RECLAMATION
Managing Water in the West

Finding of No Significant Impact

Buena Vista Water Storage District 2014 WaterSMART Grant for Section One of the Northern Area Project

15-06-MP

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Background

In accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), as amended, the Bureau of Reclamation (Reclamation) has prepared an Environmental Assessment (EA) to analyze impacts of providing a WaterSMART (program) grant to the Buena Vista Water Storage District (water district) for its Water Use Efficiency Project (project). The Draft EA, dated June 2015, was available for public review on June 16, 2015. The review period ended on July 1, 2015. No comments were received on the EA.

Proposed Action

Reclamation would contribute $1,000,000 to the water district's project through a program grant. The water district would contribute $7,626,843 to the project and would receive $2,000,000 from non-federal sources. The water district would use program funding to help fund construction of Section One of the district's Northern Area Plan (NAP). The project would consist of the installation of approximately 10 miles of buried pipeline, varying in size, between 21 and 63 inches, and be primarily buried adjacent to the Main Drain Canal, in the existing ROW and other district facilities. Laterals that deviate from the Main Drain Canal ROW would be located adjacent to field roads or other geographical features that minimize impacts to conservation and farming. Easements would be obtained from landowners to accommodate the new pipeline. The project construction would include activities consistent with digging, trenching, and excavation of soil to install the new pipeline. The pipeline would be constructed in a manner to minimize disturbance, avoid the perched aquifer, and built as three separate sections, as finances become available.

Findings

In accordance with NEPA, the Mid-Pacific Regional Office of Reclamation has found that the approval of the proposed action is not a major federal action that will significantly affect the quality of the human environment. The attached EA describes the existing environmental resources in the project area and evaluates the effects of the Action and No Action on the resources. The EA was prepared in accordance with the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR 1500-1508), and Department of the Interior Regulations (43 CFR Part 46). The analysis provided in the attached EA is incorporated by reference.

The following are the reasons why the impacts from the proposed action are not significant:

1. The proposed action will not significantly affect public health or safety (40 CFR 1508.27(b)(3))

2. The proposed action will not significantly impact natural resources and unique geographical characteristics such as historic or cultural resources; parks, recreation, and refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order (EO) 11990); flood plains (EO 11988); national monuments; migratory birds; and other ecologically significant or critical areas (40 CFR 1508.27(b)(3) and 43 CFR 46.215(b)).

3. The proposed action will not have possible effects on the human environment that are highly uncertain or involve unique or unknown risks (40 CFR 1508.27(b)(5)).

4. The proposed action will neither establish a precedent for future actions with significant effects nor represent a decision in principle about a future consideration (40 CFR 1508.27(b)(6)).

5. There is no potential for the effects to be considered highly controversial (40 CFR 1508.27(b)(4)).

6. The proposed action will not have significant cumulative impacts (40 CFR 1508.27(b)(7)).

7. The proposed action has no potential to affect historic properties (40 CFR 1508.27(b)(8)).

8. The proposed action is not likely to affect listed or proposed threatened or endangered species (40 CFR 1508.27(b)(9)). Reclamation received a letter of concurrence from the U.S. Fish and Wildlife Service on September 15, 2015.

9. The proposed action will not violate federal, state, tribal or local law or requirements imposed for the protection of the environment (40 CFR 1508.27(b)(10)).

10. The proposed action will not affect any Indian Trust Assets (512 DM 2, Policy Memorandum dated December 15, 1993).

11. Implementing the proposed action will not disproportionately affect minorities or low-income populations and communities (EO 12898).

12. The proposed action will not limit access to, and ceremonial use of, Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (EO 13007 and 512 DM 3).

RECLAMATION

Managing Water in the West

Buena Vista Water Storage District Environmental Assessment

2014 WaterSMART Grant for Section One of the Northern Area Project, California

15-06-MP

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

June 2015

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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1.0 Introduction

In accordance with Section 102 of the National Environmental Policy Act of 1969 (42 U.S.C. 4321, et seq.), as amended, this Environmental Assessment (EA) has been prepared to examine the potential direct, indirect, and cumulative impacts to the affected environment associated with awarding a WaterSMART grant to Buena Vista Water Storage District (BVWSD). BVWSD would use the funding to purchase and install equipment for Section One of their Northern Area Project (NAP). Section One of the NAP primarily involves the installation of approximately 10 miles of buried pipeline to move water through the district and service agricultural production. The BVWSD lies in the trough of California's southern San Joaquin Valley, approximately 16 miles west of the City of Bakersfield (Figure 1).

1.1 Background

The United States Department of the Interior's (DOI) WaterSMART (Sustain and Manage America's Resources for Tomorrow) Program establishes a framework to provide Federal leadership and assistance on the efficient use of water, integrating water and energy policies to support the sustainable use of all natural resources, and coordinating the water conservation activities of various DOI bureaus and offices. Through WaterSMART grants, the Bureau of Reclamation (Reclamation) provides cost-shared funding assistance on a competitive basis for projects that seek to conserve and use water more efficiently, increase the use of renewable energy and improve energy efficiency, benefit endangered and threatened species, facilitate water markets, or carry out other activities to address climate-related impacts on water or prevent any water-related crisis or conflict. In March of 2014, BVWSD applied for a WaterSMART grant, Reclamation's Funding Opportunity Announcement No. R11AF20006, to help fund Section One of the NAP. The BVWSD developed an Initial Study and Proposed Mitigated Negative Declaration for Buena Vista Water Storage District, Northern Area Project (IS/MND). On September 17, 2014, BVWSD issued the *Notice of Intent to Adopt a Mitigated Negative Declaration (MND) for Buena Vista Water Storage District, Northern Area Project*. The MND was adopted by the BVWSD on Novemember 19, 2014. The environmental commitments within this EA are a product of the IS/MND.

The BVWSD's Service Area comprises approximately 50,000 acres within the lower Kern River watershed, and can be divided into two distinct areas: the Buttonwillow Service Area and the Maples Service Area. The Buttonwillow Service Area comprises approximately 45,000 acres situated northwesterly of the Buena Vista Lake Bed. The Maples Service Area of BVWSD comprises approximately 5,000 acres situated easterly of the Buena Vista Lake Bed. The Henry Miller Water District (HMWD) is geographically located within the

BVWSD boundaries; however, HMWD is not a part of BVWSD's Service Area and possesses its own water contracts with the Kern County Water Agency.

