discretionary permits for

[13] CEQA Guidelines § 15378.

Figure 2-2: Timeline for Well Permitting Requirements to be Evaluated in the SCHM



wells that will be used to supply water for cultivation in areas previously occupied by open rangeland (i.e., for agricultural conversion), or the secondary actions that denying discretionary permits (or curtailing groundwater extraction) would trigger regarding agricultural site uses or utility service systems. However, tertiary and higher-tier actions, such as shifts in population growth or employment patterns in response to changes in land use, and their associated environmental effects are considered too speculative for analysis in the PEIR or this Initial Study. This is because the number, locations and distribution of new wells evaluated under the program are not known, and higher-tier indirect effects are often driven by influences that are not reasonably foreseeable, such as future implementation of GSPs, or adoption of state standards and policies that affect surface water flow requirements and water supply deliveries.

3.0 ENVIRONMENTAL SETTING

3.1 General

The program that will be evaluated by the proposed PEIR is applicable to unincorporated areas of Stanislaus County in central California. The county covers 1,515 square miles in the northern San Joaquin Valley and surrounding coast range to the west and Sierra Nevada foothills to the east. Stanislaus County had a population of 531,997 residents in 2014, which is projected to grow to 611,376 by 2025.[14] The county is noted for its agriculture and food processing; agricultural sales and related industry accounted for $13 billion in economic activity in 2013. Other major segments of the economy include manufacturing and a range of service industries (healthcare, retail, and others). The largest manufacturing companies in the county are associated with the production of food and wine. Water supply is a major concern and is considered key to future economic prosperity, particularly in light of projected population increases.

As noted in the Section 2, Project Description, this evaluation focuses on unincorporated portions of the county because the Ordinance does not apply to the incorporated areas. The portion of the county located in the Coast Range west of the San Joaquin Valley is largely occupied by open rangeland and underlain by relatively impermeable bedrock of the Diablo Range. Groundwater supplies are very limited in this area, and groundwater demand consists of relatively few domestic and stock wells, which would be considered *de minimis* and therefore exempt from the Ordinance. The area of potential effects (APE) considered in this Initial Study and the PEIR therefore does not include this area, and focuses on the portion of the county within the San Joaquin Valley and the eastern foothills. These areas are underlain by regional aquifers within the San Joaquin Groundwater Basin and associated subbasins, as described in greater detail below.

Conditions that may be of specific concern to this Initial Study and the PEIR include new groundwater demand to supply the conversion of rangeland to agricultural production in the eastern portion of the county, and increased reliance on groundwater in the western portion of the San Joaquin Valley, where surface water deliveries have become less reliable as a result of the current drought and increased allocation of surface water to environmental uses. These trends were partially responsible for the adoption of the Ordinance in 2014. Conjunctive use of groundwater and surface water is of critical importance to the reliability of both agricultural and municipal water supplies in the county. Throughout most of the county, and especially within the boundaries of public water agencies, this has been effectively accomplished as evidenced by the long terms stability of groundwater levels. However, increased reliance on groundwater in some areas, exclusive long-term reliance on groundwater in other areas, and the effects of the drought over the last five years have resulted in stresses to groundwater resources. Some of these stresses will be alleviated by the end of the current drought and a return of more normal climatic conditions; however,

[14] Stanislaus County, 2016. Stanislaus County Comprehensive Economic Development Strategy, 2016-2021.

trends toward agricultural land conversion and increased allocation of surface water for environmental purposes will continue to pose challenges in the future.

3.2 Land Use

Land use in Stanislaus County consists primarily of agricultural development. The communities of Ceres, Hughson, Modesto, Newman, Patterson, Riverbank, and Turlock are also located in this area. The low foothills that comprise the eastern portion of the county are occupied primarily by open rangeland and some cultivated land, as well as several unincorporated communities. Several reservoirs important to the management of local water supplies are also located in this area.

3.3 Water Supply

Stanislaus County relies on the conjunctive use of surface water and groundwater. The Stanislaus and Tuolumne Rivers are an important agricultural and municipal water supply source to the county via diversions that occur under senior water rights held by Modesto Irrigation District, Oakdale Irrigation District and Turlock Irrigation District. These districts deliver water to their agricultural and municipal customers through locally developed and financed water projects. Several public water agencies also divert at least a portion of the water they deliver from the San Joaquin River, for example El Solyo Water District, Patterson Irrigation District and Westside Irrigation District. Additional riparian and appropriative water rights holders near these rivers divert water for local use. The California Aqueduct and Delta Mendota Canal skirt the western edge of the San Joaquin Valley and also provide water to several public water agencies, for example Central California Irrigation District, Del Puerto Water District, Oak Flat Water District, Patterson Irrigation District and Westside Irrigation District.

Groundwater is the predominant source of municipal water in the county, although surface water makes up a growing percentage of the municipal water supply, and additional projects to provide surface water for municipal use are being planned. Throughout most of the county, groundwater is used conjunctively with surface water as an irrigation water supply. Generally, in areas that receive surface water deliveries, groundwater is used as a supplemental irrigation supply during times of surface water shortage. This conjunctive use pattern, combined with deep percolation of applied water to recharge groundwater supplies, has resulted in generally stable groundwater levels over the long term. A few areas rely primarily on groundwater as an irrigation water supply. These areas include, for example, Eastin Water District, Eastside Water District and the unincorporated areas of the county that are located outside of the boundaries of existing public water agencies (the "White Areas" discussed in Section 2.2. Groundwater resources in these areas are more vulnerable to long term stress and depletion; however, enhanced groundwater recharge and other means of relieving stress on groundwater resources are being investigated in these areas.

Due to regulatory restrictions associated with pumping water through the Sacramento-San Joaquin Delta and recent drought conditions, surface water deliveries from the state and federal water projects to water agencies west of the San Joaquin River have been significantly less than their contract allocations. For example, during the last seven years, Del Puerto Water District received 10% (2009), 80% (2010), 45% (2011), 40% (2012), 20% (2013), 0% (2014), and 0% (2015) of its contact allocation.[15] In addition, irrigation districts east of the San Joaquin River have not been able to deliver their full allocations during the drought. The affected water districts have actively engaged in local, regional, and statewide efforts to secure additional water supplies as needed to help meet customer demand; however, in some cases landowners have relied on the fallowing of productive lands or turned to groundwater for irrigation supplies, where available.

3.4 Physiographic Setting

The APE considered in this Initial Study includes the portions of Stanislaus County occupied by the San Joaquin Valley and the low Sierra Nevada foothills to the east. The San Joaquin Valley comprises the southern two thirds of California's Central Valley, a long asymmetrical trough that extends north-northwest for approximately 400 miles between the Coast Ranges on the west and the Sierra Nevada and Cascade Mountains to the east, and is approximately 40 to 60 miles wide. In Stanislaus County, the valley floor ranges in elevation from approximately 70 to 150 feet above mean sea level (amsl) near the southern county boundary to 30 to 100 feet amsl near the northern boundary. It is bounded by abruptly rising hills and mountains of the Diablo Range to the west that rise to elevations as high as 3,000 to 4,000 feet amsl. To the east are gently rising rolling foothills of the Sierra Nevada, which reach elevations of approximately 400 to 700 feet amsl near the eastern county boundary.

3.5 Climate

The area has a "Mediterranean" climate characterized by hot, dry summers and short, wet winters, and averages more than 260 sunny days per year. The average annual precipitation at the Modesto meteorological station is just over 13 inches per year, with 88 percent occurring between November and April.[16,17]

Much of California, including the Central Valley, has experienced unprecedented drought conditions over the last four years. As a result, water conservation measures have been mandated, delivery of surface water from the state and federal water systems has been curtailed, and reliance on groundwater resources for agricultural uses has increased.

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[15] Stanislaus Local Agency Formation Commission, 2016. Municipal Service Review and Sphere of Influence Update for: Del Puerto, Eastin, El Solyo and Oak Flat Water Districts, Patterson and West Stanislaus Irrigation Districts.

[16] Turlock Irrigation District, 2012. 2012 Agricultural Water Management Plan.

[17] Sperlings Best Places, 2016. http://www.bestplaces.net/climate/county/california/stanislaus. Accessed April 25.

3.6 Hydrology

Stanislaus County is located in the northern portion of the San Joaquin River Hydrologic Region. Major drainages entering the county from the east include the Stanislaus and Tuolumne Rivers, which are fed by storm runoff and snowmelt from the Sierra Nevada and constitute an important water supply for the county. These rivers are tributary to the San Joaquin River, which enters the county from the south and flows north-northwestward through the low point of the San Joaquin Valley. Streams entering Stanislaus County from the Diablo Range to the west are smaller and typically ephemeral in nature, reaching the San Joaquin River for only part of the year.

3.7 Geology

The San Joaquin Valley is a deep, north-northwest trending alluvial basin filled with a succession of Recent to upper Tertiary alluvial sediments derived from the Coast Range to the west and the Sierra Nevada to the east. The materials are underlain by a succession of Tertiary and Mesozoic marine sedimentary formations. On the western side of the San Joaquin Valley, Quaternary alluvial deposits are underlain by the Plio-Pleistocene Tulare Formation, which increases in thickness eastward away from the Diablo Range to a maximum thickness of approximately 1,400 feet near the valley axis.[18] Similarly, east of the San Joaquin River, Quaternary alluvium is underlain by the Pleistocene Modesto and Riverbank Formations, and the Plio-Pleistocene Turlock Lake Formations. The Tulare, Modesto, Riverbank and Turlock Lake Formations all consist largely of alluvial deposits separated by a series of fine-grained lacustrine deposits, which increase in frequency and thickness toward the valley center. The most regionally extensive lacustrine deposit is the Corcoran Clay member of the Tulare and Turlock Lake Formations, which is thickest near the axis of the basin and thins or is absent near the basin edges.

On the east side of the county, the volcano-fluvial Pliocene-Miocene Mehrten Formation underlies the Turlock Lake Formation and crops out in the foothills, where it forms a dissected upland. The Mehrten Formation consists of semi-consolidated to well consolidated sandstones, conglomerates and siltstones, and is underlain by lower Tertiary volcanic and volcano-fluvial formations in the foothills, and marine sedimentary formations beneath the valley.

3.8 Hydrogeology

Stanislaus County is underlain by the East San Joaquin, Modesto, Turlock, and Delta Mendota Subbasins of the San Joaquin Valley Groundwater Basin (SJVGB). Aquifer systems in the SJVGB consist mostly of continental sediments derived from erosion of the Sierra Nevada to the east and the Coast Ranges to the west and deposited in the valley. The alluvial aquifer system, much of which occurs as fan deposits, consists

[18] San Luis and Delta-Mendota Water Users Authority, 2011. Groundwater Management Plan for the Northern Agencies in the Delta Mendota Canal Service Area.

of a complex set of interbedded aquifers and aquitards that function regionally as a single water-yielding system. The aquifers are relatively thick, with the upper 800 feet providing the primary source of groundwater supply in the area. Aquifer materials consist of gravel and sand, which become increasingly interbedded with fine-grained silt, clay, and lakebed deposits toward the center of the valley. Regionally, the aquifer system of the SJVGB can be divided into an upper unconfined to semi-confined aquifer system, a series of geographically extensive confining clay layers, and a deep confined aquifer system that occupies the central portions of the basin. Toward the center of the valley, the distal, finer-grained facies of the alluvial deposits are interfingered and interbedded with floodplain and basin deposits. Buried river-channel deposits occur in the alluvial fan deposits at the margins of the valley and along Pleistocene and modern river courses.[19]

Although in most of the county groundwater levels have been relatively stable over the long term through conjunctive use of surface water and groundwater, all four of the subbasins underlying the county have experienced areas of stress. In some areas, these stresses have been exacerbated by drought conditions over the last five years, which have decreased surface water availability and increased reliance on groundwater for the agricultural sector. The East San Joaquin and Delta Mendota Subbasins are designated as being in a state of critical overdraft by the California Department of Water Resources (DWR), primarily due to subsidence caused by overdraft outside of the county.[20] Up to approximately 2.5 inches of subsidence has been reported in the Delta Mendota Subbasin within the county, and three of the four subbasins underlying the county have been identified as having a high or medium to high potential for future subsidence. In addition, the Delta Mendota Subbasin has experienced increased stress on groundwater resources due to the unreliability of surface water deliveries from the state and federal water projects, and the remaining subbasins are experiencing increased stress due to greater groundwater demand caused by conversion of rangeland to agricultural cultivation.

The lack of current surface-water supply options in eastern Stanislaus County, coupled with an increased rate of rangeland conversion to agricultural use, has placed significant stress on groundwater resources within the portion of the East San Joaquin Subbasin that underlies the county and on the eastern Modesto and Turlock Subbasins. Over the last 10 years, over 60,000 acres of rangeland have been converted to irrigated agriculture in these areas and are almost entirely dependent on groundwater. In addition, the predominant crop types involved are nut trees, vines and other permanent crops, resulting in a significant hardening of this new groundwater demand. This has placed a significant new stress on limited groundwater resources in the Mehrten Formation uplands that may be expected to continue, if not grow,

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[19] DWR, 2013. California's Groundwater Update 2013, A Compilation of Enhanced Content for California Water Plan Update 2013, Chapter 8 – San Joaquin River Hydrologic Region. April.

[20] DWR, 2016b. Groundwater Information Center Interactive Map Application. https://gis.water.ca.gov/app/gicima/. Accessed May 20.

over the foreseeable future. Groundwater monitoring data are limited in this portion of the county; however, this new groundwater demand has caused significant public concern.

3.9 Biological Resources

Stanislaus County is located within the San Joaquin Valley and Central Coast bioregions. These bioregions have a Mediterranean climate and support a variety of habitat types, including blue oak-digger pine forest, chaparral, annual grassland, alkali desert scrubland, tule marsh, riparian forest, freshwater emergent wetland, vernal pools, valley foothill riparian, valley oak savannah, blue oak woodland, and valley oak woodland, among others.[21] The majority of Stanislaus County lies within the San Joaquin Valley, which has a mix of agricultural and urban land uses. San Joaquin Valley grassland, rangeland, and agricultural areas provide wildlife habitat as described below.

Grassland habitats in the San Joaquin Valley were originally composed of a mix of native perennial and annual grasses such as needle grass (*Stipa cernua, S. pulchra*), and alkali sacaton (*Sporobolus airiodes*), but have since been degraded with a dominance of naturalized annual grasses such as soft chess (*Bromus hordeaceus*), red brome (*B. madritensis* ssp. *rubens*), ripgut (*Bromus diandrus*), and medusa head (*Elymus caput-medusae*). Forbs include lupines (*Lupinus* spp.), Bird's foot trefoil (*Acmispon americanus*), Mariposa lilies (*Calochortus venustus*), popcorn flower (*Cryptantha* sp.), filaree (*Erodium cicutarium* and *E. brachycarpum*), and California poppy (*Eschscholzia californica)*. Vernal pools occur in grassland habitats in small depressions underlain with an impermeable substrate that creates ephemeral wetlands with winter rains. Special status invertebrates are found in vernal pools, including federally threatened vernal pool fairy shrimp *(Branchinecta lynchi)* and federally endangered vernal pool tadpole shrimp (*Lepidurus packardi)*. Grassland habitats also support large populations of small prey species, including deer mouse (*Peromyscus maniculatus*), California vole (*Microtus californicus*), Botta's pocket gopher (*Thomomys bottae*), and California ground squirrel (*Spermophilus beecheyi*). Common reptiles and amphibians of grasslands include western fence lizard (*Sceloporus occidentalis*), common kingsnake (*Lampropeltis getula*), western rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis melanoleucus*), western toad (*Anaxyrus boreas*), and western spadefoot toad (*Spea hammondii*). Grasslands are important foraging areas for a variety of wildlife including coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), San Joaquin kit fox (*Vulpes macrotis mutica*) (federally endangered and state threatened), American badger (*Taxidea taxus*) (species of special concern), and numerous bird species, including red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), yellow-billed magpie (*Pica nuttalli*), loggerhead shrike (*Lanius ludovicianus*), and savannah sparrow (*Passerculus sandwichensis*). Nesting birds of grasslands include killdeer (*Charadrius vociferous*), ring-necked pheasant

[21] Welsh, Hartwell H., 1994. *Bioregions: An Ecological and Evolutionary Perspective and a Proposal for California*. California Department of Fish and Game.

(*Phasianus colchicus)*, western kingbird (*Tyrannus verticalis*), western meadowlark (*Strunella neglecta*), and horned lark (*Eremophila alpestris*).

Rangeland is managed for foraging livestock and is a mix of herbaceous dominated by grasses and forbs, and shrub and brush rangeland that has a mix of woody vegetation. Depending on the level of grazing, rangeland can have sparse or weedy vegetation. Coyote, black-tailed jackrabbit (*Lepus californicus*), and California kangaroo rat (*Dipodomys californicus*) are commonly found in rangeland.[22][23]

Agricultural areas include two types: (1) cropland and pasture and (2) orchards and vineyards. Irrigated pastures provide foraging and roosting opportunities for shorebirds and wading birds; unirrigated pastures provide forage for seed-eating birds and small mammals. Small mammals found in pastures include California voles, Botta's pocket gophers, and California ground squirrels, which are prey for foraging raptors, including red-tailed hawks, white-tailed kites (*Elanus leucurus*), and prairie falcons (*Falco mexicanus*). Crops include row crops, grain crops, rice, and cotton. Cropland is more intensively managed and is regularly disturbed throughout the year, generally providing lower quality habitat. Rodent species, such as the California vole, deer mouse, and California ground squirrel, are common and are preyed upon by various raptors. Orchards and vineyards are typically open, single-species habitats that are intensively managed; vineyards are often treated with herbicides to prevent understory growth of competing herbaceous species. Wildlife found in orchards and vineyards includes deer mouse, California quail (*Callipepla californica*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), California ground squirrel, black-tailed jackrabbit, mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), western scrub jay (*Aphelocoma californica*), and northern flicker (*Colaptes auratus*).[24][25]

A query of the California Natural Diversity Database (CNDDB) records of occurrences of threatened, endangered, and special status species covered all of Stanislaus County. Results of the database query are in Tables 3.7.1 and 3.7.2, which list species with the potential to occur in project areas within the county. Sensitive vegetation communities identified by the CNDDB query include Northern Hardpan Vernal Pool, Coastal and Valley Freshwater Marsh, Elderberry Savannah, Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, Great Valley Valley Oak Riparian Forest, and Sycamore Alluvial Woodland.[26]

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[22] East Stanislaus Region, 2013. East Stanislaus Region Integrated Regional Water Management Plan. December.

[23] San Luis and Delta-Mendota Water Authority, 2014. San Luis and Delta-Mendota Water Authority, Westside-San Joaquin Integrated Water Resources Plan (Draft). July.

[24] East Stanislaus Region, 2013. East Stanislaus Region Integrated Regional Water Management Plan. December.

[25] San Luis and Delta-Mendota Water Authority 2014. San Luis and Delta-Mendota Water Authority, Westside-San Joaquin Integrated Water Resources Plan (Draft). July.

[26] California Department of Fish and Wildlife, 2016. California Natural Diversity Database (CNDDB) query of special status plants, wildlife, and communities records for Stanislaus County. August.

Table 3.7-1 Special-Status Wildlife Species Potentially Occurring in Stanislaus County

Scientific Name	Common Name	Federal/State Status
AMPHIBIANS		
Ambystoma californiense	California tiger salamander	FT/ST
Rana boylii	foothill yellow-legged frog	SSC
Rana draytonii	California red-legged frog	FT, SSC
Spea hammondii	western spadefoot	SSC
BIRDS		
Agelaius tricolor	tricolored blackbird	SSC
Aquila chrysaetos	golden eagle	CFP
Athene cunicularia	burrowing owl	SSC
Branta hutchinsii leucopareia	cackling (=Aleutian Canada) goose	FD
Buteo swainsoni	Swainson's hawk	FT
Charadrius montanus	mountain plover	SSC
Coccyzus americanus occidentalis	western yellow-billed cuckoo	FT, SE
Haliaeetus leucocephalus	bald eagle	FD, SE
Icteria virens	yellow-breasted chat	SSC
Lanius ludovicianus	loggerhead shrike	SSC
Melospiza melodia	song sparrow ("Modesto" population)	SSC
Vireo bellii pusillus	least Bell's vireo	FE, SE
CRUSTACEANS		
Branchinecta conservatio	Conservancy fairy shrimp	FE
Branchinecta lynchi	vernal pool fairy shrimp	FT
Lepidurus packardi	vernal pool tadpole shrimp	FE
FISH		
Lavinia symmetricus ssp. *1*	San Joaquin roach	SSC
Mylopharodon conocephalus	Hardhead	SSC
Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	FT
Pogonichthys macrolepidotus	Sacramento splittail	SSC
INSECTS		
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	FT
MAMMALS		
Antrozous pallidus	pallid bat	SSC
Corynorhinus townsendii	Townsend's big-eared bat	CT
Eumops perotis californicus	western mastiff bat	SSC
Lasiurus blossevillii	western red bat	SSC
Neotoma fuscipes riparia	riparian (=San Joaquin Valley) woodrat	FE, SSC
Sylvilagus bachmani riparius	riparian brush rabbit	FE, SE
Taxidea taxus	American badger	SSC
Vulpes macrotis mutica	San Joaquin kit fox	FE, ST

Scientific Name	Common Name	Federal/State Status
REPTILES		
Emys marmorata	western pond turtle	SSC
Masticophis flagellum ruddocki	San Joaquin coachwhip	SSC
Masticophis lateralis euryxanthus	Alameda whipsnake	FT, ST
Phrynosoma blainvillii	coast horned lizard	SSC

Notes:
FE Federally Endangered
FT Federally Threatened
FC Federal Candidate
FD Federally Delisted
PT Federally Proposed Threatened
SSC Species of Special Concern
CFP California Fully Protected Species
SE State Endangered
ST State Threatened
SR State Rare
CT State Candidate Threatened

Table 3.7-2 Special-Status Plant Species Potentially Occurring in Stanislaus County

Scientific Name	Common Name	Federal/State Status
PLANTS		
Acmispon rubriflorus	red-flowered bird's-foot-trefoil	CNPS 1B.1
Allium sharsmithiae	Sharsmith's onion	CNPS 1B.3
Astragalus tener var. *tener*	alkali milk-vetch	CNPS 1B.2
Atriplex cordulata var. *cordulata*	heartscale	CNPS 1B.2
Atriplex minuscula	lesser saltscale	CNPS 1B.1
Atriplex persistens	vernal pool smallscale	CNPS 1B.2
Atriplex subtilis	subtle orache	CNPS 1B.2
Blepharizonia plumosa	big tarplant	CNPS 1B.1
California macrophylla	round-leaved filaree	CNPS 1B.2
Calycadenia hooveri	Hoover's calycadenia	CNPS 1B.3
Campanula exigua	chaparral harebell	CNPS 1B.2
Campanula sharsmithiae	Sharsmith's harebell	CNPS 1B.2
Castilleja campestris var. succulenta	succulent owl's-clover	FT, SE, CNPS 1B.2
Caulanthus lemmonii	Lemmon's jewelflower	CNPS 1B.2
Cirsium fontinale var. *campylon*	Mt. Hamilton fountain thistle	CNPS 1B.2
Clarkia rostrate	beaked clarkia	CNPS 1B.3
Cryptantha hooveri	Hoover's cryptantha	CNPS 1A
Cryptantha mariposae	Mariposa cryptantha	CNPS 1B.3
Delphinium californicum ssp. *interius*	Hospital Canyon larkspur	CNPS 1B.2
Downingia pusilla	dwarf downingia	CNPS 2B.2

Scientific Name	Common Name	Federal/State Status
PLANTS		
Eriastrum tracyi	Tracy's eriastrum	SR, CNPS 3.2
Eryngium racemosum	Delta button-celery	FE, CNPS 1B.1
Eryngium spinosepalum	spiny-sepaled button-celery	CNPS 1B.2
Eschscholzia rhombipetala	diamond-petaled California poppy	CNPS 1B.1
Euphorbia hooveri	Hoover's spurge	FT, CNPS 1B.2
Fritillaria agrestis	stinkbells	CNPS 4.2
Fritillaria falcata	talus fritillary	CNPS 1B.2
Juncus nodosus	knotted rush	CNPS 2B.3
Lagophylla dichotoma	forked hare-leaf	CNPS 1B.1
Legenere limosa	legenere	CNPS 1B.1
Leptosyne hamiltonii	Mt. Hamilton coreopsis	CNPS 1B.2
Lomatium observatorium	Mt. Hamilton lomatium	CNPS 1B.2
Madia radiate	showy golden madia	CNPS 1B.1
Malacothamnus hallii	Hall's bush-mallow	CNPS 1B.2
Monardella leucocephala	Merced monardella	CNPS 1A
Navarretia gowenii	Lime Ridge navarretia	CNPS 1B.1
Neostapfia colusana	Colusa grass	FT, SE, CNPS 1B.1
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	FT, SE, CNPS 1B.1
Orcuttia pilosa	hairy Orcutt grass	FE, SE, CNPS 1B.1
Phacelia phacelioides	Mt. Diablo phacelia	CNPS 1B.2
Plagiobothrys verrucosus	warty popcornflower	CNPS 2B.1
Pseudobahia bahiifolia	Hartweg's golden sunburst	FE, SE, CNPS 1B.1
Puccinellia simplex	California alkali grass	CNPS 1B.2
Sphenopholis obtusata	prairie wedge grass	CNPS 2B.2
Tuctoria greenei	Greene's tuctoria	FE, SR, CNPS 1B.1

Notes:
FE Federally Endangered
FT Federally Threatened
SE State Endangered
SR State Rare
CNPS California Native Plant Society
California Native Plant Society Rankings:
Rare Plant Ranks–
1A= Plants presumed extirpated in California and either rare or extinct elsewhere
1B=Plants rare, threatened, or endangered in California and elsewhere
2B=Plants rare, threatened, or endangered in California, but more common elsewhere
3=Plants about which more information is needed
4=Plants of limited distribution
Threat Ranks (listed after the rare plant rank with the following format [for example]: 1B.1)–
0.1–Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
0.2–Moderately threatened in California (20–80% occurrences threatened/moderate degree and immediacy of threat)
0.3–Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)
(CNPS 2016 http://www.cnps.org/cnps/rareplants/ranking.php)

4.0 ENVIRONMENTAL CHECKLIST

Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" or as a "Potentially Significant Unless Mitigation Incorporated," as indicated by the checklist on the following pages.

☐ Aesthetics	☒ Greenhouse Gas Emissions	☐ Population and Housing
☒ Agriculture and Forestry Resources	☒ Hazards and Hazardous Materials	☐ Public Services
☒ Air Quality	☒ Hydrology and Water Quality	☐ Recreation
☒ Biological Resources	☒ Land Use and Planning	☐ Transportation and Traffic
☒ Cultural Resources	☐ Mineral Resources	☒ Utilities and Service Systems
☒ Geology and Soils	☒ Noise	☐ Mandatory Findings of Significance

Determination (To Be Completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLRATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Evaluation of Environmental Impacts

A brief explanation is required for all answers except "No Impact" that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (for example, the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors, as well as general standards (for example the project would not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

All answers must take into account the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

"Negative Declaration: Less than Significant with Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact."

Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (such as general plans and zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated. A source list should be attached and other sources used or individuals contacted should be cited in the discussion.

Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

This form is only suggested, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

The explanation of each issue should identify the significance criteria or threshold, if any, used to evaluate each question.

4.1 Aesthetics

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Have a substantial adverse effect on a scenic vista?			X	
b. Substantially damage scenic resources, including, but not limited to, trees, outcroppings, and historic buildings within a state scenic highway?			X	
c. Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?			X	

a. Would the project have a substantial adverse effect on a scenic vista?

The construction of new wells would not have a substantial adverse effect on a scenic vista because any aboveground infrastructure associated with well construction would be relatively minor in scale and would not block or otherwise obstruct a scenic vista. Unincorporated Stanislaus County is not densely populated, and there are large expanses of agricultural scenery so that a small feature associated with an underground well would not be easily noticed. Additional equipment and vehicles would be present during construction of a well, but these impacts would be temporary and these features would be removed when construction is complete.

Some new irrigation wells for which discretionary permits are issued would be used to facilitate new agricultural cultivation in areas that were previously uncultivated. Land uses supported by these new wells would be consistent with existing zoning requirements and would generally be consistent with existing land uses and vistas. Therefore direct and indirect impacts from the project on scenic vistas are likely to be less than significant. For these reasons, this issue does not require further analysis in the PEIR.

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Interstate Route 5 from the Stanislaus County border to the San Joaquin County border is designated a State Scenic Highway. It parallels the Delta-Mendota Canal and the California Aqueduct and is called the West Side Freeway. Developing new wells in unincorporated Stanislaus County is not likely to substantially damage scenic resources, including those within the West Side Freeway, because any associated aboveground structures would be small and would not be noticeable when traveling on the scenic highway.

Viewers drive along the highway in vehicles at high speeds, further increasing the difficulty in noticing small-scale features, such as well infrastructure. During construction of wells, it is expected that construction vehicles and equipment would be sited away from trees, rock outcroppings, and historic buildings within the scenic highway. Any impacts during construction would be temporary, ending when construction is complete.

Some new irrigation wells for which discretionary permits are issued would be used to facilitate new agricultural cultivation in areas that were previously uncultivated. Land uses supported by new wells would be consistent with existing zoning requirements and would generally be consistent with existing land uses and vistas. Therefore, direct and indirect impacts from the project on scenic resources are likely to be less than significant. For these reasons, this issue does not require further analysis in the PEIR.

c. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

Construction of new wells would not substantially degrade the existing visual character and surroundings of unincorporated Stanislaus County because wells and their aboveground infrastructure would not be inconsistent visual features of the sites and their surroundings. As unincorporated Stanislaus County is not densely populated and is agricultural in nature, wells would be consistent with other agricultural uses in the area, and small features associated with wells would not detract from the overall character of the area. Construction of wells may temporarily affect the character of the surroundings resulting from the presence of construction vehicles and equipment, but those impacts would be temporary, lasting only during the construction period.

Some irrigation wells for which discretionary permits are issued would be used to facilitate new agricultural cultivation in areas that were previously uncultivated. Land uses supported by new wells would be consistent with existing zoning requirements and would generally be consistent with the existing visual character and quality of the sites and surrounding area. Therefore, direct and indirect impacts from the project on the existing visual character or quality of sites undergoing agricultural conversion and surrounding areas are likely to be less than significant. For these reasons, this issue does not require further analysis in the PEIR.

d. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Neither the construction of wells for which discretionary permits are issued nor any permanent infrastructure associated with them would be a new source of substantial light or glare that would adversely affect day or nighttime views in the area. Outdoor lighting would be controlled by the Stanislaus County General Plan Land Use Element, Goal 2, Policy 16, Implementation Measure 1 (develop light and glare standards to ensure that artificial outdoor lighting is efficient and focused on achieving safety and security requirements for the associated land use) and Implementation Measure 2 (outdoor lighting shall be required to provide minimum impact to the surrounding environment and where feasible will utilize downcast, cut-off type fixtures that are shielded and direct the light only towards objects requiring illumination). During construction, on-site lighting may be necessary if well drilling occurs at night; however, any light sources would be minimized, directed away from populated areas, and focused on the project site. Construction activities would be temporary. Operation of the wells may require security lighting at night, but this lighting would be shielded and directed downward to minimize light spill. Direct and indirect impacts from this project related to light and glare would be less than significant, and this issue does not require further analysis in the PEIR.

4.2 Agriculture and Forestry Resources

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	X			
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?			X	
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Codes section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				X
d. Result in the loss of forest land or conversion of forest land to non-forest use?				X
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	X			

a. Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

Most new wells for which discretionary permits are issued would be irrigation wells related to the continuance of existing agricultural use or conversion from one agricultural use to another (such as rangeland to orchards). The permitting of new wells would not result in the conversion of farmland to non-agricultural uses. Stanislaus County General Plan Land Use Element, Goal 7, Policy 32, states that any decision by the Board of Supervisors of the county to approve the redesignation or rezoning of land from an agricultural or open space use to a residential use requires and is contingent upon approval by a majority vote of the county voters at a general or special local election. Also, the majority of lands zoned General Agriculture District (A-2) are subject to Williamson Action contracts. Finally, land use conversion is also limited by Stanislaus County General Plan Agricultural Element, Goal 2, Policy 2.4 (to reduce development pressures on agricultural lands, higher density development and in-filling shall be encouraged). If, under the Ordinance, groundwater extraction from a new well is determined to be unsustainable, a permit to construct the well would not be issued, or permit conditions would be assigned to limit groundwater extraction from the well to sustainable quantities. In addition, after GSPs are adopted, if the county finds that groundwater extraction from an existing well is not sustainable, the county could require that groundwater extraction from that well be terminated or curtailed to sustainable levels. Under either of these circumstances, it is possible that the volume of irrigation water available at existing farmland would be insufficient to meet irrigation demands, resulting in changes in cultivation to non-irrigated crops or pastures (a reversal of current trends). Limitations on irrigation water availability when surface water deliveries are curtailed (e.g., during droughts) could result in some lands lying fallow for the short-term. If irrigation water restrictions were to continue long-term, there could be local conversion of farmland to non-agricultural uses. The PEIR will evaluate the potential impacts of the project on the availability of irrigation water to farmlands, and the potential for long-term or permanent conversion of unirrigated lands to non-agricultural uses.

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

The project would not directly result in the change of any zoning or Williamson Act contracts. The permitting of new wells for which discretionary permits are issued would support ongoing use of areas zoned for agriculture. Limits on the permitting of new wells could impact the continued use of agricultural lands if the volume of available irrigation water were insufficient to support irrigated cultivation; however, such limits would not create a direct conflict with existing agricultural zoning or Williamson Act Contracts. Direct and indirect impacts from the project would be less than significant, and this issue does not require further analysis in the PEIR.

c. Would the project (c) conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code § 12220(g)), timberland (as defined by Public Resources Codes § 4526), or timberland zoned Timberland Production (as defined by Government Code § 51104(g))?

Stanislaus County does not contain land designated as forest land or timberland.[27] This issue does not require further analysis in the PEIR.

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

Stanislaus County does not contain land designated as forest land. This issue does not require further analysis in the PEIR.

e. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

Limits on the construction of new wells, or on groundwater extraction from new or existing wells from which groundwater extraction is found to be unsustainable, could result in some lands lying fallow for the short term when combined with long-term limits on the availability of surface water (such as during droughts). If irrigation water restrictions were to continue long term, there could be local conversion of farmland to non-agricultural uses. This issue will be further evaluated in the PEIR.

4.3 Air Quality

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Conflict with or obstruct implementation of the applicable air quality plan?	X			
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	X			
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing	X			

[27] Stanislaus County General Plan, Conservation/Open Space Element.

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
emissions which exceed quantitative thresholds for ozone precursors)?				
d. Expose sensitive receptors to substantial pollutant concentrations?				X
e. Create objectionable odors affecting a substantial number of people?				X

4.3.1 Background

In accordance with the Clean Air Act, the U.S. Environmental Protection Agency (U.S. EPA) and the California Air Resources Board (CARB) have established ambient air quality standards for criteria pollutants: the federal National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS). These criteria pollutants include ozone, carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb) and nitrogen dioxide (NO_2).[28] Additional criteria pollutants for California include sulfates, visibility-reducing particulates, hydrogen sulfide (H_2S), and vinyl chloride. California has set standards for certain pollutants, such as particulate matter and ozone, that are more protective of public health than the corresponding federal standards. California is divided into 15 air basins that group together areas with similar geographical and meteorological features and practical combinations of political boundaries. The CARB has designated each area as attainment, nonattainment, or unclassified for each state standard.

4.3.1.1 San Joaquin Valley Air Basin

The project is located within the San Joaquin Valley Air Basin (SJVAB), which includes all of Stanislaus County. The SJVAB covers approximately 25,000 square miles, including San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties, and the Valley portion of Kern County. The SJVAB consists of a continuous inter-mountain valley approximately 250 miles long and averaging 80 miles wide. The region's topographic features restrict air movement through and out of the air basin. The SJVAB is highly susceptible to pollutant accumulation over time. Table 4.3-1 below shows the attainment status of the SJVAB for the CAAQS and NAAQS.

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[28] U.S. Environmental Protection Agency, 2016. Air Quality Planning and Standards. https://www3.epa.gov/airquality/cleanair.html. Accessed September.

Table 4.3-1 SJVAB Attainment Status[29]

Pollutant	Designation/Classification	
Ozone - One hour	No Federal Standard	Nonattainment/Severe
Ozone - Eight hour	Nonattainment/Extreme	Nonattainment
PM_{10}	Attainment	Nonattainment
$PM_{2.5}$	Nonattainment	Nonattainment
Carbon Monoxide	Attainment/Unclassified	Attainment/Unclassified
Nitrogen Dioxide	Attainment/Unclassified	Attainment
Sulfur Dioxide	Attainment/Unclassified	Attainment
Lead (Particulate)	No Designation/Classification	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particles	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

It is thought that the bulk of the valley's summer and winter air pollution is caused by locally generated emissions. Nearly all development projects within the SJVAB have the potential to generate air pollutants, increasing the difficulty in attaining state and federal ambient air quality standards. About 16.7 percent of pollutants in the SJVAB derive from stationary and area sources and approximately 11.4 percent come from farm equipment.

4.3.1.2 San Joaquin Valley Air Pollution Control District

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is the agency principally responsible for comprehensive air pollution control in the SJVAB. The SJVAPCD has developed plans to attain state and federal standards for ozone and particulate matter. The SJVAPCD's air quality plans include emissions inventories to measure the sources of air pollutants, to evaluate how well different control methods have worked, and to show how air pollution will be reduced. The SJVAPCD develops rules and regulations,

[29] San Joaquin Valley Air Pollution Control District, 2016a. Ambient Air Quality Standards & Valley Attainment Status. http://www.valleyair.org/aqinfo/attainment.htm. Accessed September 2016.

establishes permitting requirements, inspects emissions sources, and enforces such measures though educational programs or fines, when necessary.

The SJVAPCD is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources. It has responded to this requirement by preparing a series of Air Quality Management Plans (AQMPs) covering ozone and particulate matter. The AQMPs were prepared to comply with the federal and state Clean Air Acts and amendments, to accommodate growth, to reduce the high pollutant levels of pollutants in the SJVAB, to meet federal and state air quality standards, and to minimize the fiscal impact of pollution control measures on the local economy. The SJVAPCD adopted the 2016 Plan for the 2008 8-Hour Ozone Standard in June 2016 and the 2013 Plan for the Revoked 1-Hour Ozone Standard in September 2013. The 2016 plan satisfies Clean Air Act requirements and ensures expeditious attainment of the 75 parts per billion 8-hour ozone standard.[30] On May 21, 2015, CARB approved the SJVAPCD's 2015 $PM_{2.5}$ State Implementation Plan, which outlines the strategy to attain the federal 1997 24-hour $PM_{2.5}$ standard by 2018 and the 1997 Annual $PM_{2.5}$ standard by 2020.[31] The AQMPs identify the control measures that will be implemented to reduce major sources of pollutants. SJVAPCD regulations ensure that stationary source emissions will be reduced or mitigated to below the SJVAPCD's significance thresholds. SJVAPCD implementation of new source review (NSR) ensures that there is no net increase in emissions above specified thresholds from new and modified stationary sources for all nonattainment pollutants and their precursors. Furthermore, in general, permitted sources emitting more than the NSR offset thresholds for any criteria pollutant must offset all emission increases in excess of the thresholds.

4.3.1.3 Applicable SJVAPCD Regulations

Regulation II (Permits) deals with permitting emission sources**.**

Rule 2010 requires operators of emission sources to obtain an authority to construct and permit to operate from the SJVAPCD.

Rule 2201 provides for the review of new and modified stationary sources of air pollution and provides mechanisms, including emission trade-offs, that would allow construction of these sources without interfering with the attainment or maintenance of ambient air quality standards. It would preclude a net increase in emissions above specified thresholds from new and modified stationary sources of all nonattainment pollutants and their precursors.

Rule 2301 provides an administrative mechanism for sources to store emission reduction credits for later use as offsets and transfer emission reduction credits to other sources for use as offsets and defines eligibility standards, quantitative procedures, and administrative practices to ensure that emission reduction credits are real, permanent, quantifiable, surplus, and enforceable.

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[30] SJVAPCD, 2016e. Ozone Plans. http://www.valleyair.org/Air_Quality_Plans/Ozone_Plans.htm. Accessed September.
[31] SJVAPCD, 2016f. Particulate Matter Plans. http://www.valleyair.org/Air_Quality_Plans/PM_Plans.htm. Accessed September.

Regulation VIII, Fugitive PM_{10} Prohibition, was adopted to reduce ambient concentrations of fine particulate matter by requiring actions to prevent, reduce, or mitigate anthropogenic fugitive dust emissions. Regulation VIII requires property owners, farmers, and public agencies to control fugitive dust emissions from specified outdoor sources, including construction sites, paved and unpaved roads, vacant land, bulk material transport, and similar activities.

Rule 8081 limits fugitive dust emissions from agricultural sources associated with transportation of materials and commodities. Farmers must prepare a Fugitive PM_{10} Management Plan (FPMP) to address use of dust suppressants on unpaved roads and unpaved vehicle traffic areas.

Rule 4303, Orchard Heaters, limits air emissions from gas-fired heaters used to protect orchards from frost.

Rule 4550, Conservation Management, requires preparation and implementation of a Conservation Management Plan outlining practices used to limit fugitive dust emissions from agricultural sites.

Rule 4702 regulates emissions from stationary agricultural equipment by requiring non-emergency certified diesel internal combustion engines greater than 50 horsepower to be replaced by Tier 3 engines or by electrified equipment. As of January 2015, Rule 4702 requires all diesel-fired engines to be replaced with the latest tier engines or be electrified.[32]

4.3.2 Discussion of Impacts

a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

There would be no direct impacts to implementation of SJVAB air quality plans associated with issuing discretionary well permits. Discretionary permits would be issued for wells that would be constructed and operated in compliance with these plans. An increase in the number of discretionary well permits and a consequent increase in the conversion of rangeland to irrigated farmland could increase the level of air pollution, which could conflict with implementation of the AQMPs. The potential for these impacts will be examined further in the PEIR.

b. Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Construction. Well construction would involve exhaust emissions from construction equipment, motor vehicles traveling to and from the site, and fugitive dust generated by traveling on unpaved roads. Given the short-term nature of construction-related activity, and assuming compliance with control measures outlined in Regulation VIII, construction emissions would fall below the SJVAPCD threshold of 100 pounds per day of any criteria pollutant. These construction-related emissions would not likely contribute to a violation of any air quality standard, and impacts would be less than significant.