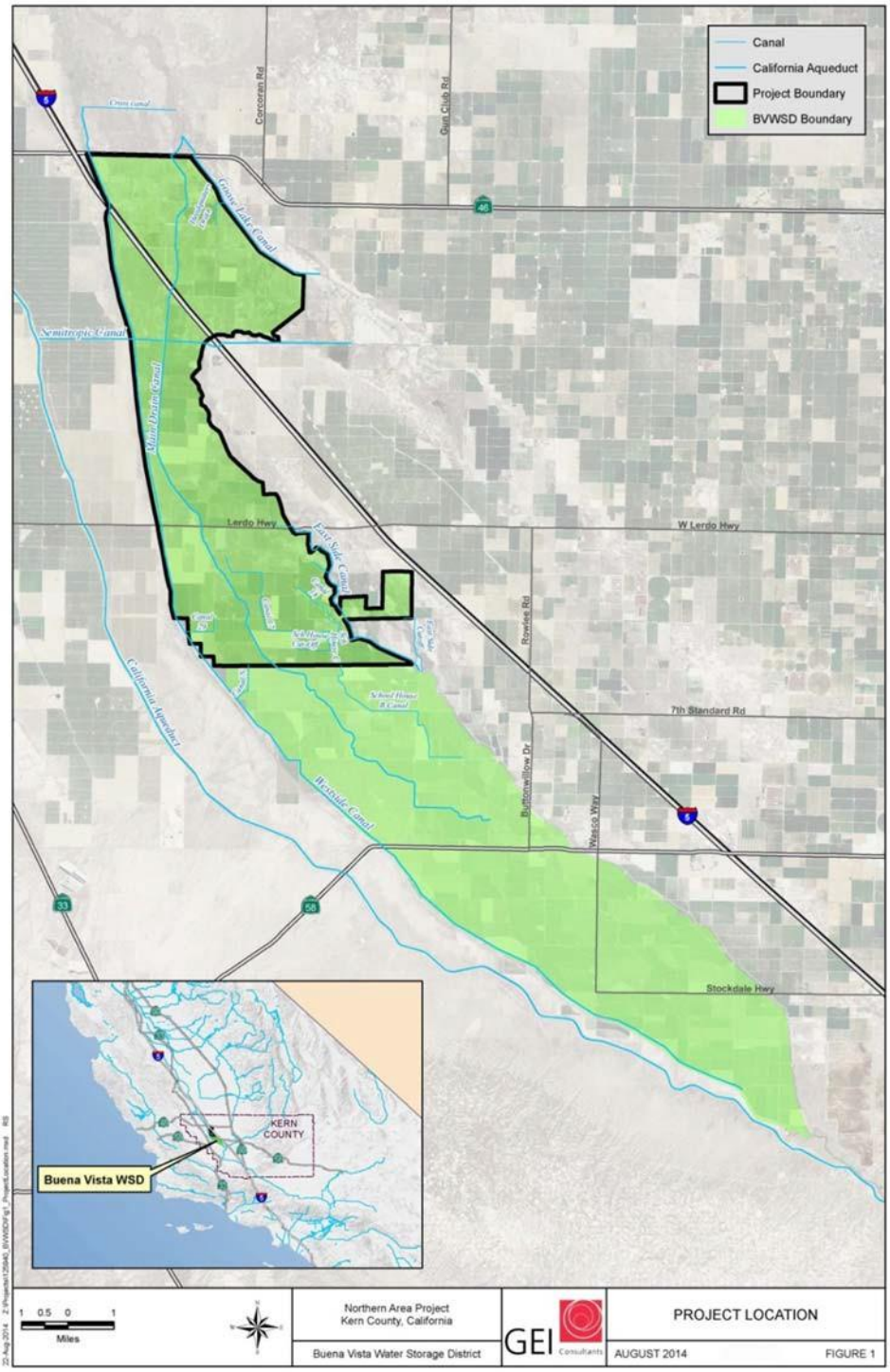


Figure 1: BVWSD's Service Area, Kern River watershed.

1.2 Need for the Proposal

The District's average transport and delivery losses of water are approximately 37,000 AF/y. Construction of Section One of the NAP would reduce this amount by approximately 4,737 AF/y and provide an overall estimated conservation of 15,427 AF/y when Sections Two and Three of the NAP are connected and fully operational. The goals of the Project are to capture additional water that is lost through canal seepage, reduce operational costs, and to allow for more irrigation water to be delivered to district agricultural users.

1.3 Potential Resource Issues

Due to the potential for impacts, the following resources are analyzed in this EA: Groundwater, Biological, Cultural Resources and Air Quality.

Impacts on the following resources were considered and found to be minor or non-existing, and as a result were eliminated from further discussion. Brief explanations are provided below:

Indian Trust Assets

There are no tribes possessing legal property interests held in trust by the U.S. within the proposed project area.

Indian Sacred Sites

No Indian sacred sites have been identified within the proposed project area.

Environmental Justice

There are no economically disadvantaged or minority populations within the Proposed Action area. There are none within the vicinity of the project area that would be subject to disproportionate impacts.

Wetlands

No wetland habitat, perennial, or intermittent streams occur in the proposed project site. The proposed project area is located in disturbed areas adjacent to existing canals and the project site is mainly surrounded by active agriculture. Therefore, the proposed project would not have any substantial adverse effect on sensitive natural wetland communities.

2.0 Alternatives Including the Proposed Action

This EA considers two possible actions: the No Action Alternative and the Proposed Action. The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential effects to the environment.

2.1 No Action Alternative

For the No Action Alternative, Reclamation would not award BVWSD with a WaterSMART grant to help fund the Project, and BVWSD would continue to operate and maintain their existing canal system until funding became available to construct Section One of the NAP.

2.2 Proposed Action

Reclamation proposes to award BVWSD with a WaterSMART grant that would help fund construction of Section One of the district's NAP. The Proposed Action would consist of approximately 10 miles of buried pipeline, varying in size, between 21 and 63 inches, and be primarily buried adjacent to the Main Drain Canal, in the existing ROW, and other district facilities (Figure 2). Laterals that deviate from the Main Drain Canal ROW would be located adjacent to field roads or other geographical features that minimize impacts to conservation and farming. Easements would be obtained from landowners to accommodate the new pipeline. The Project construction would include activities consistent with digging, trenching, and excavation of soil to install the new pipeline. The pipeline would be constructed in a manner to minimize disturbance, avoid the perched aquifer, and built as three separate sections, as finances become available.

Each section of the pipeline would operate as a discreet unit, providing water to specific locations within the BVWSD. As illustrated in Figure 2, pipeline Section One is indicated in red, which will serve agricultural lands shaded in red. Pipeline Section Two (green) will serve lands shaded in green. Pipeline Section Three (blue) serves lands shaded in blue. The three sections of the pipeline can be built and operated independently of each other.