[32] SJVAPCD, 2016b. Current District Rules and Regulations. http://www.valleyair.org/rules/1ruleslist.htm. Accessed September.

Operation. Operation of permitted wells and their associated infrastructure could increase concentrations of air pollutants. Assuming that operation would generally be limited to the typical period of irrigation (from March through October) and would most often involve the use of electrical pumps, these potential emissions would be minimized. Some irrigation wells for which discretionary permits are issued would be used to facilitate new agricultural cultivation in areas that were previously uncultivated. Increased farm operations could increase the level of air pollution in the SJVAB as a result of increased use of pump engines, boilers, vehicles, and orchard heaters, and from travel on unpaved roads. The SJVAPCD requires agricultural operations to comply with a variety of regulations designed to limit fugitive dust from crop cultivation and exhaust emissions from agricultural equipment. Future agricultural operations in the SJVAB would be subject to these requirements, which would minimize the contribution of new agricultural operations to a violation of air quality standards. This issue will be further evaluated in the PEIR.

c. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Increased air emissions would result from a potential increase in the number of wells, the conversion of rangeland to cultivated farm operations, and the consequent increase in the amount of equipment and travel generating emission as an indirect consequence of implementation of the permitting plan. This issue will be further evaluated in the PEIR.

d. Would the project expose sensitive receptors to substantial pollutant concentrations?

New wells for which discretionary permits are issued would be developed in unincorporated parts of the county, in agricultural settings, and likely away from population centers. The direct and indirect sources of emissions associated with well development are not generally expected to be located sufficiently close to sensitive receptors that those receptors would be exposed to substantial pollutant concentrations. This issue does not require further analysis in the PEIR.

e. Would the project create objectionable odors affecting a substantial number of people?

New wells for which discretionary permits are issued would be developed in unincorporated parts of the county, in agricultural settings, and generally away from population centers. As a result, the construction- and operation-phase use of chemicals, solvents, petroleum products, and other strong-smelling products would not likely result in adverse impacts on a substantial number of people. Some irrigation wells for which discretionary permits are issued under may be used to support conversion of currently uncultivated land to irrigated cultivation. Agricultural conversion would be conducted in a manner that is consistent with existing zoning and the Stanislaus County Right to Farm Ordinance, which addresses potential conflicts between agricultural operations and other land uses that could result from the application of fertilizer, pesticides and herbicides, and other odor-producing agricultural activities. This issue does not require further analysis in the PEIR.

4.4 Biological Resources

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife[33] or U.S. Fish and Wildlife Service?	X			
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	X			
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	X			
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native nursery sites?				X
e. Conflict with any local policies or ordinances protecting biological	X			

[33] Beginning January 1, 2013, the California Department of Fish and Game (CDFG) officially changed its name to California Department of Fish and Wildlife (CDFW); however, CEQA Guidelines Appendix G: Environmental Checklist Form has not been updated to reflect this name change.

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
resources, such as a tree preservation policy or ordinance?				
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

a. Could the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Stanislaus County contains federally and state-listed threatened and endangered and special-status species (listed in Tables 3.7-1 and 3.7-2). The project's potential for indirect impacts related to conversion from rangeland to irrigated farmland may result in habitat modification affecting these species. This issue will be further evaluated in the PEIR.

b. Could the project have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Stanislaus County contains riparian habitats and sensitive vegetation communities, including Northern Hardpan Vernal Pool, Coastal and Valley Freshwater Marsh, Elderberry Savannah, Great Valley Cottonwood Riparian Forest, Great Valley Mixed Riparian Forest, Great Valley Valley Oak Riparian Forest, and Sycamore Alluvial Woodland.[34] The project's potential for indirect impacts related to conversion from rangeland to irrigated farmland may result in modification of these sensitive habitats. This issue will be further evaluated in the PEIR.

c. Have a substantial adverse effect on federally protected wetlands as defined by § 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Stanislaus County contains federally protected wetlands, including riparian, emergent, and vernal pool wetlands. The operation of new wells for which discretionary permits are issued could result in shallow

[34] California Department of Fish and Wildlife, 2016. California Natural Diversity Database (CNDDB) query of special status plants, wildlife, and communities records for Stanislaus County. August.

groundwater level drawdown beneath these sensitive habitats, causing or contributing to hydrologic interruption. This issue will be further evaluated in the PEIR.

d. Could the project interfere substantially with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?

The construction and operation of wells subject to the Ordinance prohibition would involve discrete areas and negligible amounts of aboveground infrastructure that would not affect migratory movement or use of wildlife nursery sites. The adequacy of surface water flows to support anadromous fisheries is maintained through surface water releases from reservoirs and is not affected by groundwater withdrawals. This issue does not require further analysis in the PEIR.

e. Could the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

The construction and operation of wells subject to the Ordinance prohibition would involve discrete areas and negligible amounts of aboveground infrastructure and would be conducted in compliance with applicable local policies and ordinances. Some wells for which discretionary permits are issued under the Ordinance may be used to support conversion of currently uncultivated land to irrigated cultivation. Because the potential conflicts between land use changes and local policies and ordinances is not known at this time, this issue will be further evaluated in the PEIR.

f. Could the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Stanislaus County is not known to be subject to or designated for any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved conservation plan. This issue does not require further analysis in the PEIR.

4.5 Cultural Resources

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	X			
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	X			

c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	**X**			
d. Disturb any human remains, including those interred outside of formal cemeteries?	**X**			

a. Would the project cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?

Cultural resources in the county are Under Stanislaus County General Plan Conservation/Open Space Element, Goal 8, Policy 24, Implementation Measure 5 (the county shall utilize the CEQA process to protect archaeological, or historic, or paleontological resources. Most discretionary projects require review for compliance with CEQA. As part of this review, potential impacts must be identified and mitigated.) and Implementation Measure 6 (the county shall make referrals to the Office of Historic Preservation and the Central California Information Center as required to meet CEQA requirements). Construction of new wells for which discretionary permits are issued would include below-ground drilling, which may cause a localized substantial adverse change in the significance of a historic resource if the resource is located on or adjacent to the site of the new well. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation. The conversion of rangeland may cause a substantial adverse change in the significance of a historical resource, if it is located in or adjacent to the area that would be disturbed by cultivation. This issue will be further evaluated in the PEIR.

b. Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?

Construction of new wells for which discretionary permits are issued would include below-ground drilling, which may cause a localized substantial adverse change in the significance of an archaeological resource if the resource is located on or adjacent to the site of the new well. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation. The conversion of rangeland may cause a substantial adverse change in the significance of an archaeological resource, if it is located in or adjacent to the area that would be disturbed by cultivation. This issue will be further evaluated in the PEIR.

c. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Construction of new wells for which discretionary permits are issued would include below-ground drilling, which may cause a localized substantial adverse change in the significance of a paleontological resource or site or unique geologic feature if the resource is located on or adjacent to the site of the new well. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation. The conversion of rangeland may directly or indirectly destroy a unique paleontological resource or site, or unique geologic feature, if they are located in the area that would be disturbed by cultivation. This issue will be further evaluated in the PEIR.

d. Would the project disturb any human remains, including those interred outside of formal cemeteries?

Construction of new wells would include below-ground drilling, which may cause a localized substantial adverse change in the significance of human remains interred outside of formal cemeteries if human remains are located on or adjacent to the site of the new well. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation. The conversion of rangeland may disturb human remains, including those interred outside of formal cemeteries, if they are located in the area that would be disturbed by cultivation. This issue will be further evaluated in the PEIR.

4.6 Geology and Soils

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i. (1) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42.				X
ii. Strong seismic ground shaking?			X	
iii. Seismic related ground failure, including liquefaction?			X	
iv. Landslides?			X	
b. Result in substantial soil erosion or the loss of topsoil?			X	
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off site landslide, lateral spreading, subsidence, liquefaction or collapse?	X			

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
d. Be located on expansive soil, as defined in Table 18-1 B of the Uniform Building Code (1994), creating substantial risks to life or property?				**X**
e. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				**X**

a. Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

ii. Strong seismic ground shaking?

iii. Seismic-related ground failure, including liquefaction?

iv. Landslides?

The affected portion of the county is not located within an Alquist-Priolo Earthquake Fault Zone. In addition, no known active, potentially active, or inactive faults underlie the San Joaquin Groundwater Basin within Stanislaus County. The only active fault identified in Stanislaus County is the Ortigalita Fault, which is located in the Diablo Range in the southwest corner of the County.[35] Therefore, this issue does not require further evaluation in the PEIR.

Stanislaus County is located in a region of California associated with generally low to moderate seismic shaking potential.[36] The San Joaquin and Vernalis Faults, both blind thrust faults associated with the Great Valley thrust fault system, have been classified as potentially active within Stanislaus County. The San Joaquin Fault is inferred to be located beneath or slightly west of Interstate 5 on the west side of the valley, and the Vernalis Fault is inferred to be west of the San Joaquin River between Tracy and Patterson (Vernalis

[35] California Department of Conservation, California Geological Survey, 2010. Fault Activity Map of California (2010).

[36] Branum, D., Harmsen, S., Kalkan, E., Petersen, M., and Wills, C., 2008. Earthquake Shaking Potential for California, California Geological Survey Map Sheet 48 (Revised 2008).

Fault.)[37] Both faults are reported as showing evidence of Quaternary activity; activity along the San Joaquin fault is inferred to have occurred within the last 700,000 years. Outside of Stanislaus County to the west, faults associated with the San Andreas, Hayward, and Calaveras Fault systems are considered some of the most seismically active in the state. A significant earthquake on one of these faults, or on a closer potentially active fault, could cause low to moderate ground shaking in the portion of the county underlain by the San Joaquin Groundwater Basin. Strong ground shaking is possible if a very large earthquake occurs, or if an earthquake occurs on one of the potentially active faults underlying the county, but this is less likely. The project does not involve the construction of any habitable or other structures that could be damaged by strong ground shaking, and wells not generally expected to be adversely affected by strong seismic ground shaking. This issue does not require further evaluation in the PEIR.

Sediments considered most susceptible to earthquake-induced liquefaction are saturated, uniformly graded, loose sands that occur within about 50 feet of the ground surface. Liquefiable deposits could underlie portions of the San Joaquin Groundwater Basin in the county, especially near rivers; however, the likelihood of ground motion strong enough to cause liquefaction is relatively small. In addition, wells generally are less susceptible to damage from liquefaction than surface structures. This issue does not require further evaluation in the PEIR.

The area of the county affected by the permitting and operation of wells under the Ordinance is relatively level and is not included in any landslide hazard areas designated by the California Department of Conservation[38] or Stanislaus County. Steeper slopes exist near the incised river drainages on the east side of the county; however, the geologic deposits into which these drainages are incised are relatively well indurated and generally stable. This issue does not require further evaluation in the PEIR.

The permitting and operation of wells would not increase the likelihood or severity of fault rupture, seismic ground shaking, liquefaction or landsliding. No impacts would occur, and this issue does not require further evaluation in the PEIR.

b. Would the project result in substantial soil erosion or the loss of topsoil?

Construction of new wells for which discretionary permits are issued would involve limited ground-disturbing activities, including drilling of the well and excavation and closure of a mud pit (assuming wells are installed by mud rotary drilling). This work is not anticipated to result in substantial changes to the surface topography, construction of slopes, or concentration of flow. It is anticipated that typical drilling industry methods would be employed to minimize soil erosion during well installation.

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[37] William Lettis & Associates, Inc.., 2007. Final Technical Report: Assessment and Documentation of Transpressional Structures, Northeastern Diablo Range, for the Quaternary Fault Map Database: Collaborative Research with William Lettis & Associates, Inc., and the U.S. Geological Survey. June.

[38] California Department of Conservation, California Geological Survey, 2016. CGS Information Warehouse: Landslides. http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=landslides. Accessed August 9.

Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land would disturb the soil; however, as with any agricultural operation, soil conservation measures would be implemented to minimize the loss of topsoil. For these reasons, this issue does not require further evaluation in the PEIR.

c. Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off site landslide, lateral spreading, subsidence, liquefaction or collapse?

Land subsidence can occur when compressible clays are depressurized as a result of groundwater extraction, triggering water to flow from the clays into the surrounding aquifer, and ultimately consolidation of the clay under pressure from the overlying sediments. This can happen especially in confined aquifer conditions, such as below the Corcoran Clay, where the depressurization resulting from groundwater extraction is greater than in unconfined aquifers. DWR has included three of the four groundwater subbasins within Stanislaus County as having a high or medium to high potential for future subsidence[39] and identified the East San Joaquin and Delta Mendota Subbasins as being critically overdrafted basins, largely due to overdraft and subsidence reported outside Stanislaus County to the south.[40]

Although the Ordinance is intended to reduce the potential for subsidence in unincorporated portions of the county, increased groundwater extraction due to construction of new wells for which discretionary permits are issued, or the continued extraction of groundwater from existing wells, has the potential to cause subsidence. For this reason, this issue will be further evaluated in the PEIR.

Liquefaction, landsliding, soil collapse and lateral spreading are not expected to occur as a result of construction or operation of wells, and these issues will not be further evaluated in the PEIR.

d. Would the project be located on expansive soil, as defined in Table 18-1 B of the Uniform Building Code (1994), creating substantial risks to life or property?

The project involves permitting, construction, and operation of groundwater wells, which would not be susceptible to damage from expansive soils. In addition, agricultural operations supported by groundwater extracted from wells would not be susceptible to damage from expansive soils. Thus, although expansive soils occur in portions of the San Joaquin Valley in Stanislaus County, this issue does not require further evaluation in the PEIR.

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[39] DWR, 2016b. Groundwater Information Center Interactive Map Application. *https://gis.water.ca.gov/app/gicima/. Accessed May 20.*

[40] DWR, 2016a. SGM Sustainable Groundwater Management, Critically Overdrafted Basins. *http://www.water.ca.gov/groundwater/sgm/cod.cfm. Accessed May 20.*

e. Would the Project Site have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

The project involves permitting, construction, and operation of groundwater wells and does not include the generation of disposal of waste water. No impact would occur; therefore, this issue does not require further evaluation in the PEIR.

4.7 Greenhouse Gas Emissions

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	X			
b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	X			

4.7.1 Background

CEQA requires that public agencies refrain from approving projects with significant adverse impacts from greenhouse gas (GHG) emissions and their consequent adverse impacts on the world's climate if feasible alternatives or mitigation measures can substantially reduce or avoid these impacts. These gases trap heat in the atmosphere, and the major concern is that increases in GHG emissions are causing global climate change. It is thought that there is a direct link between increased emission of GHGs and long-term global temperature. GHGs allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation and warm up the air. Both natural processes and human activities generate GHGs.

The principal GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and water vapor (H_2O). CO_2 is the reference gas for climate change because it is the predominant greenhouse gas emitted. GHG emissions are often quantified and reported as CO_2 equivalents (CO_2e) to account for the varying warming potential of different GHGs.

4.7.2 Regulatory Setting

4.7.2.1 State of California

The Global Warming Solutions Act of 2006 (Assembly Bill 32) requires that CARB estimate the statewide 1990 GHG emission level and approve a statewide greenhouse gas emissions limit, equal to the 1990 level, to be achieved by 2020. Assembly Bill 1803, which became law in 2006, made CARB responsible for preparing, adopting, and updating California's GHG inventory. In April 2015, Governor Edmund G. Brown, Jr., issued an executive order to establish a California greenhouse gas reduction target of 40 percent below 1990 levels by 2030.

In August 2007, the legislature adopted Senate Bill 97, which required the Governor's Office of Planning and Research to prepare and transmit new CEQA guidelines for the mitigation of GHG emissions or the effects of GHG emissions to the Natural Resources Agency by July 1, 2009.

The amendments adopted to the CEQA guidelines became effective on March 18, 2010. A threshold of significance for GHG emissions was not specified in those amendments, nor do they prescribe assessment methodologies or specific mitigation measures. Instead, the amendments encourage lead agencies to consider many factors in performing a CEQA analysis and rely on the lead agencies to make their own significance threshold determinations based on substantial evidence.

4.7.2.2 San Joaquin Valley Air Pollution Control District

In December 2009, the SJVAPCD adopted a policy to assist lead agencies, project proponents, permit applicants, and interested parties in assessing and reducing the impacts of project-specific GHGs on global climate change: District Policy – Addressing GHG Emission Impacts for Stationary Source Projects under CEQA. The policy relies on the use of performance-based standards, otherwise known as Best Performance Standards (BPSs) to assess significance of project-specific GHG emissions on global climate change during the environmental review process, as required by CEQA. BPSs for traditional stationary source projects include equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.[41]

Use of BPSs is a method of streamlining the CEQA process of evaluating significance and is not a required emission reduction measure. Projects implementing BPSs would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions from a continuation of existing operations is required to determine that a project would have a less than cumulatively significant impact. The SJVAPCD has developed BPSs for the following stationary sources: boilers; steam generators; gasoline dispensing facilities; dry cleaners; oil and gas extraction, storage, transportation, refining operations; and co-generation.[42]

4.7.2.3 Stanislaus County

The Stanislaus Countywide Regional Community Greenhouse Gas Inventory was prepared to quantify GHG community emissions for the county as a whole for the year 2005. Using the methodology for the regional

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[41] SJVAPCD, 2009. District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency.

[42] SJVAPCD. 2016g. Best Performance Standards (BPS) for Stationary Sources. http://www.valleyair.org/programs/CCAP/bps/BPS_idx.htm#Oil&Gas. Accessed September.

inventory, separate GHG community inventories were prepared for each jurisdiction in the county and provided to the individual cities and the unincorporated county for their use.[43]

4.7.3 Discussion of Impacts

a. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Developing new wells for which discretionary permits are issued could increase GHGs during construction through operation of construction vehicles and operation of construction equipment. Well operations could generate GHGs from the use of electricity, motor vehicle emissions associated with periodic maintenance at the well site, and operation of the well pump. The use of operational efficiency measures, such as properly matching the pump to the well conditions and water demand, would minimize the horsepower required by a pump and would reduce energy use and associated GHGs. SJAVPCD has not yet adopted BPSs for well operation, but inclusion of energy efficient features would be consistent with the SJVAPCD's approach of implementing BPSs and minimizing GHGs.

Indirect impacts on GHGs also could result if the conversion of rangeland to irrigated farmland would increase as a result of an increase in the number of wells drilled under discretionary permits. Operation of farm vehicles and equipment, such as tractors, orchard heaters, and other equipment requiring diesel fuel, could increase the percentage of GHGs in the SJVAB. Implementing best management practices (BMPs), such as using energy efficient motors in farm equipment, employing BPSs, or demonstrating a 29 percent reduction in GHG emissions from a continuation of existing operations, would reduce the potential for increases in GHGs and minimize these indirect effects to a less than cumulatively significant impact. This issue will be further evaluated in the PEIR.

b. Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

An increase in the number of wells and an increase in farming activity could increase the level of GHGs generated within the SJVAB. Compliance with the goals in AB 32 and the SJVAPCD's guidance and policy for addressing GHG emissions would minimize these potential effects. This issue will be further evaluated in the PEIR.

[43] Stanislaus County. 2013. Stanislaus Countywide Regional Community Greenhouse Gas Inventory. July 2013.

4.8 Hazards and Hazardous Materials

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one quarter mile of an existing or proposed school?	X			
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 or a list of hazardous substance release sites identified by the state Department of Health Services pursuant to § 25356 of the Health & Safety Code and, as a result, would it create a significant hazard to the public or the environment? [PRC § 21151.8(a)(1)(B)]				X
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?			**X**	
h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?			**X**	

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Developing new wells for which discretionary permits are issued would involve use of hazardous materials such as cement grout, vehicle fuels, and hydraulic fluids. Operation of new wells would also involve use of solvents, lubricants, and well rehabilitation chemicals for well maintenance. Indirectly, the agricultural operations enabled by the irrigation water from the new wells for which discretionary permits are issued would involve use of fuels and agrichemicals. These hazardous materials are assumed to be stored in designated staging areas in compliance with local, state, and federal requirements, and consistent with their labeling and Material Safety Data Sheets (MSDS). As required, personnel handling these hazardous substances would follow the requirements to be properly and regularly trained in their proper handling and disposal, and the transportation of these hazardous materials would be conducted in compliance with Department of Transportation (DOT) requirements. For these reasons, direct and indirect impacts from this project would be less than significant, and this issue does not require further analysis in the PEIR.

b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

The potential for an accidental spill or release of hazardous materials exists during construction and operation of any new well, including those for which a discretionary permit is issued. In addition, an accidental spill or release of hazardous substances could occur during agricultural operations using water from such wells. As required, personnel involved with well construction and operations would follow the safety procedures in their Injury and Illness Prevention Programs (if applicable), specified on MSDSs, and outlined in the material labeling. Stanislaus County Division of Environmental Resources regulates the use and storage of hazardous materials in the county. Therefore, hazards to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment would be less than significant, and this issue does not require further analysis in the PEIR.

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

While the location of the individual wells that would be permitted is unknown at this time, they would be in unincorporated Stanislaus County and most likely away from populated areas, including school sites. Nevertheless, because the possibility exists, this issue will be further evaluated in the PEIR.

d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 or a list of hazardous substance release sites identified by the state Department of Health Services pursuant to § 25356 of the Health & Safety Code and, as a result, would it create a significant hazard to the public or the environment?

While the location of the individual wells that would be permitted is unknown at this time, they would be in unincorporated Stanislaus County and are not likely to be constructed on listed hazardous materials and release sites. In addition, the discretionary well permitting program established by the county includes a requirement that hazardous substance release sites be identified prior to granting a discretionary permit for construction of a new well. Appropriate permit conditions would be adopted to prevent potential hazards to the public or the environment. This issue does not require further analysis in the PEIR.

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

While the location of the individual wells that would be permitted is unknown at this time, they would be in unincorporated Stanislaus County. Drilling activities would be conducted in compliance with applicable regulations. Wellhead completions and power feed infrastructure are not expected to create safety hazards associated with airports. For these reasons, this issue does not require further analysis in the PEIR.

f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

While the location of the individual wells that would be permitted is unknown at this time, they would be in unincorporated Stanislaus County. Drilling activities would be conducted in compliance with applicable regulations. Wellhead completions and power feed infrastructure are not expected to create safety hazards associated with private airstrips. For these reasons, this issue does not require further analysis in the PEIR.

g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The project would involve construction and operation of groundwater wells. Road closures are not anticipated to be required during construction or operation associated with the new wells. Irrigation wells for which discretionary permits are issued under may be used to support irrigated cultivation, and associated agricultural traffic may result. Such use would be consistent with existing zoning and the Stanislaus County Right to Farm Ordinance, which addresses potential conflicts between agricultural operations and other land uses and plans that could result from agricultural traffic on surface streets. These activities would impair implementation of or physically interfere with an adopted emergency response or evacuation plan. Therefore, this issue does not require further analysis in the PEIR.

h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

During construction of new wells for which discretionary permits are issued, the drilling contractor would maintain fire extinguishers within the construction area and use standard fire prevention measures. New wells permitted under the program would mostly support ongoing or new agriculture, which would be expected to result in no change to or a decrease in fire hazard severity. For these reasons, impacts are anticipated to be less than significant, and this issue does not require further analysis in the PEIR.

4.9 Hydrology and Water Quality

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Violate any water quality standards or waste discharge requirements?	X			
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	X			
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	X			
d. Substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	X			
e. Create or contribute runoff water which would exceed the capacity of existing or			X	

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
planned storm water drainage systems or provide substantial additional sources of polluted runoff?				
f. Otherwise substantially degrade water quality?	**X**			
g. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				**X**
h. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				**X**
i. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, or dam inundation?				**X**
j. Cause inundation by seiche, tsunami, or mudflow?				**X**

a. Would the project violate any water quality standards or waste discharge requirements?

The construction and operation of wells could potentially cause the migration of impaired groundwater in violation of applicable water quality objectives and the state's anti-degradation policy. Although the Ordinance is intended to address such eventualities, because they are a possibility, this issue will be further evaluated in the PEIR.

b. Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Stanislaus County plans and policies related to hydrology and water resources include Stanislaus County General Plan Conservation/Open Space Element, Goal 2, Policy 5 (protect groundwater aquifers and recharge areas, particularly those critical for the replenishment of reservoirs and aquifers), Policy 7 (new development that does not derive domestic water from pre-existing domestic and public water supply systems shall be required to have a documented water supply that does not adversely impact Stanislaus County water resources), and Policy 8 (the county shall support efforts to develop and implement water management strategies). Other applicable parts of the Stanislaus County General Plan include Agricultural

Element, Goal 3, Objective 3.2, Policy 3.4 (the county shall encourage the conservation of water for both agricultural, rural domestic, and urban uses), Policy 3.5 (the county will continue to protect the quality of water necessary for crop production and marketing), and Policy 3.6 (the county will continue to protect local groundwater for agricultural, rural domestic, and urban use in Stanislaus County).

All four subbasins within the county are experiencing storage depletion and other stresses resulting from current drought conditions. Particular concerns include new groundwater demand to supply the conversion of rangeland to irrigated agricultural production in the eastern portion of the county and increased reliance on groundwater in the western portion of the county in areas where surface water deliveries have been curtailed due to drought conditions and changing surface water allocations. In addition, the Eastern San Joaquin Subbasin and the Delta-Mendota Subbasin, portions of which underlie the county, have been designated as critically overdrafted[44] by the DWR.

Although the Ordinance is intended to support sustainable groundwater extraction, the construction and operation of new groundwater wells for which discretionary permits are issued, or the operation of existing wells that could become subject to the Ordinance prohibition after GSPs are adopted, may substantially deplete groundwater supplies or cause a lowering of groundwater levels. This issue will be further evaluated in the PEIR.

c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

The project involves construction and operation of groundwater wells. The wells and their appurtenances are unlikely to be located within surface water bodies or drainages where they could alter the course of a stream or river and result in substantial erosion or siltation. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land may cause some alteration of drainage patterns; however, as with any agricultural operation, impacts to surface drainages that cause erosion or siltation would be minimized. Nevertheless, because some alteration is possible, this issue will be further evaluated in the PEIR.

d. Would the project substantially alter the existing drainage pattern of the site or area, including through the alternation of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

The project involves the construction and sustainable operation of groundwater wells. The wells and their appurtenances are unlikely to be located within surface water bodies or drainages where they could alter

[44] SGMA includes the following definition of critical overdraft, adapted from DWR Bulletin 118-80: "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."

the course of a stream or river and result in an increase in surface runoff resulting in flooding. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, consistent with applicable land use and zoning requirements. The conversion of rangeland to actively cultivated land would not add impervious surface and is not likely to result in changes in surface runoff. In addition, while conversion of rangeland to cultivated agriculture may cause some alteration of drainage patterns, as with any agricultural operation, impacts to surface drainages would be minimized. Nevertheless, because some alteration is possible, this issue will be further evaluated in the PEIR.

e. Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

The project involves construction and operation of groundwater wells. Construction and operation of the wells and their appurtenances would not result in significant increases in storm water runoff or provide additional sources of polluted runoff. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, but would not add impervious surface and is not likely to result in changes in surface runoff. This issue does not require further evaluation in the PEIR.

f. Would the project otherwise substantially degrade water quality?

The construction and operation of wells could potentially cause degradation of water quality due to cross connection of aquifers of varying quality or induced migration of groundwater with impaired water quality. Although the Ordinance is intended to address these eventualities, it is possible that water quality could be degraded. Therefore, this issue will be further evaluated in the PEIR.

g. Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

The project involves construction and sustainable operation of groundwater wells, and its implementation would not result in the construction of housing in floodplains. No impact would occur; therefore, this issue does not require further analysis in the PEIR.

h. Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

The project involves construction and sustainable operation of groundwater wells, and its implementation would not result in the construction of structures that would impede or redirect flood flows, either directly or indirectly. No impact would occur; therefore, this issue does not require further analysis in the PEIR.

i. Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam, or dam inundation?

The project involves construction and sustainable operation of groundwater wells, and its implementation would not result in the exposure of people or structures to flood hazards. No impact would occur; therefore, this issue does not require further analysis in the PEIR.

j. Would the project cause inundation by seiche, tsunami, or mudflow?

The project involves construction and sustainable operation of groundwater wells, and its implementation would not result in the exposure of people or structures to seiche, tsunami or mud flows. No impact would occur; therefore, this issue does not require further analysis in the PEIR.

4.10 Land Use and Planning

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Physically divide an established community?				X
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	X			
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

a. Would the project physically divide an established community?

Well development or operation under this project would not involve activities that could physically divide a community. This issue does not require further analysis in the PEIR.

b. Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Well development under this project would not result in any changes in zoning or land use designations, so it is not expected to directly conflict with any agency plans or policies regarding mitigation of environmental effects. Stanislaus County General Plan Land Use Element, Goal 7, Policy 32, states that any decision by the Board of Supervisors of the county to approve the redesignation or rezoning of land from an agricultural or open space use to a residential use requires and is contingent upon approval by a majority vote of the county voters at a general or special local election. Some irrigation wells for which discretionary permits are issued may be used to support conversion of undeveloped rangeland to irrigated cultivation, with unknown effects on environmental mitigation plans and policies. This issue will be further evaluated in the PEIR.

c. Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?

Stanislaus County is not known to be subject to or designated for any adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved conservation plan. This issue does not require further analysis in the PEIR.

4.11 Mineral Resources

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

Minerals with known extraction value that are found within the county include bementite, braunite, chromite, cinnabar, garnet, gypsum, hausmannite, hydromagnesite, inesite, magnesite, psilomelane, and rhodochrosite. Small deposits of gold, clay, and lead are also known to exist within the county. Most of these deposits occur in the Diablo Range, or, in the case of gold, the Sierra Nevada foothills. Commercial extraction of these resources does not currently occur within the county. Numerous exploratory oil and gas wells have been drilled within the county, and the underlying geological structure of the county indicates oil or gas may be present. A small portion of the Vernalis gas field crosses into the northern portion of Stanislaus County near the San Joaquin River north of State Highway 132. This is the only active oil or gas field within the county and includes only three producing gas wells within the County.[45] Sand and gravel deposits currently constitute the only significant commercially extractive mineral resource in the region. The majority of sand and gravel deposits are a result of stream deposition or dredge tailings. The most significant deposits are found in old stream beds and along rivers and streams such as the San Joaquin River and Orestimba Creek. The construction of new wells would not require large amounts of land for each well and would not affect the availability of mineral resources in the county. Operation of the wells may support agricultural activities, but this would occur in areas that are zoned for this purpose and would not result in the long-term loss of potential mineral resources. This issue does not require further analysis in the PEIR.

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Under the Surface Mining and Reclamation Act (SMARA), the California Department of Conservation classified land in Stanislaus County into Mineral Resource Zones (MRZs). Twenty-two areas within the county are classified as MRZ-2a, zones with known mineral significant mineral deposits, or MRZ-2b, zones with inferred significant mineral deposits. These zones total approximately 32 square miles (about 2 percent) of the area of the County. Thirteen of these zones (totaling approximately 29.4 square miles) are underlain by aggregate resources, and the remaining nine zones (totaling approximately 2.6 square miles) are underlain by industrial minerals (such as kaolinitic clay, diatomite, silica, and specialty sand). While the location of the individual wells for which discretionary permits are issued is unknown at this time, construction of new wells is not expected to affect the availability of mineral resources. Operation of the wells may support agricultural activities, but this would occur in areas that are zoned for this purpose and would not result in the long-term loss of potential mineral resources. This issue does not require further analysis in the PEIR.

4.12 Noise

Would the project result in:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Exposure of persons to or generation of noise level in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	X			

[45] California Department of Conservation, Division of Oil Gas and Geothermal Resources (DOGGR), 2016. Well Finder. http://maps.conservation.ca.gov/doggr/#close. Accessed September 15, 2016.

Would the project result in:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
b. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?				X
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	X			
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

4.12.1 Background

Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. Three components make up sound: source, path, and receiver. All three components must be present for sound to exist. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. The perception of sound and noise is determined by its effects on receptors. Examples of sensitive noise receptors are facilities or areas, including residential areas, hospitals, and schools, where excessive noise levels would be considered an annoyance. The "A-weighted" noise scale (measured in A-weighted decibels (dBA)) was developed because it corresponds closer to people's subjective judgment of sound levels.

Noise sources are classified in two forms: (1) point sources, such as stationary equipment or individual vehicles; and (2) line sources, such as a roadway with large number of cars. Sound generated by a point source typically attenuates at a rate of 6 dBA for each doubling of distance from the source to the receptor at acoustically soft sites such as vacant land.[46] Sound levels can also be attenuated by placement of barriers such as solid walls or berms between the source and receptor.

Community reaction to noise is assessed on a scale that averages varying noise exposures over time and quantifies the results in terms of a single value. The Community Noise Equivalent Level (CNEL) is an average A-weighted scale measured over a 24-hour period and adjusted to account for increased sensitivity to noise levels during evening and nighttime hours. A CNEL noise measurement is obtained after adding 5 decibels to sound levels occurring during the evening from 7:00 p.m. to 10:00 p.m., and 10 decibels to sound occurring during the nighttime from 10:00 p.m. to 7:00 a.m. The major sources of noise in Stanislaus County are roadway traffic, railroad noise, airport operations, and industrial activities. The quietest areas of unincorporated Stanislaus County are those that are removed from major transportation-related noise sources and local industrial or other stationary noise sources. Examples of these quiet areas are rural areas such as Hickman, Valley Home, and La Grange. The maximum noise levels in these areas are generated by local automobile traffic or heavy trucks. Other sources of maximum noise levels include occasional aircraft overflights and, in some areas, railroad operations, particularly horns. Background noise levels in the absence of these sources derive from distant traffic, wind in the trees, running water, birds, and distant industrial or other stationary noise sources.[47,48]

Vibration is sound radiated through the ground. Typical sources of ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads, which can create vibration waves that propagate through the soil to the foundations of nearby buildings. Ground-borne vibration is almost never annoying to people who are outdoors. Although the motion of the ground may be perceived without the effects associated with the shaking of a building, the motion does not provoke the same adverse human reaction. The rumbling sound caused by the vibration of room surfaces is called ground-borne noise, which is usually characterized with the A-weighted sound level. Ground-borne noise is perceived as louder than the same broadband noise because the human ear perceives sound dominated by low-frequency components as louder than broadband sounds that have the same A-weighted level. The background vibration velocity level perceptibility threshold is about 65 vibration decibels (VdB), and human response to vibration is not usually significant unless the vibration exceeds 70 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels.[49]

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[46] La Plata County, 2002. La Plata County Impact Report, Coal Bed Methane Development. October 20002. http://lpccds.org/UserFiles/Servers/Server_1323669/File/2002%20Oil%20and%20Gas%20Impact%20Report.pdf. Accessed September 2016.

[47] Stanislaus County Planning and Development Department, 2005. Stanislaus County General Plan Update, Technical Reference Document for Noise Analysis. Modesto, California. November 25, 2005.

[48] Stanislaus County Planning and Development Department, 2016. Stanislaus County General Plan Noise Element. http://www.stancounty.com/planning/pl/gp/gp-chapter4.pdf. Accessed September.

[49] U.S. Department of Transportation, Federal Transit Authority, Office of Planning and Environment, 2006. Transit Noise and Vibration Impact Assessment. May 2006.

4.12.2 Applicable Noise Regulations

General Plan Noise Element. The Stanislaus County General Plan Noise Element was designed to limit the exposure of the community to excessive noise levels. The plan prohibits new development of noise-sensitive land uses in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise. These measures include:

- For transportation noise sources, 60 dBA CNEL or less in outdoor activity areas of single-family residences, 65 dBA CNEL or less in community outdoor space for multi-family residences, and 45 dBA CNEL or less within noise-sensitive interior spaces. An exterior noise level of up to 65 dBA CNEL will be allowed where best available noise-reduction technology cannot produce the prescribed noise level. However, interior noise with the windows and doors closed in residential uses may not exceed 45 dBA CNEL.[50]
- The standards for other noise sources such as local industries or other stationary noise sources (such as groundwater well pumps) are listed below in Table 4.12-1. These standards apply at a residential or other noise-sensitive land use and not on the property of a noise-generating land use. Where measured ambient noise levels exceed the standards, the standards would be equal to those ambient noise levels.

Table 4.12-1. Maximum Allowable Noise Exposure from Stationary Sources[51]

	Daytime 7:00 AM to 10:00 PM	Nighttime 10:00 PM to 7:00 AM
Average equivalent continuous noise level (dBA)	55	45
Maximum noise level (dBA)	75	65

Stanislaus County Noise Ordinance. The Stanislaus County Noise Control Ordinance is codified in Chapter 10.46 of the Municipal Code. This ordinance restricts creation of noise that causes the exterior noise level when measured at any property situated in either the incorporated or unincorporated area of the county to exceed adopted noise levels. Agricultural activity is exempt under the ordinance. Construction equipment noise beyond the property line of any property where a dwelling unit is located cannot exceed an average sound level greater than 75 dBA between the hours of 7:00 p.m. and 7:00 a.m.[52]

[50] Stanislaus County Planning and Development Department, 2016. Stanislaus County General Plan Noise Element. http://www.stancounty.com/planning/pl/gp/gp-chapter4.pdf. Accessed September.

[51] Stanislaus County Code, 2016. Chapter 10.46, Noise Control. http://qcode.us/codes/stanislauscounty/?view=desktop&topic=10-10_46-10_46_080. Accessed September.

[52] Stanislaus County Code, 2016. Chapter 10.46, Noise Control. http://qcode.us/codes/stanislauscounty/?view=desktop&topic=10-10_46-10_46_080. Accessed September.

4.12.3 Discussion of Impacts

a. Would the project expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction of wells for which discretionary permits are issued could increase noise levels through operation of construction vehicles and construction equipment, such as drilling rigs, portable generators, compressors, and power tools. These construction activities may occur 24 hours per day. The Stanislaus County Noise Ordinance limits noise generated by use of construction equipment to 75 dBA between 7:00 p.m. and 7:00 a.m. at the property line. A study of drilling rig noise levels conducted for the oil and gas well industry reported measurable noise at 700 feet from the drilling rig and audible noise at 1,000 feet from the drilling rig. The maximum noise levels were produced by running casing and were measured at an average of 102 dBA at a distance of 10 feet from the drill rig engine. Average noise levels of 71 to 79 dBA were found at a distance of 200 feet from the drilling rig.[53] Noise levels typically attenuate at approximately 6 dB for each doubling of distance from the noise source.[54] While the potential for significant noise impacts is small, this issue will be further evaluated in the PEIR.

While operation of newly permitted wells could result in long-term noise increases, agricultural activity is exempt under the Stanislaus County Noise Ordinance. According to the Federal Highway Administration Noise Handbook, pumps are rated at a noise level of 77 dBA at a distance of 50 feet.[55] At an attenuation of 6 dB for every doubling of distance from the noise source,[56] well operations would have a less than significant effect at approximately 70 feet from the nearest sensitive receptor. In general, these wells are not expected to operate 24 hours per day, but only when irrigation is taking place during daytime hours, which coincides with the time when receptors are least sensitive to noise exposure. This issue does not require further analysis in the PEIR.

b. Would the project expose persons to or generate excessive groundborne vibration or groundborne noise levels?

Groundborne vibration and noise could be increase during construction of wells for which discretionary permits are issued, through use of construction vehicles and construction equipment, such as drilling rigs. According to the Federal Transit Administration's Transit Noise and Vibration Impact Assessment,[57] use of

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[53] Behrens and Associates, Inc., 2006. *Gas Well Drilling Noise Impact and Mitigation Study.*

[54] La Plata County, 2002. La Plata County Impact Report, Coal Bed Methane Development. October 20002. http://lpccds.org/UserFiles/Servers/Server_1323669/File/2002%20Oil%20and%20Gas%20Impact%20Report.pdf. Accessed September 2016.

[55] Federal Highway Administration, 2016. Construction Noise Handbook. https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm. Accessed September.

[56] La Plata County, 2002. La Plata County Impact Report, Coal Bed Methane Development. October 20002. http://lpccds.org/UserFiles/Servers/Server_1323669/File/2002%20Oil%20and%20Gas%20Impact%20Report.pdf. Accessed September 2016.

[57] U.S. Department of Transportation, Federal Transit Authority, Office of Planning and Environment, 2006. Transit Noise and Vibration Impact Assessment. May 2006.

heavy equipment during well construction could generate vibration levels up to 0.089 peak particle velocity or 87 VdB (for caisson drilling) at a distance of 25 feet. Structures can typically be exposed to groundborne vibration levels of 0.2 peak particle velocity without experiencing damage. Sensitive structures would have to be closer than 25 feet to the well construction area to experience groundborne vibration that exceeds the building damage threshold of 0.2 peak particle velocity. At a distance of 50 feet from the well construction area, groundborne vibration is estimated at 78 VdB, which is slightly greater than the 75 VdB-level of human response. While the well locations are unknown at this time, they would be located in unincorporated areas of the county and in predominantly agricultural areas, and well away from inhabited structures that are sufficiently close to the well locations to experience excessive groundborne vibrations or noise levels.

Operation of the wells would not likely result in negatively perceptible or damage-causing groundborne vibration or noise, nor would conversion of rangeland to farmland operations be likely to have significant adverse impacts. Also, agricultural activity is exempt under the Stanislaus County Noise Ordinance. This issue does not require further analysis in the PEIR.

c. Would the project cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Agricultural activity is exempt under the Stanislaus County Noise Ordinance. The wells developed under this project are expected to operate intermittently, primarily during daytime hours within the irrigation season. As a result, the project would not cause an increase in sustained ambient noise levels. This issue does not require further analysis in the PEIR.

d. Would the project cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Agricultural activity is exempt under the Stanislaus County Noise Ordinance. The wells developed under this project would operate intermittently during the irrigation season and may increase ambient noise levels during those periods of operation. As discussed above, pumps are rated at a noise level of 77 dBA at a distance of 50 feet. At an attenuation of 6 dB, well operations would have a less than significant effect at approximately 70 feet from the property line.[58] Given that the wells would be located largely in rural, unincorporated parts of the county, the increases in ambient noise levels are not expected to be substantial relative to the locations of the nearest sensitive receptors. Nevertheless, because the uses and locations of wells for which discretionary permits will be issued is not known, this issue will be further evaluated in the PEIR.