The Proposed Action involves the construction of Section One of the pipeline. Section One would be connected to the Semitropic 120-inch line and run south, along the Main Drain Canal ROW, for 8 miles and terminate at Lerdo Highway. The Section One pipeline is designed to operate by gravity flow. Two lateral

pipeline sections would be constructed, running east and west, which would be approximately 1 mile and 0.25-mile in length respectively. Two pumping stations would be retrofitted to allow water to be pumped from the existing Main Drain Canal into the pipeline (Figure 2).

BVWSD will use two areas for the temporary deposition of excavated soil and construction materials: One just north of the Semitropic canal, adjacent to the proposed pipeline route, and the other at the intersection of the Main Drain Canal and Carmel Road. Each laydown area would be approximately 5 acres in size (Figure 2, 3 and 4).

Although the three sections can be built and operated as separate projects, when Sections One and Two are completed they can be connected to allow water from the California Aqueduct to flow into Section Two.

Upon completion of the project, the use of the existing West Side and East Side Canals would be minimized. The East and West Side Canals would be left intact and would continue to be maintained, but would remain dry except during flood conditions. The Main Drain Canal would continue to function as a transportation and drainage facility for irrigation and storm water.

2.2.1 Environmental Commitments

As part of the Proposed Action, BVWSD staff and its contractors will implement the following Avoidance and Minimization Measures prior to and during construction activities. These measures were included in the IS/MND as mitigation measures to reduce potential Project impacts to a less than significant level.

Air Quality

AQ-1: The BVWSD will develop a Dust Control Plan as prescribed and approved by the San Joaquin Valley Air Pollution Control Board (SJVAPCB) to minimize and control fugitive dust during construction.

Biological

BIO 1 - An Environmental Awareness Program will be presented to all personnel working in the field on the proposed project site. The program will consist of a brief presentation in which biologists knowledgeable of endangered species biology and legislative protection explain endangered species concerns. The program will include a discussion of special status plants and sensitive wildlife species. Species biology, habitat needs, status under the Endangered Species Act, and measures being incorporated for the protection of these species and their habitats will also be discussed.

BIO 2- Project activities will occur during daylight hours (30 minutes after sunrise to 30 minutes prior to sunset).

BIO 3 - As close to the beginning of project activities as possible, but not more than 14 days prior, a qualified biologist will conduct a final pre-construction biological survey of the proposed project site and buffer areas to verify that no special status species have become established in the project site or buffer areas.

a. If no burrows, dens, or nests are identified within the boundaries of the proposed project or within 50 feet of the project sites, then construction activities may proceed.

b. If potential burrows, dens, or nests are identified within the boundaries of the proposed project or within 50 feet of the project sites, the FWS and CDFW will be contacted and efforts to determine species and activity will be initiated.

BIO 4 – Project site boundaries will be clearly delineated by stakes and/or flagging. Project activities are restricted to the project site to minimize inadvertent degradation or loss of adjacent lands during project construction.

BIO 5 - All small mammal burrows that may serve as potential refugia for special status species will be marked for avoidance by construction activities.

BIO 6 - Project equipment traffic will be limited to the action area.

BIO 7 - Project-related traffic will observe a 10 mph speed limit in the project site except on county roads and state and federal highways to avoid impacts to special status and common wildlife species.

BIO 8 - When possible project activities will be scheduled to avoid evening hours to minimize potential impacts to special status wildlife species that are active in the nighttime.

BIO 9 - Hazardous materials, fuels, lubricants, and solvents that spill accidentally during project-related activities will be cleaned up and removed from the project as soon as possible according to applicable federal, state and local regulations.

BIO 10 - All excavated steep-walled holes or trenches in excess of three (3) feet in depth will be provided with one or more escape ramps constructed of earth fill to prevent entrapment of endangered species or other animals. Ramps will be located at no greater than 500-foot intervals (for pipelines etc.)

and at not less than 45-degree angles. Trenches will be inspected for entrapped wildlife each morning prior to onset of project activities and immediately prior to the end of each working day. Before such holes or trenches are filled they will be inspected thoroughly for entrapped animals. Any animals discovered will be allowed to escape voluntarily without harassment before project activities related to the trench resume, or removed from the trench or hole by a qualified biologist and allowed to escape unimpeded.

BIO 11 - All pipes, culverts, or similar structures stored at the proposed project site overnight having a diameter of four inches or greater will be inspected thoroughly for wildlife species before being buried, capped, or otherwise used or moved in any way. Pipes laid in trenches overnight will be capped. If during project implementation a wildlife species is discovered inside a pipe, that section of pipe will not be moved or, if necessary, moved only once to remove it from the path of project activity, until the wildlife species has escaped.

BIO 12 - All food-related trash items such as wrappers, cans, bottles or food scraps generated during project activities will be disposed of only in closed containers and regularly removed from the proposed project site. Food items may attract wildlife species onto the proposed project site, consequently exposing such animals to increased risk of injury or mortality. No deliberate feeding of wildlife will be allowed.

BIO 13 - To prevent harassment or mortality of wildlife species via predation, or destruction of their dens or nests, no domestic pets will be permitted on the project site.

BIO 14 - The following measures (a-g) will be implemented by BVWSD to ensure protection and avoid take of blunt-nosed leopard lizards during periods that are optimal for blunt-nosed leopard lizard activity (mid-April through mid-October):

a. A final clearance survey will be conducted to ensure that no blunt-nosed leopard lizards are present and no burrows have become established in the project site and a 50-foot avoidance buffer.

b. If suitable burrows that may serve as potential refugia for blunt-nosed leopard lizard cannot be avoided within the project site and a minimum 50-foot avoidance buffer cannot be maintained, then additional surveys to detect the species will be completed in accordance with California Department of Fish and Wildlife's

(CDFW) Approved Survey Methodology For The Blunt-Nosed Leopard Lizard.

c. If no individual blunt-nosed leopard lizards are observed and no burrows are identified within the project site and a 50-foot avoidance buffer during the final clearance survey, then project activities may proceed.

d. When possible, conduct project activities when lizards are inactive (generally when temperatures are below 77° F and/or above 95° F).

e. All vehicle operators will check under vehicles and equipment prior to operation, or if left idle.

f. If a blunt-nosed leopard lizard is observed during project pre-construction or clearance surveys, the US Fish and Wildlife Service (USFWS) and CDFW will be notified for further guidance.

g. Measures to protect blunt-nosed leopard lizards during their active season may be discontinued upon determination by the biological monitor that temperature patterns at the project site no longer support blunt-nosed leopard lizard activity for the season, or once pipeline installation complete.