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[58] La Plata County, 2002. La Plata County Impact Report, Coal Bed Methane Development. October 20002. http://lpccds.org/UserFiles/Servers/Server_1323669/File/2002%20Oil%20and%20Gas%20Impact%20Report.pdf. Accessed September 2016.

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The project would not result in facilities where people would be residing or working, so it would not expose people to airport noise. This issue does not require further analysis in the PEIR.

f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

The project would not result in facilities where people would be residing or working, so it would not expose people to noise from private airstrips. This issue does not require further analysis in the PEIR.

4.13 Population and Housing

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			X	
b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

4.13.1 Background

The population of Stanislaus County is estimated at 538,388, which is a 4.7 percent increase from 2010. The population of the state increased by about 5.1 percent. Annual population growth in unincorporated Stanislaus County is projected to be 0.69 percent by 2020 and 1.25 percent by 2040.[59]

Between 2010 and 2015, the housing supply increased by approximately 0.67 percent, from 179,503 units to 180,704 units. According to recent estimates, about 57.2 percent of the housing in Stanislaus County is

[59] U.S. Census Bureau, 2016. Stanislaus County Quickfacts. http://www.census.gov/quickfacts/table/LFE041214/06099,06. Accessed September.

owner-occupied, and the average household size is 3.07 people. About 82.2 percent of families are living in the same house as the year before.[60] Much of the population growth over the last two decades was the result of the county's location near the San Francisco Bay Area. The combination of Bay Area job markets and freeway access to inexpensive land for housing development in Stanislaus County contributed to increased development pressures in the cities within the county. Within the rapidly urbanizing San Joaquin Valley, many forecasters believe Stanislaus County would be the fastest growing region in California in the coming decades. However, Stanislaus County was hit particularly hard in the recent economic downturn, with some of the highest home foreclosure rates in the nation. Most of the future residential growth in Stanislaus County is projected to follow historical trends and occur within the limits of the incorporated cities.[61]

Approximately 62.3 percent of the population is estimated to be in the civilian labor force. Farming employs about 14,500 workers, which is about 8.0 percent of total employment in Stanislaus County and is an increase from 2010 of approximately 12.4 percent. Civilian unemployment decreased from 16.9 percent in 2010 to 9.5 percent.[62] Employment of farmers, ranchers, and other agricultural managers is projected to decrease in Stanislaus County by 4.7 percent between 2010 and 2020, and the number of agricultural workers is forecast to increase by 1.3 percent (140 jobs). Employment of agricultural inspectors is expected to increase by 16.7 percent (10 workers). Construction and extraction occupations are projected to increase by 47.6 percent (3,000 jobs) between 2010 and 2020.[63]

The jobs/housing balance is the ratio of jobs in a jurisdiction compared to the number of housing units in a jurisdiction. Jobs and housing are considered to be balanced when there is an equal number of housing units to jobs within a given area, an optimal ratio of approximately 1.0. There were 68,086 employed persons and 36,684 housing units in Stanislaus County in 2010, a ratio of 0.54 employed workers per housing unit, which indicates an imbalance in the jobs-to-housing ratio. By 2020, this ratio is projected to decrease to 5.0, and by 2040 it would be 4.7, indicating an increasing disparity between employment and available housing in Stanislaus County.[64]

Stanislaus County General Plan Land Use Element, Goal 7, Policy 32, states that any decision by the Board of Supervisors of the county to approve the redesignation or rezoning of land from an agricultural or open space use to a residential use requires and is contingent upon approval by a majority vote of the county voters at a general or special local election.

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[60] Ibid

[61] Michael Baker International, 2016. Stanislaus County Housing Element 2015-2023. April 2016. http://www.stancounty.com/planning/pl/gp/gp-chapter6-housing-element.pdf. Accessed September.

[62] U.S. Census Bureau, 2016. Stanislaus County Quickfacts. http://www.census.gov/quickfacts/table/LFE041214/06099,06. Accessed September.

[63] California Employment Development Department, Labor Market Information Division, 2013. 2010-2020 Occupational Employment Projections, Modesto Metropolitan Statistical Area (Stanislaus County). August 16, 2013.

[64] Michael Baker International, 2016. Stanislaus County Housing Element 2015-2023. April 2016. http://www.stancounty.com/planning/pl/gp/gp-chapter6-housing-element.pdf. Accessed September.

4.13.2 Discussion of Impacts

a. Would the project induce substantial growth in an area either directly (for example, by proposing new homes and business) or indirectly (for example, through extension of roads or other infrastructure)?

No housing or businesses would be created by issuing discretionary well permits or by regulating extraction from existing wells, and these actions would not directly induce growth. Well construction could generate temporary increases in employment and population; however, the number of new wells for which discretionary permits would be issued is relatively small, and much of this temporary increase can be expected to be derived from the existing labor force.

Some of the wells for which discretional permits are issued may be used to supply water to newly cultivated areas that were previously used as rangeland. While such an increase in farming activity could attract more workers from outside the local economy over time and induce population growth, the number of new wells permitted is expected to be relatively small, and well construction would not by itself induce growth in the absence of more direct factors such as agricultural economics, demographic changes, governmental policies and other factors. This issue does not require further analysis in the PEIR.

b. Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

None of the activities associated with the project would displace housing units. This issue does not require further analysis in the PEIR.

c. Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

None of the activities associated with the project would displace people. This issue does not require further analysis in the PEIR.

4.14 Public Services

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the need for new or physically altered governmental facilities, construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a. Fire protection?			X	
b. Police protection?			X	
c. Schools?			X	

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
d. Parks?			X	
e. Other public facilities?			X	
f. Does the site promote the joint use of parks, libraries, museums, and other public services?				X

a. Fire protection?

b. Police protection?

c. Schools?

d. Parks?

e. Other public facilities?

f. Does the site promote the joint use of parks, libraries, museums, and other public services?

The project would not directly or indirectly result in new or physically altered government facilities, so it would not cause adverse physical impacts or significant environmental impacts. No housing or businesses would be created by the project, and it would not directly induce growth and would not increase the demand for public facilities and services. The indirect effects of construction and operation of new wells and the potential for an increase in farming activity as a result of conversion of rangeland to irrigated farmland could induce growth in Stanislaus County and increase the demand for fire and police protection, schools, parks, and other public facilities. Because this growth and the potential for increased demand for public services would be dispersed throughout unincorporated Stanislaus County, and agricultural operations are not very labor intensive and are likely to be staffed by existing local residents, it is not expected to increase the demand for public services and facilities beyond the capacity of existing governmental facilities. This issue does not require further analysis in the PEIR.

4.15 Recreation

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?			X	

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Developing new wells in unincorporated Stanislaus County would not increase the use of existing neighborhood or regional parks or other recreational facilities, as construction and operation of new wells would not likely to increase the number of permanent residents or otherwise increase the use of existing recreational facilities so as to substantially deteriorate those facilities. Direct and indirect impacts from this project would be less than significant, and this issue does not require further analysis in the PEIR.

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The project does not include recreational facilities and would not require the expansion or construction of recreational facilities. This issue does not require further analysis in the PEIR.

4.16 Transportation and Traffic

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?				X
b. Conflict with an applicable congestion management program, including, but not limited to level of				X

Would the project:	**Potentially Significant Impact**	**Less than Significant Impact with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?				
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location, which results in substantial safety risks?				**X**
d. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				**X**
e. Result in inadequate emergency access?				**X**
f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?				**X**

a. Would the project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

There would be a negligible increase in vehicle trips associated with workers traveling to and from the well site and transport of drilling equipment and materials during construction of wells for which discretionary permits are issued. No additional vehicle trips are expected during well operation. As a result, the project would not affect established transportation performance standards. This issue does not require further analysis in the PEIR.

b. Would the project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

The increase in vehicle trips during well construction under would be a negligible, and there would be no additional trips during well operation. As a result, the project would have no effects on congestion management programs. This issue does not require further analysis in the PEIR.

c. Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location, which results in substantial safety risks?

Well development under this project would not affect air traffic. This issue does not require further analysis in the PEIR.

d. Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

There are no project design features, and use of farm equipment would continue in the unincorporated and predominantly rural areas where wells would be developed, consistent with existing land uses and zoning, and in compliance with the county's Right to Farm Ordinance. There would be no substantial increase in traffic hazards. This issue does not require further analysis in the PEIR.

e. Would the project result in inadequate emergency access?

The project would not result in road closures or other actions that could affect emergency access. This issue does not require further analysis in the PEIR.

f. Would the project conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The increase in vehicle trips during well construction under would be a negligible, and there would be no additional trips during well operation. As such, the project is not expect to affect public transit, bicycle, or pedestrian facility policies, plans, or programs. This issue does not require further analysis in the PEIR.

4.17 Utilities and Service Systems

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB)?				X
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of				X

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
existing facilities, the construction of which could cause significant environmental effects?				
c. Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				**X**
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	**X**			
e. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				**X**
f. Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				**X**
g. Would the project comply with federal, state, and local statutes and regulations related to solid waste?				**X**

a. Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB)?

The project would not generate wastewater requiring treatment. This issue does not require further analysis in the PEIR.

b. Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

The project would not generate wastewater requiring treatment or require additional treatment of water supplies. This issue does not require further analysis in the PEIR.

c. Would the project require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

The proposed project would construct and operate new wells within unincorporated Stanislaus County, which would not increase the amount of stormwater runoff or result in the need to expand existing facilities or construct new stormwater drainage facilities.[65] This issue does not require further analysis in the PEIR.

d. Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

The project is intended to assure sustainable groundwater extraction as a condition of approving construction of new wells and, after GSP adoption, from the operation of existing wells. The Ordinance includes measures to ensure that construction of new wells will be in areas that have sufficient groundwater supplies and that wells will be sustainably operated. Before a discretionary permit can be issued, the Ordinance requires the applicant to provide substantial evidence that the proposed groundwater extraction will be sustainable, as defined under both the Ordinance and SGMA. In addition, the well permitting guidelines developed under the Ordinance prescribe well permit conditions for new wells as needed to assure they are operated sustainably. These conditions could result in an inability to meet proposed or existing groundwater demands without additional surface water entitlements or development of other water sources. This issue will be further evaluated in the PEIR.

e. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

The project would not generate wastewater requiring treatment. This issue does not require further analysis in the PEIR.

f. Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

The project would not generate solid waste requiring disposal. This issue does not require further analysis in the PEIR.

g. Would the project comply with federal, state, and local statutes and regulations related to solid waste?

The project would not generate solid waste requiring disposal and would not require compliance with related statutes and regulations. This issue does not require further analysis in the PEIR.

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[65] California State Water Resources Control Board, 2015. A Guide for Private Domestic Well Owners: http://www.waterboards.ca.gov/gama/docs/wellowner_guide.pdf. Accessed September 14, 2016.

4.18 Mandatory Findings of Significance

Would the project:	Potentially Significant Impact	Less than Significant Impact with Mitigation Incorporated	Less than Significant Impact	No Impact
a. The potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	**X**			
b. Impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	**X**			
c. Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	**X**			

Based on the screening analysis conducted in the preceding sections for the 17 environmental resources, it has been determined that Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, and Utilities and Service Systems will be further evaluated in the PEIR. No additional analysis is required for Aesthetics, Mineral Resources, Population and Housing, Public Services, Recreation, and Transportation and Traffic.

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6.0 LIST OF PREPARERS

6.1 Lead Agency

Walter Ward, Water Resources Manager, reviewed the Initial Study.

Angela Freitas, Planning Director, reviewed the Initial Study.

Kristin Doud, Associate Planner, reviewed the Initial Study.

6.2 Consultants

Mike Tietze, PG, CHG, CEG, Principal Engineering Geologist with Jacobson James & Associates, prepared the Geology and Soils, and Hydrology and Water Quality sections. Mr. Tietze also prepared the Project Description and reviewed the Initial Study.

Joel Bauman, Principal with Jacobson James & Associates, prepared the Geology and Soils and Hydrology and Water Quality sections.

John Bock, Senior Environmental Scientist with Tetra Tech, prepared the Land Use and Planning and Transportation and Traffic sections. Mr. Bock also reviewed the Initial Study.

Julia Mates, Historian with Tetra Tech, prepared the Aesthetics, Cultural Resources, Recreation, and Utilities and Service Systems sections.

Cliff Jarman, Senior Geologist with Tetra Tech, prepared the Agriculture and Forestry Resources, Hazards and Hazardous Materials, and Mineral Resources sections.

Genevieve Kaiser, Senior Planner with Tetra Tech, prepared the Air Quality, Greenhouse Gas Emissions, Noise, Population and Housing, and Public Services sections.

Angela Lortie, Biologist with Tetra Tech, prepared the Biological Resources section.

Ann Zoidis, Senior Biologist with Tetra Tech, prepared the Biological Resources section.

APPENDIX A

STANISLAUS COUNTY GROUNDWATER ORDINANCE AND IMPLEMENTATION GUIDELINES

Chapter 9.37 GROUNDWATER

9.37.010 Title.

The ordinance codified in this chapter may be cited as the Stanislaus County Groundwater Ordinance. (Ord. CS 1155 §2, 2014; Ord. CS 1138 §1, 2013).

9.37.020 Findings.

The Stanislaus County Board of Supervisors hereby finds:

1. The protection of the health, welfare, and safety of the residents of the county require that the groundwater resources of Stanislaus County be protected from adverse impacts resulting from the specific acts of unsustainable groundwater extraction within the county and the export of water outside of the county; and

2. Groundwater is an essential resource for continued agricultural production within the county which production includes, but is not limited to, field crops, nut and fruit crops, vegetable crops, seed crops, poultry and livestock and products which significantly contribute to the gross value of the total agricultural production of the county; and

3. Groundwater is an essential resource for municipal, industrial and domestic uses within the county; and

4. The unsustainable extraction of groundwater resources within the county and the export of water outside of the county each could have adverse environmental impacts on the county, including, but not limited to, increased groundwater overdraft, land subsidence, uncontrolled movement of inferior quality groundwater, the lowering of groundwater levels, and increased groundwater degradation; and

5. The unsustainable extraction of groundwater resources within the county and the export of water outside of the county each could have adverse economic impacts on the county, including, but not limited to, loss of arable land, a decline in property values, increased pumping costs due to the lowering of groundwater levels, increased groundwater quality treatment costs, and replacement of wells due to declining groundwater levels, replacement of damaged wells, conveyance infrastructure, roads, bridges and other appurtenances, structures, or facilities due to land subsidence; and

6. California Constitution, Article X, Section 2, as well as Water Code Section 100 prohibit the waste, unreasonable use, unreasonable method of use, and unreasonable method of diversion of water. The county finds that the unsustainable extraction of groundwater and the export of water outside of the county are presumptively inconsistent with the California Constitution and the California Water Code; and

7. Nothing in this chapter determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water rights; and

8. There is a critical need for water well extraction data to analyze and understand the degree of groundwater depletion or recharge, to establish water budgets, and to balance conjunctive use of groundwater resources. The county finds and determines that

such data is critical to the implementation of groundwater regulation under this chapter. The county finds and determines that such data from persons is presumptively confidential and proprietary information, including geological and geophysical data, plant production data, or trade secrets. The county further finds and determines that the need to receive or obtain such data, and to maintain its confidentiality, outweighs the public need for site specific private information and that the public will have access to the aggregate of such information which is a better measure of the cumulative status of groundwater resources. (Ord. CS 1155 §3, 2014; Ord. CS 1138 §1, 2013).

9.37.030 Definitions.

The following words and phrases shall have the following meanings when used in this chapter:

1. "County" means the county of Stanislaus.

2. "Board" means the board of supervisors of Stanislaus County.

3. "Person" means and includes natural persons, corporations, firms, partnerships, joint stock companies, associations and other organizations of persons, and public entities.

4. "Groundwater" means water that occurs beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

5. "Public water agency" means any local public agency, mutual water company, or nonprofit tax-exempt unincorporated association within, or partially within, Stanislaus County that has authority to undertake water-related activities.

6. "Unsustainable extraction of groundwater" means the extraction of groundwater in a manner that is not sustainable groundwater management as defined in this chapter or state law.

7. "Export of water" means the act of conveying groundwater, or surface water for which groundwater has been substituted, out of the county.

8. "Sustainable groundwater management" means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon as defined in subdivision (q) of Water Code Section 10721 without causing or substantially contributing to undesirable results.

9. "Undesirable result" means one or more of the following:

a. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

b. Significant and unreasonable reduction of groundwater storage.

c. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

d. Significant and unreasonable land subsidence that substantially interferes with surface land uses.

e. Surface water depletions that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

10. "De minimis extractor" means a person who extracts two acre-feet or less per year.

11. "Groundwater sustainability plan" means a plan adopted pursuant to Water Code Section 10727 et seq. (Ord. CS 1155 §4, 2014; Ord. CS 1138 §1, 2013).

9.37.040 Prohibition.

Except as otherwise provided in this chapter, the following actions are prohibited:

A. The unsustainable extraction of groundwater within the unincorporated areas of the county.

B. The export of water. (Ord. CS 1155 §5, 2014; Ord. CS 1138 §1, 2013).

9.37.045 Application.

A. The prohibition set forth in subsection A of Section 9.37.040 is applicable to the extraction from any groundwater well for which an application for a new well construction permit pursuant to Chapter 9.36 is filed after November 25, 2014. Applications for a well construction permit submitted after that date shall demonstrate, based on substantial evidence, that either: (1) one or more of the exemptions set forth in Section 9.37.050 apply; or (2) that extraction of groundwater from the proposed well will not constitute unsustainable extraction of groundwater. This subsection shall not apply to a well designed to replace an existing well that has been permitted under Chapter 9.36 prior to November 25, 2014 if the replacement well has no greater capacity than the well it is replacing.

B. Effective upon adoption of an applicable groundwater sustainability plan, the prohibition set forth in subsection A of Section 9.37.040 shall be applicable to the extraction from any groundwater well for which the county reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In the event of such determination by the county, the affected holder or holders of a well construction permit issued pursuant to Chapter 9.36 for such well shall be notified and shall be required to demonstrate, based on substantial evidence, that continued extraction of groundwater will not result in an unsustainable extraction of groundwater as defined in subsection 6 of Section 9.37.030.

C. This section does not limit the application of subsection B of Section 9.37.040.

D. The regulations and prohibitions set forth in this chapter apply only to the unincorporated areas of Stanislaus County. (Ord. CS 1155 §6, 2014).

9.37.050 Exemptions.

A. The following water management practices are exempt from the prohibitions in Section 9.37.040:

1. Water resources management practices of public water agencies that have jurisdictional authority within the county, and their water rate payers, that are in compliance with and included in groundwater management plans and policies adopted by that agency in accordance with applicable state law and regulations, as may be amended, including, but not limited to, the California Groundwater Management Act (Water Code Sections 10750 et seq.), or that are in compliance with an approved groundwater sustainability plan.

2. De minimis extractions as set forth in Section 9.37.030(10) of this chapter.

3. Groundwater extraction or the export of water in compliance with a permit issued by the Stanislaus County department of environmental resources pursuant to this chapter.

B. The following water management practices are exempt from the prohibition against export of water in this chapter:

1. De-watering of shallow water tables where the net benefits of the removal of subsurface water substantially outweighs the loss of water because of damage the high water table reasonably may cause to agriculture, industry, commerce and other property uses. The groundwater in some areas of the county is very near the surface and if not removed by interceptor ditches or subsurface tile drains, the water can seriously impact crop root zones for agricultural production or destroy foundations, equipment, materials, buildings and infrastructure used for residences, industry, utilities or commerce. This groundwater may or may not be reused for other purposes and at times may leave the county and its groundwater system.

2. Reasonable use of groundwater resources to supplement or replace surface water released for other reasonable and beneficial purposes, including, but not limited to, fisheries, ecosystem habitat or downstream water quality or quantity needs, when required pursuant to federal and state law, regulations, licenses or permit conditions.

3. Conservation of water in compliance with applicable state law that authorizes public water agencies to transfer water outside its usual place of use. Conservation investments may include, but are not limited to, irrigation practices in agricultural areas where the crops grown use less water, or communities that produce recycled water, fix leaks or promote other water saving devices and methods to conserve water on a temporary or permanent basis.

4. Recharge of groundwater in locations in the county that are capable of improving groundwater conditions in order to meet total water demands of beneficial uses in the hydrologic and groundwater basin area including, but not limited to, the following sources: surface water, treated municipal drinking water, recycled water and stormwater. The amount of recaptured groundwater transferred out of the area should not exceed the amount of water used to recharge the aquifer. The transfer can be accomplished by either direct or indirect transfer, that is, a public water agency can leave the water in the ground and transfer other supplies in lieu of pumping out the recharge water.

5. Remediation of contaminated groundwater that is pumped and treated to remove contaminants that are in violation of standards for beneficial uses. The extracted and treated water may be released out of the county, resulting in a net loss to the groundwater basin, if the release complies with discharge permits issued by the federal, state or state resource agencies.