BIO 15 - The following measures (a-b) will be implemented by BVWSD to ensure protection and no take of blunt-nosed leopard lizards during periods of inactivity for the species (late October through early spring):

a. If the project is conducted during the blunt-nosed leopard lizard inactive period (late October through early spring) and no burrows are identified within the boundaries of or within 50 feet of the project site during pre-construction surveys, then construction activities may proceed.

b. If suitable burrows that may serve as potential refugia for blunt-nosed leopard lizard cannot be avoided within the project site and a minimum 50-foot avoidance buffer cannot be maintained, then additional surveys to detect the species will be completed in accordance with the CDFW Approved Survey Methodology For The Blunt-Nosed Leopard Lizard.

BIO 16 - If San Joaquin kit foxes become established within the proposed project site prior to project implementation, BVWSD will implement the following measures contained in the USFWS's Standardized Recommendations

for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance (USFWS 2011):

a. For kit fox dens within 200 feet of proposed construction area(s), protective exclusion zones will be established prior to construction by a qualified biologist. Exclusion zones will be roughly circular with a radius of the following distances measured outward from the entrance:

Potential den	50 feet
Atypical den	50 feet
Known den	100 feet
Natal/pupping den (occupied and unoccupied)	UWFWS must be contacted

b. Exclusion zones will be fenced to protect the den in such a manner that kit fox's access to the den is not restricted Acceptable fencing includes untreated wood particle-board, silt fencing, or orange construction fencing, as long as it has opening for kit fox ingress/egress and keeps humans and equipment out.

c. Exclusion zone barriers will be maintained until all construction related or operational disturbances have been terminated. At that time all fencing will be removed to avoid attracting subsequent attention to the dens.

d. For potential and/or atypical dens, placement of 4 to 5 flagged stakes 50 feet from the den entrance(s) will suffice to identify the den location; fencing will not be required, but the exclusion zone must be observed.

e. Project activities are not allowed within exclusion zones.

f. Project activities will occur during daylight hours (30 minutes after sunrise to 30 minutes prior to sunset).

BIO 17 - If a natal/pupping den is discovered within the project site or within 200 feet of the project boundaries, the USFWS will be immediately notified and under no circumstances should the den be disturbed or destroyed without prior authorization. If the pre-construction biological surveys reveal an active natal pupping den or new information, BVWSD will contact the USFWS immediately to discuss requirements to proceed with project activities. The following measures will be observed:

a. Potential dens occurring within the footprint of the project must be

monitored for three (3) consecutive days with tracking medium or an infra-red camera beam to determine the current use. If no kit fox activity is observed during this period, the den(s) should be destroyed immediately to preclude subsequent use.

b. If kit fox activity is observed at the den(s) during this period, no project activities will occur and the FWS and CDFW will be notified. The den(s) should be monitored for at least five (5) consecutive nights from the time of the observation to allow any resident animal to move to another den during its normal activity. Only when the den(s) are determined unoccupied may the den(s) be excavated with FWS approval.

c. Destruction of the den(s) should be accomplished by careful excavation until it is certain that no kit foxes are inside. The den(s) should be fully excavated, filled with dirt and compacted to ensure that kit foxes cannot reenter to use the den(s) during the construction period. If at any point during excavation, a kit fox is discovered inside the den(s), the excavation activity will cease immediately and monitoring the den as described above should resume. Destruction of the den(s) may be completed when in the judgment of the biologist, the animal has escaped, without further disturbance, from the partially destroyed den(s).

BIO 18 - Potential dens occurring within the footprint of the project or within 50 feet must be monitored for three (3) consecutive days with tracking medium or an infra-red camera beam to determine the current use. If no kit fox activity is observed during this period, the den(s) should be destroyed immediately to preclude subsequent use.

BIO 19 - If any kit fox den is considered to be a potential den, but is later determined during monitoring or destruction to be currently, or previously used by kit fox (e.g., if kit fox sign is found inside), then all construction activities will cease and the USFWS will be notified immediately.

BIO 20 - If ground disturbing activities occur during the breeding season of migratory avian or raptor species (February through mid-September), surveys for active nests will be conducted by a qualified biologist no more than 10 days prior to start of activities. Pre-construction nesting surveys will be conducted for nesting migratory avian and raptor species in the project site and buffer areas. Pre-construction biological surveys will occur prior to the proposed project implementation, and during the appropriate survey periods for nesting activities for individual avian species. Surveys will follow required CDFW and USFWS

protocols, where applicable. A qualified biologist will survey suitable habitat for the presence of these species. If a migratory avian or raptor species is observed and suspected to be nesting, a buffer area will be established to avoid impacts to the active nest site. Identified nests should be continuously surveyed for the first 24 hours prior to any construction-related activities to establish a behavioral baseline. If no nesting avian species are found, project activities may proceed and no further mitigation measures will be required. If active nesting sites are found, the following exclusion buffers will be established, and no project activities will occur within these buffer zones until young birds have fledged and are no longer reliant upon the nest and parental care for survival:

- Minimum no disturbance of 250 feet around active nest of non-listed bird species and 250-foot no disturbance buffer around migratory birds;

- Minimum no disturbance of 500 feet around active nest of non-listed raptor species;

- and 0.5-mile no disturbance buffer from listed species and fully protected species until breeding season has ended or until a qualified biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival;

- Once work commences, all nests should be continuously monitored to detect any behavioral changes as a result of project activities. If behavioral changes are observed, the work causing that change should cease and the appropriate regulatory agencies (i.e., CDFW, USFWS, etc.) will be consulted for additional avoidance and minimization measures; and

- A variance from these no disturbance buffers may be implemented when there is compelling biological or ecological reason to do so, such as when the project area would be concealed from a nest site by topography. Any variance from these buffers is advised to be supported by a qualified wildlife biologist and is recommended that CDFW and USFWS be notified in advance of implementation of a no disturbance buffer variance.