6. Export of water that reasonably supports agricultural operations on property outside the county that is contiguous with property within the county and is under common ownership.

7. Export of water from a private water source that is bottled in compliance with a private water source operator license issued by the state pursuant to Health and Safety Code Section 111120.

C. The exemptions set forth in subsections A and B above do not exempt the activities described in those subsections from subsection B of Section 9.37.045. (Ord. CS 1155 §7, 2014; Ord. CS 1138 §1, 2013).

9.37.060 Implementation.

A. The Stanislaus County department of environmental resources shall have the primary responsibility for implementation of this chapter and regulations adopted by the board of supervisors. That responsibility shall include any preparation, approval, and/or certification of any environmental document pursuant to the California Environmental Quality Act (CEQA) for issuance of any permit for a groundwater well, to the extent required by CEQA, or a determination that such permit is not subject to, or is exempt from, CEQA.

B. The department of environmental resources shall establish a system of permits to authorize water management practices otherwise prohibited by this chapter. The department may issue a permit for a water management practice to the extent that such practice is consistent with the statements of county policy set forth in Section 9.37.020 of this chapter, and provided that such practice is for a reasonable and beneficial use of groundwater resources, supports sustainable groundwater management, and promotes the public interest. The term of a groundwater extraction permit issued by the department pursuant to this subsection shall not exceed the remaining term of any applicable groundwater sustainability plan.

C. The department of environmental resources shall have authority to investigate any activity subject to this chapter. Compliance with this chapter will be determined based on the submission of a technical report to the department of environmental resources on a form provided by the county. The department is authorized to enforce the prohibition of any activity that is determined to be in violation of this chapter or regulations adopted by the board of supervisors.

D. Any interested person or entity may appeal an administrative determination made by the department under this chapter which: (1) finds that an application is complete or incomplete; (2) establishes or modifies operating conditions; (3) grants or denies a permit; or (4) suspends or revokes a permit. Administrative appeals under this section must be made in writing, must clearly set forth the reasons why the appeal ought to be granted, and must be received by the chief executive officer within fifteen days of the postmark date on the envelope that transmits the administrative determination. Any appeal that is not timely filed, or that is not accompanied by the required fee, will be deemed ineffective and the administrative determination that is being appealed will become final. The chief executive officer shall fix a reasonable time for the hearing of an appeal of an administrative determination, and shall provide written notice of the appeal hearing to the appellant and all interested parties, and to all landowners within one-quarter mile of the parcel where operations will occur. An appeal review committee comprised of the chief executive officer or designee, the chair and vice chair of the board of supervisors shall hear the appeal and issue a decision within thirty days after the hearing. The appeal review committee may take any appropriate action upon the original administrative action that was appealed, including granting or denying the appeal in whole or in part, or imposing, deleting or modifying operating conditions of the permit. The decision of the appeal review committee shall be final.

E. Any interested person or entity may appeal to the board of supervisors the following decisions and determinations of the department regarding a groundwater well permit: (1) a decision to approve or deny a negative declaration; (2) a decision to certify or refuse to certify an environmental impact report; or (3) a determination that a permit is not subject to, or is exempt from, CEQA. (Ord. CS 1155 §8, 2014; Ord. CS 1138 §1, 2013).

9.37.065 Groundwater monitoring.

A. All persons, including public water agencies that extract groundwater within the county shall cause to be prepared and submitted to the county department of environmental resources periodic reports of groundwater information that are reasonably necessary to monitor the existing condition of groundwater resources within the county, to determine trends, or to develop effective sustainable groundwater management plans and policies. A de minimis extractor shall not be required to submit such information.

B. The department shall develop and recommend regulations to be adopted by the board that establish the frequency and timing of required reports, and the required information to be monitored, including, without limitation, water level and pumping data, or other data necessary for any other method to determine groundwater production.

C. The county presumes that information submitted pursuant to this section will be exempt from disclosure under the California Public Records Act. The regulations developed under subsection B of this section shall include a process for submitters to confirm that their information is exempt from disclosure. Any document that aggregates information submitted under this section shall not be treated as exempt from disclosure if such document neither identifies the sources of that information nor permits the reader to otherwise determine the sources of that information. (Ord. CS 1155 §9, 2014).

9.37.070 Penalty for violation.

A. Any person violating any of the provisions of this chapter shall be guilty of a misdemeanor and upon conviction thereof shall be punished as set forth in Stanislaus County Code Section 1.36.010. Each person shall be guilty of a separate offense for each and every day during any portion of which any violation of any provision of this chapter is committed, continued or allowed and shall be punishable accordingly.

B. In addition to or in lieu of the penalty provisions or remedies set forth in this chapter, any violation may be abated in any manner set forth in Chapter 2.92 of the Stanislaus County Code, including, but not limited to, abatement or issuance of administrative citations.

C. In addition to or in lieu of the penalty provisions or remedies set forth in this chapter, any violation of any of the provisions of this chapter, and any condition caused or allowed to exist in violation of any of the provisions of this chapter, shall be deemed a public nuisance and shall, at the discretion of county, create a cause of action for injunctive relief, including but not limited to any remedy under Chapter 5 (commencing with Section 17200) of Part 2 of Division 7 of the Business and Professions Code. (Ord. CS 1138 §1, 2013).

9.37.080 Severability and effect.

A. The provisions of this chapter are hereby declared to be severable. If any provision, clause, word, sentence or paragraph of this chapter or the application thereof to any person, establishment or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this chapter.

B. The prohibitions of this chapter shall not be applicable to the extent that their application would result in a violation of the Constitution or other laws of the United States or the state of California. The department of environmental resources shall issue a permit to authorize conduct otherwise prohibited under this chapter if the applicant demonstrates that such permit is necessary to avoid such a violation of state or federal law. (Ord. CS 1138 §1, 2013).

DEPARTMENT OF ENVIRONMENTAL RESOURCES

3800 Cornucopia Way, Suite C, Modesto, CA 95358-9592
Phone: 209.525.6770 Fax: 209.525.6773

COUNTY GROUNDWATER ORDINANCE

WELL PERMIT APPLICATION REVIEW PROCESS

The following process has been adopted by the Stanislaus County Department of Environmental Resources (DER) to review and process well permit applications under the County Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code) after the effective date of November 26, 2014. The process is also illustrated graphically on the attached flow chart.

1. The Applicant submits a Well Permit Application using the Application Packet available at http://www.stancounty.com/ER/pdf/water-well-construction-and-destruction-application.pdf, or from the DER office, and provides a check for the appropriate permit fees.
2. After receipt of a Permit Application, it is reviewed by the DER to determine whether it is subject to the prohibitions in the Groundwater Ordinance against unsustainable groundwater extraction and the export of water using the following criteria:
   a. Section 9.37.030 (4): If the Permit Application is for a well that will pump water from a known and definite channel, it is not pumping groundwater as defined by the Groundwater Ordinance, and the prohibitions of the Ordinance do not apply. (A copy of the "Application to Appropriate Water" submitted to the California State Water Resources Control Board (SWRCB) is required.)
   b. Section 9.37.045 (A): The prohibition against unsustainable groundwater extraction does not apply to an application for a well designed to replace an existing well permitted prior to November 25, 2014, provided the replacement well has no greater capacity than the well it is replacing. (Construction details and groundwater extraction capacities for the original and replacement well are required.)
   c. Section 9.37.045 (D): The prohibitions and requirements of the Groundwater Ordinance do not apply to Permit Applications for wells that are not located in an unincorporated area of the County.
   d. Section 9.37.050 (A1) Permit Applications for wells on property served by a public water agency that is in compliance with an adopted Groundwater Management Plan or Groundwater Sustainability Plan are not subject to the prohibitions in the Groundwater Ordinance. (Current proof that water delivery charges are being paid by the parcel in question is required.)
   e. Section 9.37.050 (A2): Permit Applications for wells intended to extract 2 acre-feet/year of groundwater or less are exempt from the prohibitions in the Groundwater Ordinance. (Construction and pump details are required.)

f. Section 9.37.050 (A3): Groundwater extraction or water export in compliance with a permit previously granted by the DER is exempt from the prohibitions in the Groundwater Ordinance. (A copy of the permit is required.)

   Based on this review, if the Permit Application is exempt, it is processed and a permit is issued by DER after receipt of the required permit fees.[1]

3. If the Permit Application is not exempt, the Applicant must submit a Supplemental Application for Non-Exempt Wells with information to demonstrate that groundwater pumped from the well is being sustainably extracted and will not cause any of the "Undesirable Results" listed in Section 97.030 (9) the Ordinance. This Supplemental Application is reviewed to determine whether the information provided is complete and adequate to demonstrate that the Permit Application complies with the Groundwater Ordinance. The review is completed over a 30-day period and is conducted at the expense of the Applicant. Additional permit application fees may be due at the time the supplemental information is provided and/or prior to issuance of the permit.

   a. A copy of the Supplemental Application for Non-Exempt Wells is attached. The DER will contact the Applicant to review what is required, which may vary depending on location and well depth.

   b. After the Applicant submits the supplemental information, it is administratively checked to verify that all of the required information has been provided. The Applicant will be notified if any additional information is required before review of the Permit Application for compliance with the Groundwater Ordinance can begin. This may include special studies that are required under some circumstances.

   c. Next, the Permit Application and supplemental information provided by the applicant is reviewed to determine whether the Applicant has met the requirement to demonstrate by "Substantial Evidence" (Section 97.045 (A)) that the proposed groundwater extraction will not result in "Unsustainable Groundwater Extraction" as defined in Sections 97.030 (6) and 97.030 (8) of the Groundwater Ordinance. Specifically, a technical review is conducted to verify whether the information submitted by the Applicant demonstrates that groundwater extraction from the well will not cause, or substantially contribute to, any of the "Undesirable Results" listed in Section 97.030 (9) of the Groundwater Ordinance. These Undesirable Results include the following:

      i. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and

[1] Note that effective upon adoption of an applicable Groundwater Sustainability Plan, the prohibition against unsustainable groundwater extraction shall be applicable to any well for which the County reasonably concludes that the extraction of groundwater constitutes unsustainable extraction of groundwater. In addition, if the proposed well is intended to be used for the export of water as defined in the Groundwater Ordinance, a separate review is conducted to determine whether such export is exempt from the Ordinance prohibition against such export.

recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

ii. Significant and unreasonable reduction of groundwater storage.

iii. Significant and unreasonable degradation of water quality, including the migration of contaminant plumes that impair water quality.

iv. Significant and unreasonable land subsidence that substantially interferes with surface land uses.

v. Surface water depletions that have significant and unreasonable adverse impacts on the beneficial uses of the surface water.

d. If the review finds the Applicant has failed to demonstrate that the their proposed groundwater extraction will not cause or substantially contribute to any of the above-listed Undesirable Results, the application is discussed with the Applicant, and they are given the opportunity to submit additional data, accept mitigation measures that will lessen the Undesirable Results to an insignificant level, or amend their application. Note that the Applicant is not required to submit additional date, amend their application or accept the mitigation measures in such a situation; however, it they do not do so, an Environmental Impact Report (EIR) will be required.

4. After completion of the Groundwater Ordinance Completeness and Compliance Review, the application is reviewed as required under the California Environmental Quality Act (CEQA) to determine whether construction and use of the proposed well could result in potentially significant environmental impacts, and to determine what type of environmental document is appropriate for evaluation of the project and compliance with the CEQA. This is called a CEQA Initial Study, and is completed during a 30-day period. If the Initial Study finds that construction and operation of the proposed well will not result in potentially significant environmental impacts, or that the impacts will be mitigated to a less-than-significant level, then the application qualifies for processing under a Negative Declaration (ND) or a Mitigated Negative Declaration (MND). If the Initial Study finds that there are potentially significant environmental impacts, then an EIR is required.

5. If the application qualifies for a ND or MND, then the appropriate CEQA document is prepared and processed. Under the State CEQA Guidelines, the County has 180 days to complete this process. First, the DER prepares the draft document (either a ND or MND) and files a Notice of Intent with the County Clerk; then, a 30-day public comment period is opened.

6. If the application requires preparation of an EIR, the DER will meet with the applicant to go over the requirements. EIR’s will usually require more in depth studies to evaluate specific impacts and determine whether or not they are significant. Under the CEQA Guidelines, the County has one year to complete the EIR, but this period may be extended by 90 days.

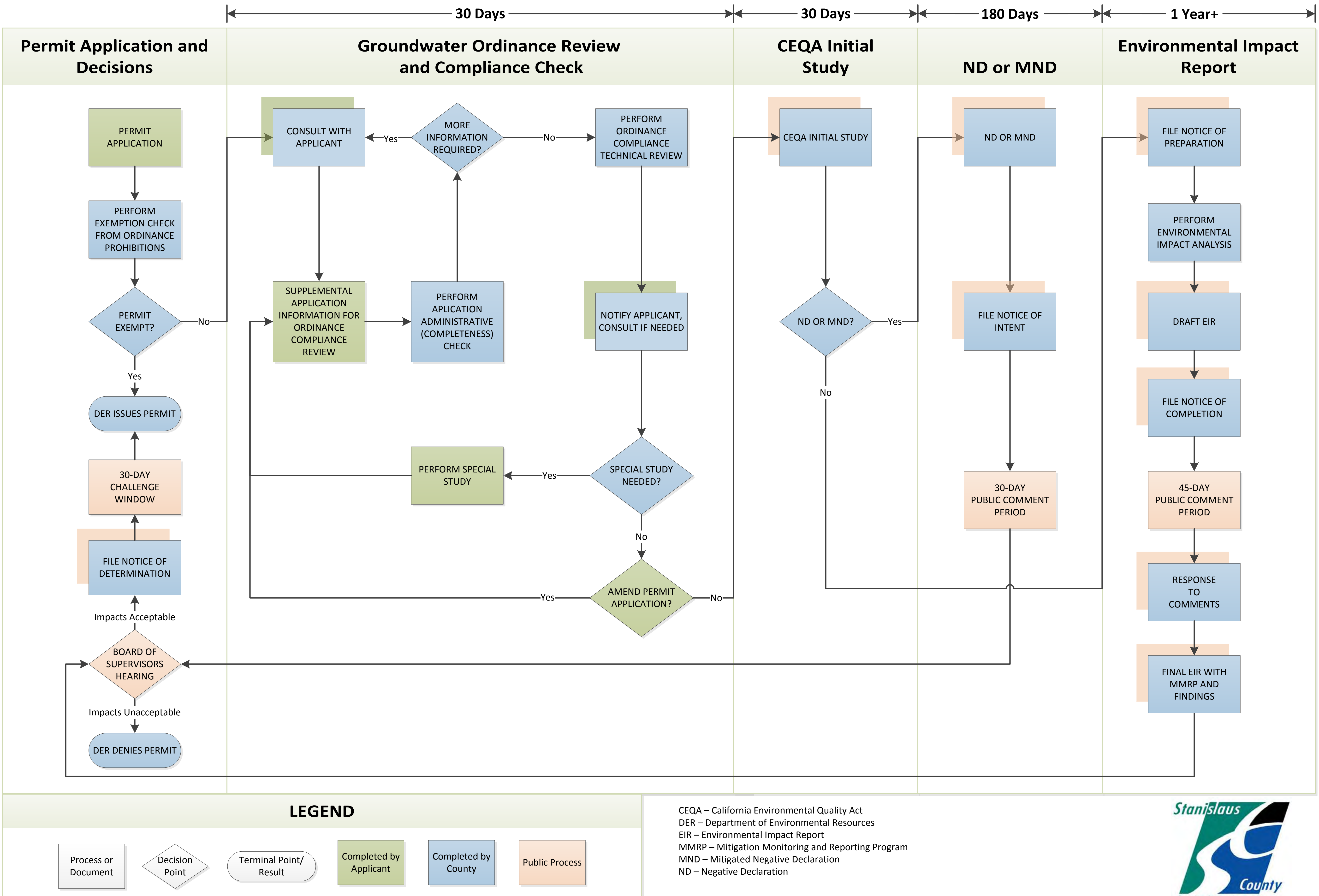
7. After conclusion of the public comment period for the ND, MND or EIR, and development of appropriate responses to any comments that are received, the well

permit application receives a public hearing during a regularly-schedule Board of Supervisors meeting, and the application is voted upon. If the application is accepted, then a Notice of Determination is filed with the County Clerk. After the Notice of Determination is filed, there is a 30-day period during which the County's decision can be legally challenged. After this period is over, if no challenges are received, the DER will issue the permit, pending receipt of any fees that are due for review and processing of the permit application.

Attachments:

1. Stanislaus County Groundwater Ordinance Well Permitting Process Flow Chart
2. Supplemental Application for Non-Exempt Wells

Stanislaus County Groundwater Ordinance Well Permitting Process



CEQA – California Environmental Quality Act
DER – Department of Environmental Resources
EIR – Environmental Impact Report
MMRP – Mitigation Monitoring and Reporting Program
MND – Mitigated Negative Declaration
ND – Negative Declaration

Jacobson James & Associates, Rev C August 7, 2015

DEPARTMENT OF ENVIRONMENTAL RESOURCES

3800 Cornucopia Way, Suite C, Modesto, CA 95358-9592
Phone: 209.525.6770 Fax: 209.525.6773

SUPPLEMENTAL APPLICATION FOR NON-EXEMPT WELLS

The following supplemental information is required for all wells that are determined not to be exempt from the prohibitions and requirements of the County Groundwater Ordinance effective November 25, 2014.

Applicant Information

Name of Applicant:		Firm (if applicable):	
Address:	City:	State:	Zip Code:
Daytime Phone Number:	Fax Number	Email:	
Name of Owner (if different from Applicant):		Firm (if applicable):	
Address:	City:	State:	Zip Code:
Daytime Phone Number:	Fax Number	Email:	

Licensed Professional Information (Professional Engineer or Geologist)

Name of Licensed Professional:		Firm:	
Address:	City:	State:	Zip Code:
Daytime Phone Number:	Fax Number	Email:	
License Type and Number:	Sections of Application Completed:		
Name of Licensed Professional:		Firm:	
Address:	City:	State:	Zip Code:
Daytime Phone Number:	Fax Number	Email:	
License Type and Number:	Sections of Application Completed:		

For County Use Only

I. Location Map

Provide a map or maps showing the following:

A. Well location

B. Outline of property to be served by the well, and APN number(s)

C. Outline of contiguous owned property surrounding the well location, and APN number(s)

D. Streams and lakes within 2 miles

E. Springs, seeps, wetlands and other Groundwater-Dependent Ecosystems (GDEs) within 3 miles. (Use USGS topographic maps, aerial photo imagery available from the internet or other sources, state databases, studies, DER resources, or knowledge of the area to identify any areas where groundwater may be discharging to surface water either perennially or seasonally.)

F. Existing sewer lines, cisterns and septic disposal systems within 250 feet

G. Concentrated Animal Feeding Operations (CAFOs) within 1 mile

H. Reported hazardous materials and hazardous waste sites or release incidents within 1 mile (from Section VI.A.)

I. Existing wells on the property, keyed to a table that provides well use, depth, diameter, screen interval, and pumping rate. If available, attach information regarding any specific capacity or other pumping tests completed.

J. Predicted area of drawdown exceeding 5 feet (from Section III, below).

K. For proposed wells within 2 miles of areas underlain by the Corcoran Clay and completed below the depth of the Corcoran Clay, the location of any infrastructure within 2 miles that is potentially sensitive to subsidence. This includes, but is not necessarily limited to, canals, ditches, pipelines, utility corridors, and roads.

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

II. Pumping and Water Use Data

Provide the following information regarding groundwater extraction from the proposed well.

A. For irrigation wells, use the following table to calculate the water demand to be served by the proposed well.

Crop Type	Irrigated Acres	Irrigation System Type	Irrigation Season Length (days)	Average Annual Demand (AFY)	Maximum Monthly Demand (MGM)	Peak Daily Demand (GPM)

B. Estimated pumping rate of proposed well: _________ gpm

C. Anticipated pumping schedule for proposed well (hours per day, days per week, approximate annual start date and stop date for seasonal pumping):

D. Estimated annual extraction volume: ________ gal

E. Estimated cumulative extraction volume prior to January 1, 2022: ________ gal

F. Estimated cumulative extraction volume in 20 years: ________ gal

G. Planned water use: ☐ Irrigation ☐ Stock ☐ Domestic ☐ Municipal ☐ Industrial ☐ Other (describe): ____________________________________

H. Size of area to be served by the well: __________ acres

I. Size of contiguous owned property on which the well is located: ________ acres

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

III. Water Export

A. Will groundwater extracted from the well be exported from the County, or substituted for surface water that will be exported form the County,

B. If the attach a Groundwater Export Proposal that includes, at a minimum, the following:

1. List the exemptions from Section 9.37.050 of the Groundwater Ordinance that apply and provide any substantiating evidence.
2. Provide specific timeframes and conveyance mechanisms by which the groundwater will be conveyed out of the County.
3. Indicate the purpose and use of such water at the terminal point of delivery.
4. Indicate the methods used to monitor and report the volume of water to be exported.
5. Explain whether the project involves exporting water during periods of emergency. (An emergency includes (1) states of emergency as described in the California Government Code, section 8558; (2) states of water shortage emergency as determined by the California Department of Water Resources; or (3) determination by the Stanislaus County Board of Supervisors that groundwater within the County can assist areas outside the County.)
6. Groundwater extraction for the purpose of emergency relief shall be monitored so that the volume of water exported can be determined.
7. The duration of groundwater extraction for the purpose of emergency relief shall not exceed the time frame of the emergency.
8. Groundwater extraction for the purpose of emergency relief does not set precedents or entitles the exporter to future exports.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

IV. Local Groundwater Level Decline

Provide distance-drawdown calculations for groundwater extraction from the proposed well. The approach taken may include calculations, spreadsheets, analytical computer models or numerical computer models, at the discretion of the Applicant. The DER can provide additional guidance if needed. Evaluation may consist of a simple one dimensional distance-drawdown calculation using the Theiss Equation, or more complex two and three dimensional approaches may be taken when the applicant feels that doing so presents a more realistic assessment of potential impacts. Input parameters for aquifer properties (Transmissivity and Storativity) may be derived from local pump and aquifer tests, other site investigation data, the County’s well database, literature, or professional judgment based on the materials in which the well is completed. A description of the conceptual approach taken to the analysis must be provided, and justification must be provided for all inputs and assumptions to assure that impacts are not underestimated.