BIO 21 - The following measures included in the CDFW's Staff Report on Burrowing Owl Mitigation (2012) will be implemented by BVWSD for the proposed project:

a. If pre-construction biological surveys determine that burrowing

owls are present in the project site and buffer areas, a burrowing owl mitigation plan will be prepared by a qualified biologist describing recommended site specific shelter-in-place measures, worker training, and/or other measures to ensure that project construction does not result in adverse impacts to the burrowing owls.

b. Occupied burrows will not be disturbed during the burrowing owl nesting season (February 1 through August 31) unless a qualified biologist approved by the CDFW verifies through non-invasive methods that either: (1) the birds have not begun egg-laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

c. Burrowing owls present in the project site or within 500 feet (as identified during pre-construction biological surveys) will be moved away from the disturbance area using passive relocation techniques. Prior to commencement of relocation, a management plan will be prepared and approved by CDFW. Relocation will be completed between September 1 and January 31 (outside of breeding season). A minimum of one or more weeks is required to relocate the owls and allow them to acclimate to alternate burrows. Passive relocation techniques will follow the CDFW Staff Report on Burrowing Owl Mitigation Guidelines (2012) and include the following measures:

    i. Install one-way doors in burrow entrances. Leave doors in place for 48 hours to ensure owls have left the burrow.

    ii. Allow one or more weeks for owls to acclimate to off-site burrows. Daily monitoring will be required for the passive relocation period.

    iii. Once owls have relocated off-site, collapse existing burrows to prevent reoccupation. Prior to burrow excavation, flexible plastic pipe will be inserted into the tunnels to allow escape of any remaining owls during excavation. Excavation will be conducted by hand whenever possible.

    iv. Destruction of burrows will occur only pursuant to a management plan approved by CDFW.

    v. As an alternative (if approved by CDFW), all occupied burrows identified off-site within 500 feet of construction activities outside of nesting season (September through

January) and during nesting season (February 1 through August 31) could be buffered by hay bales, fencing (e.g. sheltering in place) or as directed by a qualified biologist and the CDFW.

BIO 22 - In order to avoid or reduce potential impacts to the special status plant species, the BVWSD will implement the following avoidance and minimization measures:

a. If any special status plant species are identified during pre-construction surveys adjacent to the proposed disturbance zone, a qualified biologist retained by BVWSD will clearly delineate the location of the plant population. If the plant population(s) is directly adjacent to the proposed disturbance zone, BVWSD will install protective fencing between the disturbance zone and the plant population to ensure that special status plants are avoided or adequately protected.

b. Avoid travel and impact to sensitive habitats near the project site.

2.2.2 Best Management Practices

In addition to the Avoidance and Minimization Measures specific to listed species identified in Section 3.2.1, the following Best Management Practices (BMPs) will be implemented by BVWSD and contractors working on the Project to further minimize and avoid effects to sensitive species and air quality during construction activities:

- A biological monitor(s) shall be present while ground-disturbing activities are occurring based on the sensitivity of the habitat in which construction is occurring. In addition to conducting preconstruction surveys for the project, the biological monitors shall aid crews in satisfying take avoidance criteria and implementing project mitigation measures, document pertinent information concerning project effects on sensitive species, and shall assist in minimizing the effects of project activities on sensitive species.

- Biological monitors may order work to cease if take avoidance and/or mitigation measures are violated and would notify the BVWSD representative and Reclamation.

- Unless biological monitors allow alterations to routes, all project vehicles shall be confined to existing roads or prominently staked and/or flagged access routes that are surveyed prior to use. All observed sensitive species and their habitat features such as dens, burrows or specific habitats shall

be flagged as necessary to alert project personnel to their presence. All project-related flagging shall be collected and removed after completion of the project.

- All spills of hazardous materials shall be cleaned up immediately.
- Pets and firearms are prohibited on the construction site.
- All food-related trash, such as wrappers, cans, bottles, bags, and food scraps shall be disposed of daily in containers with secure covers and regularly removed from project sites.
- BVWSD shall appoint a representative who will be the point of contact; the representative will be identified during the preconstruction educational briefing.
- All project-related vehicles shall observe a speed limit of 10 miles per hour or less on all routes except as posted on State and County highway/roads or paved facility roads.
- Appropriate measures (i.e. signage) shall be undertaken to prevent unauthorized vehicle entry to off-road survey routes in sensitive habitat areas.
- Work boundaries will be delineated with flagging, temporary exclusionary fencing or other marking to minimize surface disturbance associated with project activities.
- The area of disturbance will be reduced to the smallest practical area, considering topography, placement of facilities, location of burrows, nesting sites or dens, public safety, and other limiting factors.
- Laydown areas, existing access roads, and areas within the NAP corridor that are disturbed through construction, will be used to stockpile excavated materials, storage of equipment, trailer placement, and vehicle parking..
- All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.

- When materials are transported offsite, all material shall be covered or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.

- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, the piles will be effectively stabilized of fugitive dust emissions utilizing sufficient water stabilizer/suppressant.

- In the unlikely event that archaeological resources are discovered during the construction or use of the pipeline, an archeologist will be consulted.

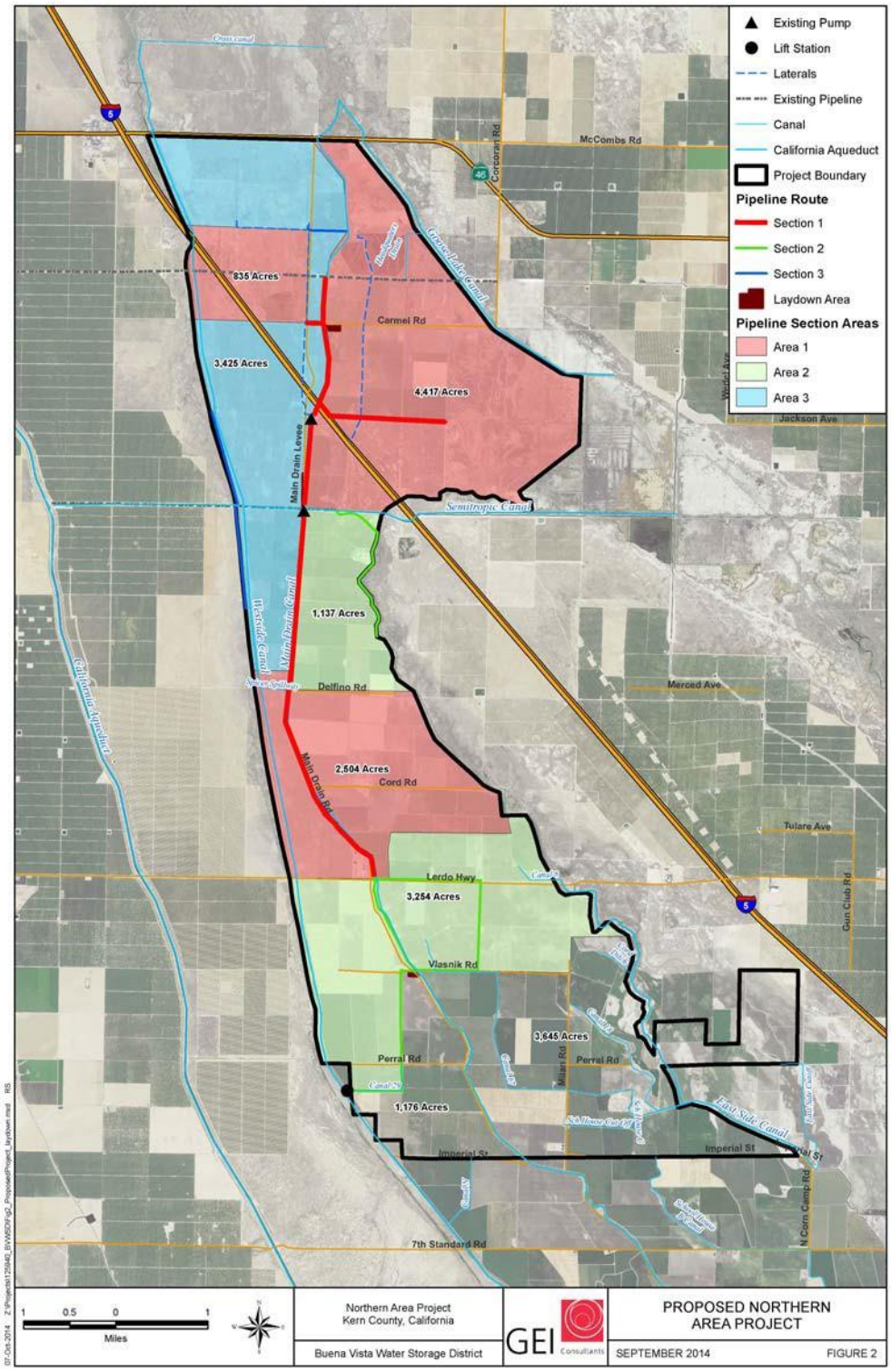


Figure 2: BVWSD Proposed Section One of the NAP.

Figure 3: BVWSD laydown area for Section One of the NAP.

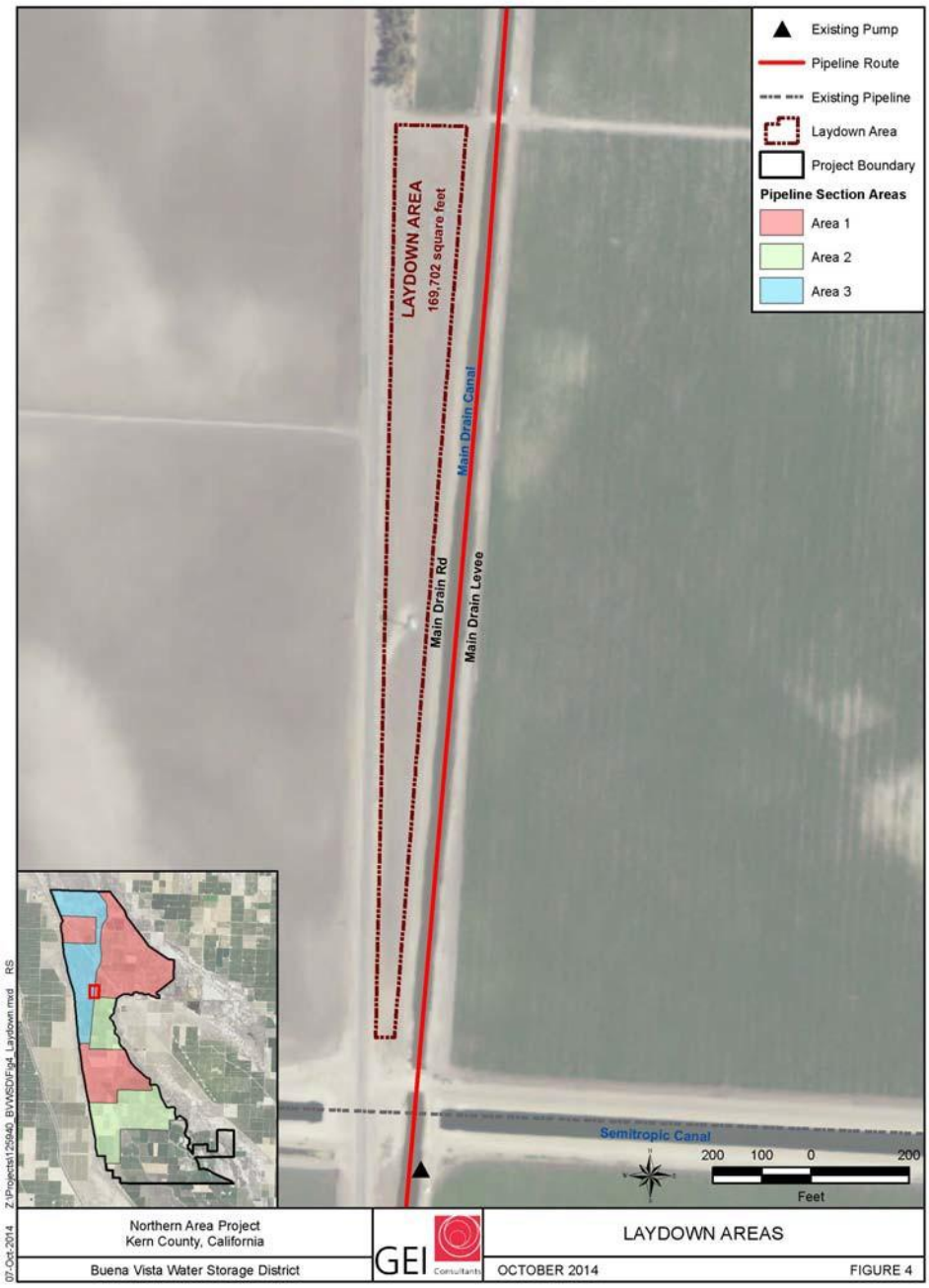


Figure 4: BVWSD laydown area for Section One of the NAP

3.0 Affected Environment and Environmental Consequences

This section of the EA provides the analysis of impacts from implementing the alternatives.

The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential effects to the human environment. In the No Action Alternative, Sections 2 and 3 of the NAP are still constructed and operated.

3.1 Groundwater Resources

The BVWSD manages an average water supply of approximately 164,000 acre-feet per year (AF/y) from State Water Project (SWP) allocations, groundwater pumping, and Kern River diversions.

3.1.1 Affected Environment

BVWSD is located in the southwestern portion of the San Joaquin Valley and the western edge of the Kern County groundwater subbasin (California Department of Water Resources [DWR] 2004). The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern lakes.