A. Method used: ☐Calculations ☐Spreadsheet ☐Computer Model

B. Describe Approach (attach additional sheets, calculations and results):

C. Provide drawdown estimates for January 1, 2022 and after 20 years of pumping:

1. Distance to 5 feet drawdown: _______________ feet
2. Distance to 20 feet drawdown: _______________ feet
3. Drawdown at the nearest property line: _______________ feet
4. If the well is in a Subsidence Study Zone (within 2 miles of an area underlain by the Corcoran Clay) and completed in a confined aquifer system, maximum drawdown at the nearest ditch, canal, utility easement or other sensitive infrastructure: _______________ (feature); _______________ feet
5. Maximum drawdown at each GDE within 3 miles or less of the proposed well: _______________ feet

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

V. Wells in a Groundwater Level Management Zone

If the proposed well is in a County-designated Groundwater Level Management Zone, the Applicant shall provide the following:

A. A Groundwater Extraction Offset Plan that demonstrates that the proposed groundwater extraction will be 100% offset. The scope of the Groundwater Extraction Offset Plan must be discussed with the DER and agreed to prior to implementation. The Plan shall include, at a minimum, the following:

1. The proposed method and location of offset;
2. The proposed timing and duration of offset;
3. Supporting calculations to demonstrate offset volume; and
4. Any assurances and/or agreements with other parties that verify their agreement to support the proposed offset.

OR B. A Groundwater Resources Investigation that demonstrates the proposed groundwater extraction will not cause or contribute to Undesirable Results in the Groundwater Level Management Zone. The scope of the Groundwater Resources investigation must be discussed with the DER and agreed to prior to implementation and, at a minimum, shall include the following:

1. A summary of previous studies and reports;
2. A summary of available information regarding undesirable results observed in the area;
3. Analysis of local and regional groundwater level trends based on available well hydrographs within no less than 5 miles of the proposed well;
4. Any additional site specific hydrogeologic investigation performed;
5. An analysis of the local groundwater balance;
6. A prediction of future groundwater level drawdown and trends in the area with and without the proposed well;
7. Evaluation and conclusions whether the proposed groundwater extraction will cause, or contribute to, undesirable results; and
8. Signature by a Registered Professional Geologist or Registered Professional Engineer in California.

AND C. A Groundwater Level Monitoring Plan that includes, at a minimum, the following:

1. A description of the aquifers to be monitored;
2. A description of any existing or new wells to be used, their locations, construction specifications and completion depths; and
3. Water level measurement methods and frequency (minimum spring and fall).

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

VI. Regional Groundwater Level Decline and Storage Reduction

For all proposed well not located within a County-designated Groundwater Level Management Zone, the Applicant shall provide the following:

A. Calculate available aquifer storage beneath the contiguous property owned by the Applicant on which the proposed well is located: ________________ acre-feet

Parameter	**Value**	**Source/Justification** (attach additional information as needed)
Size of Property (acres)		
Aquifer Thickness (feet)		
Specific Yield (assume 0.25 or provide justification for alternate value)		

B. Divide the cumulative groundwater extraction volume prior to January 1, 2022 by the available aquifer storage calculated above: ___________ %

C. Divide the cumulative groundwater extraction volume for the first 20 years of well operation by the available aquifer storage calculated above: ___________ %

D. If the cumulative extraction volume exceeds 10% of available aquifer storage, submit a Groundwater Level Monitoring Plan that includes, at a minimum, the following:

   a. A description of the aquifers to be monitored;

   b. A description of any existing or new wells to be used, their locations, construction specifications and completion depths; and

   c. Water level measurement methods and frequency (minimum spring and fall).

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

VII. Water Quality Degradation

A. Provide a database search for reported hazardous materials and waste sites and release incidents near the proposed well with search radii that comply with ASTM Standard 1527. (Commercial database search services provide this service.)
B. Provide water quality data available within 1 mile of the proposed well for small water supply systems regulated by the County or the State, and from the State Geotracker website (http://geotracker.waterboards.ca.gov/) and from the USGS NWIS Database (http://maps.waterdata.usgs.gov/mapper/index.html).
C. If the well is located in a County-designated Groundwater Quality Protection Zone (in an area underlain by the Corcoran Clay), the Applicant shall provide data regarding the well seals and construction methods used to prevent communication between the unconfined aquifer system overlying the Corcoran Clay with the confined aquifer system underlying the Corcoran Clay.
D. If the well is located in a County-designated Groundwater Quality Study Zone (within 1 mile of a well that produces water with solute concentrations that exceed primary or secondary MCLs or other applicable Water Quality Objectives), or within 1 mile of a reported contamination incident identified by the database search, the Applicant shall submit a Groundwater Quality Investigation. The scope of the Groundwater Quality investigation must be discussed with the DER and agreed to prior to implementation. At a minimum, the Groundwater Quality Investigation shall include the following:
    1. A summary of relevant data, studies and/or reports regarding the local aquifer system, groundwater quality and contaminant transport;
    2. Analysis of local and regional groundwater quality trends based on available data in the area;
    3. The methods and results of any additional site-specific hydrogeologic and groundwater quality investigation;
    4. Evaluation of the potential effect of the proposed well on future groundwater quality trends and contaminant migration;
    5. Evaluation of whether the proposed groundwater extraction will cause, or contribute to, groundwater quality degradation in excess of applicable standards for beneficial uses, or will interfere with groundwater quality management or remediation efforts overseen by State or Federal agencies; and
    6. Signature by a Registered Professional Geologist or Registered Professional Engineer in California.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

VIII. Land Subsidence

A. If the well is in a Subsidence Study Zone (i.e., it is within 2 miles of an area underlain by the Corcoran Clay) and is proposed to be completed in the confined aquifer system, the Applicant shall provide the following:

1. The estimated maximum drawdown on January 1, 2022 and after 20 years of pumping at the nearest property line, ditch, canal, utility easement other sensitive infrastructure: _______ ft on January 1, 2022 and ______ feet after 20 years.
2. Attach hydrographs for nearby wells showing lowest historical groundwater levels. (Hydrographs are available from https://www.casgem.water.ca.gov and http://maps.waterdata.usgs.gov/mapper/index.html.)

Well ID	Distance and Direction from Proposed Well	Date Range of Data	Lowest Groundwater Level and Date

3. Attach data relevant to subsidence from the Groundwater Information Center Interactive Map Application (https://gis.water.ca.gov/app/gicima/)
4. If the above information indicates the predicted drawdown is lower than the historical low groundwater level, or inelastic subsidence has been measured in the vicinity of the proposed well, the Applicant shall submit a Geotechnical Subsidence Investigation. The scope of the Geotechnical Subsidence Investigation must be discussed with the County Geologist and agreed to prior to implementation. At a minimum, the Geotechnical Subsidence Investigation shall include the following:
   a. A description of available information regarding the local geology and hydrogeology, especially as it relates to potential compression of fine grained aquitards in confined aquifer systems;
   b. A summary of data, studies and/or reports regarding subsidence in the area;
   c. Analysis of historical and current local and regional groundwater level trends based on available well hydrographs;
   d. Prediction of future groundwater level drawdown and trends;
   e. Any additional site specific investigation performed by the Applicant of conditions related to subsidence;
   f. Evaluation of whether, and to what extent, the proposed groundwater extraction will cause, or contribute to, subsidence; and
   g. Signature by a Registered Professional Civil or Geotechnical Engineer in California.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

IX. Surface Water Depletion

If the well is in a Surface Water Protection Zone (within 1 mile of groundwater-connected streams, tributaries or reservoirs associated with the Calaveras, Stanislaus or Tuolumne Rivers if the well screen and gravel pack are completed within 200 feet of the streambed elevation, and within 2,500 feet if the well screen and gravel pack are completed at least 200 feet below the streambed elevation) the Applicant shall submit a Surface-Groundwater Interaction Study. The scope of the Surface-Groundwater Interaction Study must be discussed with the DER and agreed to prior to implementation. At a minimum, the Surface-Groundwater Interaction Study shall include the following:

A. A summary of previous data, reports and/or studies relevant to hydrostratigraphy and surface-groundwater interaction;
B. Additional site-specific investigation of conditions related to surface-groundwater interaction as may be required by the County, including but not necessarily limited to well-log interpretation or pumping tests;
C. Evaluation of the predicted surface water depletion by the proposed groundwater extraction using on-line analytical models available from the USGS (http://mi.water.usgs.gov/software/groundwater/strmdepl08/) or other methods approved by the County; and
D. Signature by a Registered Professional Geologist or Engineer in California.

<u>For County Use Only</u>

Data Adequate? ☐ Yes ☐ No

Comments:

X. Impacts to Groundwater Dependent Ecosystems (GDEs)

If drawdown at any GDE is projected to exceed 1 foot in Section IV.C.5, the Applicant shall submit a GDE Impact Study. The scope of the GDE Impact Study must be discussed with the DER and agreed to prior to implementation. At a minimum, the GDE Impact Study shall include the following:

A. A summary of previous groundwater resources and GDE studies and reports in the area;
B. A description of the groundwater flow regime and aquifer system in the area and the nature of the groundwater discharge at the GDE;
C. Analysis of local and regional groundwater level trends based on available well hydrographs within no less than 5 miles of the proposed well;
D. Any additional site specific hydrogeologic investigation performed;
E. An analysis of the local groundwater balance and the impact of the proposed groundwater extraction on surface water discharge, including evapo-transpiration, if applicable;
F. A prediction of future groundwater level drawdown and trends in the area with and without the proposed well;
G. Evaluation of the GDE for the presence of habitat and for the potential presence of any sensitive, threatened, or endangered species or rare plants;
H. Evaluation and conclusions regarding the impact of the proposed groundwater extraction on the GDE; and
I. Signature by a Registered Professional Geologist or Engineer in California, and a qualified biologist or environmental scientist.

For County Use Only

Data Adequate? ☐ Yes ☐ No

Comments:

INDEMNIFICATION

In consideration of the County's processing and consideration of this application for approval of the groundwater project being applied for (the "Project"), and the related CEQA consideration by the County, the Owner and Applicant, jointly and severally, agree to indemnify the County of Stanislaus ("County") from liability or loss connected with the Project approvals as follows:

1. The Owner and Applicant shall defend, indemnify and hold harmless the County and its agents, officers and employees from any claim, action, or proceeding against the County or its agents, officers or employees to attack, set aside, void, or annul the Project or any prior or subsequent development approvals regarding the Project or Project condition imposed by the County or any of its agencies, departments, commissions, agents, officers or employees concerning the said Project, or to impose personal liability against such agents, officers or employees resulting from their involvement in the Project, including any claim for private attorney general fees claimed by or awarded to any party from County. The obligations of the Owner and Applicant under this Indemnification shall apply regardless of whether any permits or entitlements are issued.
2. The County will promptly notify Owner and Applicant of any such claim, action, or proceeding, that is or may be subject to this Indemnification and, will cooperate fully in the defense.
3. The County may, within its unlimited discretion, participate in the defense of any such claim, action, or proceeding if the County defends the claim, actions, or proceeding in good faith. To the extent that County uses any of its resources responding to such claim, action, or proceeding, Owner and Applicant will reimburse County upon demand. Such resources include, but are not limited to, staff time, court costs, County Counsel's time at their regular rate for external or non-County agencies, and any other direct or indirect cost associated with responding to the claim, action, or proceedings.
4. The Owner and Applicant shall not be required to pay or perform any settlement by the County of such claim, action or proceeding unless the settlement is approved in writing by Owner and Applicant, which approval shall not be unreasonably withheld.
5. The Owner and Applicant shall pay all court ordered costs and attorney fees.
6. This Indemnification represents the complete understanding between the Owner and Applicant and the County with respect to matters set forth herein.

The Stanislaus County Department of Environmental Resources (DER) will notify the applicant of the date in which the completed information has been received. This date will trigger the 30-day review period to determine whether the application is complete. If additional information is needed or requested, this will trigger another 30-day review period.

IN WITNESS WHEREOF, by their signature below, the Owner and Applicant hereby acknowledge that they have read, understand and agree to perform their obligations under this Indemnification.

______________________________	______________________________
Signature of Applicant/Date	Signature of Owner(s)/Power of Attorney/Legal Representative/Date •

Note: Applications are not valid without the property owner's signature.

NOTICE TO ALL APPLICANTS

Pursuant to California Fish and Game Code §711.4, the County of Stanislaus is required to collect filing fees for the California Department of Fish and Wildlife for all projects subject to the California Environmental Quality Act (CEQA) unless a fee exemption is provided in writing from the California Department of Fish and Wildlife. Pursuant to California Fish & Game Code §711.4(d), all applicable fees are required to be paid within 5 DAYS of approval of any project subject to CEQA. These fees are subject to change without County approval required and are expected to increase yearly. Please contact the Department of Environmental Resources or refer to the current fee schedule for information on current fee amounts.

If a required filing fee is not paid for a project, the project will not be operative, vested or final and any local permits issued for the project will be invalid. (Section 711.4(c)(3) of the Fish and Game Code.)

Under the revised statute, a lead agency may no longer exempt a project from the filing fee requirement by determining that the project will have a de minimis effect on fish and wildlife. Instead, a filing fee will have to be paid unless the project will have no effect on fish and wildlife. (Section 711.4 (c)(2) of the Fish and Game Code). If the project will have any effect on fish and wildlife resources, even a minimal or de minimis effect, the fee is required.

A project proponent who believes the project will have no effect on fish and wildlife should contact the California Department of Fish and Wildlife. If the California Department of Fish and Wildlife concurs the project will have no such effect, the Department will provide the project proponent with a form that will exempt the project from the filing fee requirement. Project proponents may contact the Department by phone at (916) 651-0603 or through the Department's website at www.dfg.ca.gov.

Pursuant to California Fish and Game Code §711.4(e)(3) , the department (CDFW) shall assess a penalty of 10 percent of the amount of fees due for any failure to remit the amount payable when due. The department may pursue collection of delinquent fees through the Controller's office pursuant to Section 12419.5 of the Government Code.

Additionally California Fish and Game Code §711.4(f) states the following: Notwithstanding Section 12000, failure to pay the fee under subdivision (d) is not a misdemeanor. All unpaid fees are a statutory assessment subject to collection under procedures as provided in the Revenue and Taxation Code.

Failure to pay the necessary fee will also extend the statute of limitations for challenging the environmental determination made by the County, thus increasing exposure to legal challenge. The type of environmental determination to be made by the County may be discussed with the project reviewer following the environmental review stage of the project and will be outlined in a Board of Supervisor's staff report.

REQUIRED ADDITIONAL FEE: STANISLAUS COUNTY RECORDER

Upon approval of the proposed project, Stanislaus County will record either a “Notice of Exemption” or a “Notice of Determination” pursuant to CEQA Guidelines. The Clerk Recorder charges an additional fee of $57.00 for recording these documents. A separate check made payable to “Stanislaus County” is due and payable within 5 DAYS of approval of the project.

Attachment 3.B

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # 2016102005

Project Title: Discretionary Well Permitting and Management Program

Lead Agency: Stanislaus County Department of Environmental Resources   Contact Person: Walter Ward

Mailing Address: 3800 Cornucopia Way, Suite C   Phone: (209) 525-6710

City: Modesto   Zip: 95358   County: Stanislaus

Project Location: County: Stanislaus   City/Nearest Community: Not applicable

Cross Streets: Not applicable   Zip Code: ____

Longitude/Latitude (degrees, minutes and seconds): ___° ___′ ___″ N / ___° ___′ ___″ W   Total Acres: ____

Assessor's Parcel No.: ____   Section: ____   Twp.: ____   Range: ____   Base: ____

Within 2 Miles: State Hwy #: ____   Waterways: ____

Airports: ____   Railways: ____   Schools: ____

Document Type:

CEQA: ☐ NOP ☒ Draft EIR ☐ Early Cons ☐ Supplement/Subsequent EIR ☐ Neg Dec (Prior SCH No.) ____ ☐ Mit Neg Dec Other: ____

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other: ____

Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☒ Other: Well permits

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Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational: ____
☐ Recreational: ____
☒ Water Facilities: Type Wells MGD Unknown
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☐ Other: ____

Project Issues Discussed in Document:

☒ Aesthetic/Visual ☐ Fiscal ☒ Recreation/Parks ☒ Vegetation
☒ Agricultural Land ☒ Flood Plain/Flooding ☒ Schools/Universities ☒ Water Quality
☒ Air Quality ☒ Forest Land/Fire Hazard ☒ Septic Systems ☒ Water Supply/Groundwater
☒ Archeological/Historical ☒ Geologic/Seismic ☒ Sewer Capacity ☒ Wetland/Riparian
☒ Biological Resources ☒ Minerals ☒ Soil Erosion/Compaction/Grading ☒ Growth Inducement
☐ Coastal Zone ☒ Noise ☒ Solid Waste ☒ Land Use
☒ Drainage/Absorption ☒ Population/Housing Balance ☒ Toxic/Hazardous ☒ Cumulative Effects
☒ Economic/Jobs ☒ Public Services/Facilities ☒ Traffic/Circulation ☐ Other: ____

Present Land Use/Zoning/General Plan Designation:

Not applicable

Project Description: *(please use a separate page if necessary)*

Stanislaus County is implementing a Discretionary Well Permitting and Management Program pursuant to its Groundwater Ordinance (Chapter 9.37 of the County Code), which was adopted in November 2014 to promote sustainable groundwater management in the unincorporated areas of the County. The project consists of continued discretionary well permitting and regulation activities that will be implemented after the PEIR is adopted to assure that groundwater extraction complies with the Groundwater Ordinance's prohibition against unsustainable groundwater extraction. The purpose of the PEIR is to streamline the environmental review process for subsequent individual well permit applications and to help refine the program and make it more robust through environmental analysis and assignment of program level mitigation, as needed.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "X".
If you have already sent your document to the agency please denote that with an "S".

	Air Resources Board	X	Office of Historic Preservation
	Boating & Waterways, Department of		Office of Public School Construction
	California Emergency Management Agency	X	Parks & Recreation, Department of
X	California Highway Patrol		Pesticide Regulation, Department of
X	Caltrans District #10	X	Public Utilities Commission
	Caltrans Division of Aeronautics	X	Regional WQCB #5
	Caltrans Planning	X	Resources Agency
	Central Valley Flood Protection Board		Resources Recycling and Recovery, Department of
	Coachella Valley Mtns. Conservancy		S.F. Bay Conservation & Development Comm.
	Coastal Commission		San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
	Colorado River Board	X	San Joaquin River Conservancy
X	Conservation, Department of		Santa Monica Mtns. Conservancy
	Corrections, Department of		State Lands Commission
	Delta Protection Commission		SWRCB: Clean Water Grants
	Education, Department of	X	SWRCB: Water Quality
	Energy Commission	X	SWRCB: Water Rights
X	Fish & Game Region #4		Tahoe Regional Planning Agency
	Food & Agriculture, Department of		Toxic Substances Control, Department of
	Forestry and Fire Protection, Department of	X	Water Resources, Department of
	General Services, Department of		
	Health Services, Department of	X	Other: SWRCB: Division of Drinking Water
	Housing & Community Development		Other:
X	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date March 23, 2018 Ending Date May 7, 2018

Lead Agency (Complete if applicable):

Consulting Firm: Jacobson James and Associates
Address: 9083 Foothills Boulevard, Suite 370
City/State/Zip: Roseville, CA 95747
Contact: Mike Tietze
Phone: (916) 367-5111 ext. 131

Applicant:
Address:
City/State/Zip:
Phone:

Signature of Lead Agency Representative: JAMI AGGERS, DIRECTOR **Date:** 3/21/2018

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

NOTICE OF AVAILABILITY

DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM
DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

Stanislaus County is implementing a Discretionary Well Permitting and Management Program pursuant to its Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code), adopted in November 2014 to promote sustainable groundwater management.