The subbasin is bounded on the north by the Kern County line and the Pleasant Valley, Tulare Lake, and Tule groundwater subbasins, on the east and southeast by the Sierra Nevada foothills and Tehachapi Mountains, and on the southwest and west by the San Emigdio Mountains and Coast Ranges. There are no streams or rivers within the project area. The project area is primarily flat and developed with a water conveyance system to deliver water to crops.

About 40,000 acres of land are used for growing crops in the BVWSD. The crop water demand is met by the delivery of surface water from seasonally regulated flows of the Kern River, schedulable deliveries of SWP water through the California Aqueduct, and occasional purchases or exchanges for water from the federal Central Valley Project. Irrigation demand that cannot be met by surface water deliveries must be satisfied by groundwater pumping. There are primarily three groundwater sources within the Project area: the perched, shallow, and deep aquifers. The perched aquifer extends from near ground surface to approximately 20 to 30 feet below ground surface. The shallow aquifer extends to a depth of approximately 200

feet and the deep aquifer extends from approximately 200 to 400 feet. For purposes of the analysis, the shallow and deep aquifers are consolidated and referred to as the main aquifer.

Groundwater recharge occurs from precipitation, subsurface inflow from aquifers west of the district, seepage from district and private canals, and deep percolation from applied water. Groundwater quality varies by location and depth. A groundwater study was conducted to ascertain the impacts associated with the implementation of all three sections of the NAP (Appendix A). Groundwater storage in the Proposed Action area is estimated at approximately 70,380 AF in the perched aquifer and 1,162,800 AF in the main aquifer (Appendix A). The District's average transport and delivery losses of water are approximately 37,000 AF/y. Construction of Section One of the NAP would reduce this amount by approximately 4,737 AF/y and provide an overall estimated conservation of 15,427 AF/y when Sections Two and Three of the NAP are connected and fully operational. The salt balance is a summation of salts into and out of the perched and main aquifers. Baseline Total Dissolved Solids (TDS) levels were estimated at 1,772 and 3,965 mg/L for the perched and main aquifers, respectively. Salt concentrations are influenced by the amount of precipitation, quantity and quality of surface water, and evaporation.

3.1.2 Environmental Consequences

3.1.2.1 No Action Alternative

For the No Action Alternative, Reclamation would not award BVWSD with a WaterSMART grant to help fund the Project, and BVWSD would continue to operate and maintain their existing canal system until funding became available to construct Section One of the NAP.

Under the No Action Alternative, water would continue to leak through the portions of the BVWSD canals that would remain in service because Section One of the NAP would not be funded. The loss of irrigation water to the groundwater system would continue. Water levels in the main aquifer would decline less than under the Proposed Action Alternative because portions of the BVWSD canals would continue to leak.

Salinity levels in the perched aquifer would not increase as much as under the Proposed Action Alternative because portions of the BVWSD canals would continue to leak relatively low TDS water into the perched aquifer. Therefore, impacts to water quality would be less than under the Proposed Action Alternative.

3.1.2.2. Proposed Action

The Proposed Action is to fund the construction of Section One of the NAP. Construction of Section One will have approximately 1/3 to half the impact as construction of all three sections.

Groundwater Quality

A groundwater study (Appendix A) was conducted to assess the impacts from implementation of all three Sections of the NAP as the intent of the district is to replace leaking canals with a pipeline system to conserve water.

Table 3.1 displays the potential impact of construction of Sections One, Two, and Three of the NAP on salt concentrations in both the perched aquifer and the main aquifer. If all three sections of the NAP are constructed, salinity of the perched aquifer would gradually increase from baseline conditions. The increase is mainly due to the decrease in recharge of low TDS water into the aquifer. Salinity levels are expected to increase in the main aquifer as well, although not as much as the perched aquifer. Although the perched water salt concentrations are lower than in the main aquifer, the perched water is not the only source of recharge to the main aquifer. Water enters the main aquifer in the subsurface from the west and north and has higher salt concentrations than the perched water. During dry years the underflow is greater than from the perched water, due to increased gradients due to pumping within the District. As a result, the salts in the main aquifer increase during these years due subsurface inflow bringing in more salt. During the 16 projected baseline periods, six dry years occurred. In normal or wet years recharge from the perched aquifer is greater than inflow from the north and south and has a lower salt concentration. Over the base period the combination of salts from these two different recharge sources leads to the main aquifer having a slight increase in salt concentrations from before and after the project implementation.

Table 3.1: BVWSD Perched and Main Aquifer salt concentrations before and after (projected) implementation of Sections 1, 2 and 3 of the NAP.

Analysis	Salt Concentrations (mg/L)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	1,772	1,662	-110
With Project	1,772	3,407	1,635
Main Aquifer			
Baseline	3,965	4,217	252
With Project	3,965	4,387	422

Groundwater Levels

If all three sections of the NAP are constructed, groundwater levels are projected to decrease in the main aquifer by 2 feet over a period of 13 years as leakage to the perched aquifer is reduced. There would be a slight increase in groundwater levels of the perched aquifer (Table 3.2). The potential effect is small due to the reduction in evaporation and a reduction in outflow to the Main Drain Canal.

Construction of the NAP is projected to result in no change in the groundwater level of the perched aquifer and a very small decrease (less than 2 feet) in the groundwater level of the main aquifer over a period of 13 years. Section One will account for approximately 1/3 of the change.

Table 3.2: BVWSD Perched and Main Aquifer groundwater levels baseline and after implementation (projected) of Sections 1, 2, and 3 of the NAP.

Analysis	Groundwater Level (in feet msl)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	232.5	234.2	1.6
With Project	232.5	234.2	1.6
Main Aquifer			
Baseline	199.3	186.1	-13.1
With Project	199.3	183.8	-15.4

3.2 Biological Resources

Special-status species are those taxa that are legally protected under the State or Federal Endangered Species Act (ESA) or other regulations and considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants and animals generally fall into one or more of the following categories:

- Plants or animals listed or proposed for listing as Threatened or Endangered under the Federal ESA (50 Code of Federal Regulations [CFR] 17.12 [listed plants], 1711 [listed animal] and various notices in the Federal Register [FR][proposed species]);

- Plants or animals that are candidates for possible future listing as Threatened or Endangered under the Federal ESA (61 FR 40, February 28, 1996);

- Plants or animals listed or proposed for listing by the State of California as Threatened or Endangered under the California ESA (14 California Code of Regulations [CCR] 670.5);

- Animal Species of Special Concern to the CDFW (Remsen 1978 [birds], Williams 1986 [mammals], Jennings and Hayes 1994 [reptiles and amphibians], Moyle et al. 1989 [fish]);

- Animals Fully Protected in California (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]);

- Plants listed as California Rare Plant Rank (CRPR) 1A are presumed extinct in California (California Native Plant Society [CNPS] 2001, 2014);

- Plants listed as CRPR 1B are considered rare, threatened, or endangered in California or elsewhere (CNPS 2001, 2014);

- Plants listed as CRPR 2 are considered rare or endangered in California, but more common elsewhere (CNPS 2001, 2014);

- Plants identified as California Rare Plant Rank 3 (CNPS List 3) are those for which more information is needed; a review list (CNPS 2001, 2014); and

- Plants listed as CRPR 4 are of limited distribution, on a watch list (CNPS 2001, 2014). These taxa may be included as special-status species on the basis of local significance or recent biological information.