Pursuant to the California Environmental Quality Act (CEQA), Stanislaus County has prepared a Draft Program Environmental Impact Report (PEIR) for the discretionary well permitting and management program. The Draft PEIR provides program-level analysis of the program across its implementation period through 2042, at which time all groundwater subbasins in Stanislaus County are required under the Sustainable Groundwater Management Act (SGMA) to be operated sustainably. The potential impacts related to the program would primarily occur before Groundwater Sustainability Plans are adopted under the SGMA in 2020 or 2022.

Stanislaus County has issued a Draft PEIR that identifies and describes the environmental issues expected to result from implementing the program. The environmental topics addressed in the Draft PEIR are Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, and Utilities and Service Systems. While the Draft EIR identifies potentially significant adverse impacts to Biological Resources, Cultural Resources, Geology and Soils, Hydrology and Water Quality, Land Use and Planning, and Noise, those impacts would be mitigated to less than significant levels. Other CEQA environmental topics were addressed in the previously issued Notice of Preparation and Initial Study.

Copies of the Draft PEIR are available for review at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, Modesto. The Draft PEIR is also available at the Stanislaus County Library, 1500 I Street, Modesto. In addition, the documents may be downloaded from the county's groundwater resources web page at the following internet address: http://www.stancounty.com/er/groundwater/. A public workshop discussing the PEIR will occur at the Stanislaus County Farm Bureau at 1201 L Street in Modesto from 1:30 to 3:00 PM on April 12, 2018.

The Draft PEIR public comment period is March 23 to May 7, 2018. Comments on the Draft PEIR must be received before 5:00 PM on May 7, 2018, to be considered in the preparation of the Final PEIR. They may be e-mailed to wward@envres.org or mailed to:

Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

Affidavit of Publication

PUBLIC NOTICE

STATE OF CALIFORNIA,
County of Stanislaus

KATICA KROLL

Of the said County, being duly sworn, deposes and says:
I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE CERES COURIER, 138 South Center Street, Turlock, California, a newspaper of general circulation, published in Ceres, California in the City of Ceres, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-with

APRIL 4, 2018

I certify (or declare) under penalty of perjury that the foregoing is true and correct. This 4th day of April, 2018.

Katica Kroll

Principal Clerk of the Printer

PUBLIC NOTICE

NOTICE OF AVAILABILITY

DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

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The Draft PEIR public comment period is March 23 to May 7, 2018. Comments on the Draft PEIR must be received before 5:00 PM on May 7, 2018, to be considered in the preparation of the Final PEIR. They may be e-mailed to wward@envres.org or mailed to:

Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358
Publication Date: April 4, 2018
CC#03-24

Affidavit of Publication

STATE OF CALIFORNIA }ss.
County of Stanislaus

Hughson Chronicle

Shay Gordon

Here-un-to being first duly sworn, deposes and says that all time hereinafter mentioned he/she was a citizen of the United States over the age of twenty-one (21) years, and doing business in said county, not interested in the matter of the attached publication, and is competent to testify in said matter, that he/she was at and during all said time the principal clerk to the printer and publisher of the

HUGHSON CHRONICLE

a legal newspaper of general circulation published weekly in Hughson in said County of Stanislaus, State of California: that said

HUGHSON CHRONICLE

is and was at all times herein mentioned, a newspaper of general circulation as that term is defined by Section 6000 of the Government Code, and as provided by said section and so adjudicated by Decree No. 41926 by the Superior Court of Stanislaus County, State of California, is published for the dissemination of local and telegraphic news and intelligence of a general character, have a bonafide subscription list of paying subscribers, and is not devoted to the interest, or published for the entertainment or instruction of a particular class, profession, trade, calling, race of denomination: or for the entertainment and instruction of any number of such classes, professions, trades, callings, races or denominations: that at all times said newspaper has been established, in Hughson; in said County and State, at regular intervals for more than one year preceding the first publication of the notice herein mentioned, that said notice was set in type not smaller than nonpareil and was preceded with words printed in blackface type not smaller than nonpareil, describing and expressing in general terms, the purport and character of the notice intended to be given

Legal # 4113

PUBLIC NOTICE

Publish Date: 03-27-2018

of which named annexed is a printed copy, was published and printed in said

HUGHSON CHRONICLE

at least 1 times, commencing on the 27 TH of March ending on the 27th of March, 2018 the days inclusive,
and as often during said time as said newspaper was regularly issued, to wit:

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.
Dated this 27th of March, 2018

PRINCIPAL CLERK OF THE PRINTER

Legal#4113

NOTICE OF AVAILABILITY
DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM DRAFT PROGRAMENVIRONMENTAL IMPACT REPORT

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Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

Publish Date: 03-27-2018

Attachment 3.D-3: Modesto Bee

The Modesto Bee
modbee.com
Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
549227	0003582193	PEIR NOA JOHN BOCK	PEIR NOA JOHN BOCK	1	83

Attention:

TETRA TECH
1999 HARRISON STREET, SUITE 500
OAKLAND, CA 94612

NOTICE OF AVAILABILITY
DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM
DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

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Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

MOD- 3582193 3/23

Declaration of Publication
C.C.P. S2015.5

STATE OF CALIFORNIA)
) ss.
County of Stanislaus)

I am a citizen of the United States; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am a printer and principal clerk of the publisher of the The Modesto Bee, which has been adjudged a newspaper of general circulation by the Superior Court of the County of Stanislaus, State of California, under the date of February 25, 1951 Action No. 46453. The notice of which the annexed is a printed copy has been published in each issue thereof on the following dates, to wit:

March 23, 2018

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Modesto, California on:

Date: 23rd, day of March, 2018

Cynthia A. McNamara

Signature

PROOF OF PUBLICATION

(2015.5 C. C. P.)

This space is for the County Clerk's Filing Stamp

STATE OF CALIFORNIA,

County of Stanislaus

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE OAKDALE LEADER, 122 South Third Avenue, Oakdale, California, a newspaper of general circulation, published in Oakdale, California in the City of Oakdale, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

March 28, in the year 2018.

I certify or declare under penalty of perjury that the foregoing is true and correct.

Dated at Oakdale,

This 28th day of March 2018.

Signature

Proof of Publication of

PUBLIC NOTICE
NOTICE OF AVAILABILITY

PUBLIC NOTICE
NOTICE OF AVAILABILITY
DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM
DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

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Signature

Preparation and Initial Study.
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Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358
March 28, 2018
QL #18-089

PROOF OF PUBLICATION
(2015.5 C.C.P)

STATE OF CALIFORNIA
County of Stanislaus

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years and not a party to or interested in the above-entitled matter. I am the principal clerk of the printer of the Patterson Irrigator, a newspaper of general circulation, printed and published once a week on Thursdays, in the city of Patterson, California, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court, of the County of Stanislaus, State of California, under the date of June 23, 1952, Case Number 47304; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to –wit:

April 5

all in the year 2018

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Patterson, California, this 5 day of April, 2018

Signature

NOTICE OF AVAILABILITY

DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

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Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

4/5/2018

ounty Clerk's Filing stamp

Attachment 3.D-6: Riverbank News

PROOF OF PUBLICATION

(2015.5 C. C. P.)

STATE OF CALIFORNIA,

County of Stanislaus

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE RIVERBANK NEWS, 122 South Third Ave, Oakdale, California, a newspaper of general circulation, published in Riverbank, California in the City of Riverbank, County of Stanislaus, and which newspaper has been adjudged a Newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the Notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

March 28, in the year 2018

I certify or declare under penalty of perjury that the Foregoing is true and correct.

Dated at Riverbank, California

This 28th day of March 2018

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication of

PUBLIC NOTICE
NOTICE OF AVAILABILITY

PUBLIC NOTICE
NOTICE OF AVAILABILITY
DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM
DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

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Signature

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Walter Ward
Stanislaus County
3800 Cornucopia Way, Suite C
Modesto, CA 95358

March 28, 2018
RN #18-035

Affidavit of Publication

STATE OF CALIFORNIA }ss.
County of Stanislaus

Alyssa Mendoza

Here-un-to being first duly sworn, deposes and says that all time hereinafter mentioned he/she was a citizen of the United States over the age of twenty-one (21) years, and doing business in said county, not interested in the matter of the attached publication, and is competent to testify in said matter, that he/she was at and during all said time the principal clerk to the printer and publisher of the

WATERFORD NEWS

a legal newspaper of general circulation published weekly in Waterford in said County of Stanislaus, State of California: that said

WATERFORD NEWS

is and was at all times herein mentioned, a newspaper of general circulation as that term is defined by Section 6000 of the Government Code, and as provided by said section and so adjudicated by Decree No. 41155 by the Superior Court of Stanislaus County, State of California, is published for the dissemination of local and telegraphic news and intelligence of a general character, have a bonafide subscription list of paying subscribers, and is not devoted to the interest, or published for the entertainment or instruction of a particular class, profession, trade, calling, race of denomination: or for the entertainment and instruction of any number of such classes, professions, trades, callings, races or denominations: that at all times said newspaper has been established, in Waterford; in said County and State, at regular intervals for more than one year preceding the first publication of the notice herein mentioned, that said notice was set in type not smaller than nonpareil and was preceded with words printed in blackface type not smaller than nonpareil, describing and expressing in general terms, the purport and character of the notice intended to be given

Legal #4107

NOTICE OF AVAILABILITY

PUBLISH DATES: 03-27-2018

of which named annexed is a printed copy, was published and printed in said

WATERFORD NEWS

at least 1 time commencing on the 27th of March, 2018 and ending on the 27th of March, 2018 the days inclusive, and as often during said time as said newspaper was regularly issued, to wit:

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Dated this March 27th, 2018.

Alyssa Mendoza

PRINCIPAL CLERK OF THE PRINTER

Legal#4107

NOTICE OF AVAILABILITY

DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM DRAFT PROGRAMENVIRONMENTAL IMPACT REPORT

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Walter Ward
Stanislaus County
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Modesto, CA 95358

Publish Date: 03-27-2018

Attachment 3.D-8: Westside Index

PROOF OF PUBLICATION

(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Stanislaus

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am the printer, foreman or principal clerk of The West Side INDEX, a newspaper of general circulation, printed and published weekly in the City of Newman, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Stanislaus, State of California, under the date of April 25, 1952, Case Number 46882; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

April 5

in the year **2018**.

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Newman, California, this **5th** day of **April, 2018**.

Mary E. Baker

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication of

Public Notice

Notice of Availability

Discretionary Well Permitting and Management Program Draft Program Environmental Impact Report

Tetra Tech

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NOTICE OF AVAILABILITY

DISCRETIONARY WELL PERMITTING AND MANAGEMENT PROGRAM DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT

Stanislaus County is implementing a Discretionary Well Permitting and Management Program pursuant to its Groundwater Ordinance (Chapter 9.37 of the Stanislaus County Code), adopted in November 2014 to promote sustainable groundwater management.

Pursuant to the California Environmental Quality Act (CEQA), Stanislaus County has prepared a Draft Program Environmental Impact Report (PEIR) for the discretionary well permitting and management program. The Draft PEIR provides program-level analysis of the program across its implementation period through 2042, at which time all groundwater subbasins in Stanislaus County are required under the Sustainable Groundwater Management Act (SGMA) to be operated sustainably. The potential impacts related to the program would primarily occur before Groundwater Sustainability Plans are adopted under the SGMA in 2020 or 2022.

Stanislaus County has issued a Draft PEIR that identifies and describes the environmental issues expected to result from implementing the program. The environmental topics addressed in the Draft PEIR are Agriculture and Forestry Resources, Air Quality, Biological Resources, Cultural Resources, Geology and Soils, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, and Utilities and Service Systems. While the Draft EIR identifies potentially significant adverse impacts to Biological Resources, Cultural Resources, Geology and Soils, Hydrology and Water Quality, Land Use and Planning, and Noise, those impacts would be mitigated to less than significant levels. Other CEQA environmental topics were addressed in the previously issued Notice of Preparation and Initial Study.

Copies of the Draft PEIR are available for review at the Stanislaus

PROOF OF PUBLICATION

ATTACHMENT 4

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measures	Responsibility for Implementation	Mitigation Timing	Verification and Enforcement Responsibility
Section 4.3 - BIOLOGICAL RESOURCES			
Mitigation Measure BIO-1a. A qualified biologist shall investigate the potential presence or absence of sensitive habitats and wetlands, and special-status plants or wildlife in areas that will be disturbed by well construction or conversion of rangelands to cultivated use that is made possible by the well, prior to well permit approval or project implementation. Documentation could involve any of these tasks: • Desktop review of existing site records through the county records and general plan, California Natural Diversity Database (CNDDB), California Native Plant Society (CNPS) inventory, environmental documents and surveys to determine likelihood of occurrence near (within ½ mile) the well site, any rangeland converted to cultivated agricultural use that is supplied by the well, and any related construction areas. • Conduct field reconnaissance. A field reconnaissance survey shall be conducted, including a habitat assessment to determine whether suitable conditions exist for special-status species. • Determine the need for additional species-specific surveys or wetland delineation. If warranted, coordinate with appropriate agencies (U.S. Fish and Wildlife Service [USFWS], California Department of Fish and Wildlife [CDFW], or U.S. Army Corps of Engineers [USACE]) as may be necessary to determine appropriate survey timing and effort. • Coordinate with appropriate agencies and the County as may be necessary based on the results of additional species-specific surveys or wetland delineation to identify and implement mitigation measures as necessary to avoid, minimize, or otherwise mitigate potential impacts to special-status species, wetlands or other habitat to a less-than-significant level.	County of Stanislaus Department of Environmental Resources (DER), or, with approval by DER, a qualified biologist retained by the Well Permit Applicant	Prior to well permit approval	County of Stanislaus Department of Environmental Resources
Mitigation Measure BIO-1b. The applicant shall endeavor to conduct any drilling, construction work and/or ground-disturbing activities associated with installation of the proposed well or the conversion of rangeland to cultivated agricultural use that will be irrigated using the well during the non-breeding season of any birds and raptors protected under the Migratory Bird Treaty Act (generally September 16 through January 31). If construction activities must be scheduled during the nesting season (generally February 1 to September 15), pre-construction surveys for raptors, migratory birds, and special-status bird species shall be done by a qualified biologist to identify active nests near the site. This shall include a buffer extending out from the construction or disturbance area to a distance of approximately ½ mile. If active nests are found, no drilling construction activities shall occur within 500 feet of the nest until the young have fledged and the nest is no longer active (as determined by the qualified biologist). Survey timing and frequency requirements differ among species; species-specific surveys should follow all timing and frequency requirements of CDFW and USFWS. Consultation with the CDFW and/or USFWS shall occur if required, and may result in additional requirements.	Well Permit Applicant	Prior to any ground-disturbing or construction activities	County of Stanislaus Department of Environmental Resources
Mitigation Measure BIO-4. Evaluate well construction permit applications to assess potential conflicts with local policies or ordinances that protect biological resources, and consider mitigation measures for significant effects on the environment on a project-specific basis.	County of Stanislaus Department of Environmental Resources	Prior to well permit approval	County of Stanislaus Department of Environmental Resources
Section 4.4 CULTURAL RESOURCES			
Mitigation Measure CUL-1a. For projects with anticipated ground disturbance that would extend beyond previously disturbed soils, a qualified cultural resources professional shall investigate the potential presence of archaeological or historical resources in the vicinity of the well, the well pad, any appurtenant access drives and electrical service lines, and any rangeland tracts converted to cultivated agricultural use that will be irrigated by the well, through a desktop review. The review shall include records at the Central California Information Center (CCIC), records at the University of California Berkeley Museum of Paleontology (UCMP), a Sacred Lands File search at the Native American Heritage Commission, Native American tribal consultation, California Register of Historical Resources (CRHR), and the National Register of Historic Places (NRHP).	County of Stanislaus Department of Environmental Resources (DER), or, with approval by DER, a qualified cultural resources specialist retained by the Well Permit Applicant	Prior to well permit approval	County of Stanislaus Department of Environmental Resources
Mitigation Measure CUL-1b. If it is determined through implementation of Mitigation Measure CUL-1a that archaeological, historical or paleontological resources or human remains may be located on a site, or the area is judged to have a high degree of sensitivity relative to these resources, prior to any project-related ground disturbing or construction activities, a qualified archaeologist, historian or paleontologist (as applicable) shall conduct an archaeological/ historical/paleontological resources survey (as applicable). If it is determined that the proposed well is in an area adjacent to or in one of these resources, the well would be relocated and the project reconfigured to avoid substantial changes to the resource.	Well Permit Applicant	Prior to any ground-disturbing activities	County of Stanislaus Department of Environmental Resources
Mitigation Measure CUL-1c. If the construction staff or others observe previously unidentified archaeological, historical or paleontological resources, or human remains during drilling or other ground-disturbing activities associated with well construction or conversion of rangeland to cultivated agricultural use, they will halt work within a 100-foot radius of the find(s), delineate the area of the find with flagging tape or rope (may also include dirt spoils from the find area), immediately notify the lead agency, and retain a qualified archaeologist, historian or paleontologist (as applicable) to review the observed resources. Construction will halt within the flagged or roped-off area. The archaeologist will assess the resource as soon as possible and determine appropriate next steps in coordination with the lead agency. Such finds will be formally recorded and evaluated. The resource will be protected from further disturbance or looting pending evaluation.	Well Permit Applicant	Immediately upon discovery of previously unidentified archaeological, historical or paleontological resources, or human remains	County of Stanislaus Department of Environmental Resources

Mitigation Measures	Responsibility for Implementation	Mitigation Timing	Verification and Enforcement Responsibility
Section 4.8 HYDROLOGY AND WATER QUALITY			
Mitigation Measure WAT-2. Property owners and water agencies in the area where predicted drawdown exceeds 5 feet will be notified of the existence of the Interference Drawdown Monitoring and Mitigation Program, and will be invited to register any domestic wells in the predicted 5-foot drawdown area and any municipal, industrial, or irrigation wells in the predicted 20-foot drawdown area to participate in the program. To register for the program, well owners will be required to complete a Well Information Questionnaire regarding the construction, use, history and performance of their well, and to allow access for periodic measurement of water levels and assessment of well condition and performance by the County or a neutral third party. If well performance is found to be diminished by more than 20 percent or to be inadequate to meet pre-existing water demand due to interference drawdown, registered participants will be eligible to receive reimbursement for reasonable and customary costs for well replacement, deepening or rehabilitation, or pump lowering as needed to restore adequate well function. The cost of reimbursement shall be borne by the operator of the well causing the interference in proportion to the degree of their contribution to the drawdown that caused the diminished yield.	County of Stanislaus Department of Environmental Resources (DER), or, with approval by DER, the Well Permit Applicant	Prior to beginning groundwater extraction from a permitted well	County of Stanislaus Department of Environmental Resources
Mitigation Measure WAT-3. The County will identify additional Groundwater Level Management Zones in the unincorporated, non-district portions of the County where existing groundwater level trends constitute “chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon” as defined in Section 9.37.030(9)(a) of the Ordinance. In such areas, an applicant proposing installation of a new discretionary well is required to submit a Groundwater Extraction Offset Plan that describes how groundwater extraction from the well will be offset, resulting in no net additional groundwater demand to the pumped aquifer system. Alternatively, the applicant must do a Groundwater Resources Investigation and implement a Groundwater Level Monitoring Program that demonstrates the proposed extraction will not result in, or contribute to, Undesirable Results as defined in the Ordinance.	County of Stanislaus Department of Environmental Resources	After certification of the Final PEIR	County of Stanislaus Department of Environmental Resources
Mitigation Measure WAT-4. Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in significant on- or off-site erosion or sedimentation. If the potential for significant erosion or sedimentation is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.	County of Stanislaus Department of Environmental Resources (evaluation of permit applications); Well Permit Applicant (preparation of a Drainage, Erosion and Sediment Control Plan)	Prior to well permit approval (evaluation of permit applications); and prior to any ground disturbing activities (preparation of a Drainage, Erosion and Sediment Control Plan)	County of Stanislaus Department of Environmental Resources
Mitigation Measure WAT-5. Applications to construct new wells shall be evaluated to assess the potential for construction activities or conversion of previously uncultivated rangeland to change drainage patterns and result in an increase in runoff and significant on- or off-site flooding. If the potential for significant flooding is found to exist, the applicant will be required to prepare and submit and implement a Drainage, Erosion and Sedimentation Control Plan.	County of Stanislaus Department of Environmental Resources (evaluation of permit applications); Well Permit Applicant (preparation of a Drainage, Erosion and Sediment Control Plan)	Prior to well permit approval (evaluation of permit applications); and prior to any ground disturbing activities (preparation of a Drainage, Erosion and Sediment Control Plan)	County of Stanislaus Department of Environmental Resources
Section 4.10 NOISE			
Mitigation Measure NOI-1. If well construction activities will take place closer than 200-feet from nearby sensitive receptors on non-agriculturally zoned parcels, the project shall employ noise attenuating measures and/or work schedules such that the project would comply with the Stanislaus County Noise Ordinance and General Plan Noise Element. Noise mitigation shall include a combination of the measures to achieve construction noise at or below the maximum allowable noise level of 75 A-weighted decibels from 7:00 p.m. to 7:00 a.m. If a well is located closer than 70 feet to sensitive receptors on non-agriculturally zoned parcels, operating noise mitigation measures shall be implemented such that the project will comply with the Stanislaus County Noise Ordinance.	Well Permit Applicant	Prior to starting well construction activities	County of Stanislaus Department of Environmental Resources