- Species protected by other Federal or State statutes such as the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

The ESA of 1973, as amended, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems upon which they depend. Section 7 of the ESA requires Federal agencies to consult with the United States Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service on activities that may affect any species listed as threatened or endangered to ensure that their action(s) do not jeopardize the continued existence of those species, or result in the destruction or adverse modification of their critical habitat.

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Unless permitted by regulations, the MBTA provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Subject to limitations in the MBTA, the Secretary of the Interior may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg will be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits and migratory flight patterns.

3.2.1 Affected Environment

Through a literature review and an electronic search of the California Natural Diversity Database (CNDDB), CNPS, and USFWS databases, a total of 36 special-status species were identified that occur in or may be affected by projects in the Semitropic, Lost Hills, and Lokern quadrangles (an area measuring approximately 210 square miles). A total of 15 species, ten (10) special-status wildlife species and five (5) special-status plants have been documented in areas of habitat that occur in proximity to the Proposed Action area. Special-status wildlife species that have been recorded in proximity to the proposed project sites include San Joaquin kit fox, Western burrowing owl, San Joaquin antelope squirrel, Tipton kangaroo rat, short-nosed kangaroo rat, blunt-nosed leopard lizard, Coast horned lizard, Western pond turtle, Western mastiff bat, and Western snowy plover. In addition, two (2) Swainson's hawks were observed overhead in flight near the West Side Canal during biological surveys. Special-status plants that have been documented in vicinity to the project sites include Kern mallow, slough thistle, Lost Hills crownscale, and recurved larkspur.

BVWSD retained qualified biologists from Robert A. Booher Consulting to conduct a biological study of the Proposed Action area on May 21-22, 2014, August 5, 2014 and September 11, 2014. In addition to a literature review from various sources, they conducted biological reconnaissance surveys for the San Joaquin Kit Fox, San Joaquin Antelope Squirrel, Blunt-Nosed Leopard Lizard, and the presence of suitable habitat for the Tipton kangaroo rat, giant kangaroo rat, Western burrowing owl, Swainson's hawk, and other targeted species of concern. Habitat within the Proposed Action area has been largely modified by human activity. Habitat types and land uses within the area include active and fallow agricultural/ruderal habitat, non-native grass communities, and aquatic habitat in irrigation canals. There is no critical habitat for any listed species within

the Proposed Action Area. Table 3-3 lists the special status species that could potentially occur within the Proposed Action area.

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Amphibians and Reptiles					
Western pond turtle	*Emys marmorata*	-	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches, typically with aquatic vegetation. Require basking sites and suitable upland habitat (sandy banks or grassy open fields) near water for egg-laying.	Low Potential. Potential habitat is present in the Kern River Flood Canal to the west, outside of the proposed project site. The proposed project sites do not support suitable habitat for the species, as canals are regularly maintained and lack aquatic vegetation year round. Where canals were observed to have water, the adjacent upland habitats were under active agricultural production (i.e., pomegranates, grape vineyards). No individuals were observed or evidence of the species was identified during biological surveys. Western pond turtles have not been recorded within the boundaries of the proposed project sites; however, the species has been documented in the Kern River Flood Canal at Lerdo Highway, approximately 1 mile west of the project site (see Figure 3a) and to the northeast, near Goose Lake (CDFW 2014).
Blunt-nosed leopard lizard	*Gambelia sila*	FE	CE, FP	Resident of sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief. Seeks cover in mammal burrows, under shrubs or structures such	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project site (Interstate 5 corridor, areas adjacent to the West Side Canal, etc.).

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
				as fence posts. May excavate their own burrows, but typically utilize small mammal or other lizard burrows.	No suitable habitat for blunt-nosed leopard lizard is present in the proposed project sites, as much of the area is used for water distribution and adjacent lands have been converted to agricultural use. No burrows suitable for potential use by this species were observed within the boundaries of the proposed project sites. No individual blunt-nosed leopard lizards were observed during biological surveys and the species has not been recorded in the project sites. A blunt-nosed leopard lizard was documented approximately 1.8 miles to the east (see Figure 3a). Blunt-nosed leopard lizards have been recorded in locations north of Highway 46, approximately 2 miles and 4 miles from the project site, and 5 miles to the south, in the Lokern Area (CDFW 2014).
San Joaquin whipsnake	*Masticophis flagellum ruddocki*	-	SSC	Open, dry habitats with little or no tree cover. Found in valley grassland and saltbush scrub in the San Joaquin Valley. The species needs mammal burrows for refuge and egg laying sites.	Low Potential. The species may be present in undisturbed/uncultivated areas of habitat in vicinity to the proposed project site (Interstate 5 corridor, areas adjacent to the West Side and Semitropic Canals, etc.). However, no suitable habitat that contains small mammal burrows was

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					observed within the boundaries of the proposed project sites. No individual San Joaquin whipsnakes were observed during biological surveys. The species has been documented in Valley Saltbush Scrub habitat between the West Side Canal and the California Aqueduct, at a location approximately 5.3 miles northwest of the project site (CDFW 2014) (see Figure 3a).
Coast horned lizard	*Phyrnosoma blainvillii*	-	SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Requires open areas for sunning, bushes for cover, and patches of loose soil for burial. Needs an abundant supply of ants and other insects.	Low Potential. The species may be present in undisturbed/uncultivated areas of habitat in vicinity to the proposed project site (Interstate 5 corridor, areas adjacent to the West Side and Semitropic Canals, etc.). However, no suitable habitat was observed within the boundaries of the proposed project sites, as much of the area is used for water distribution and adjacent lands have been converted to agricultural use. No individual Coast horned lizards were identified during biological surveys. The species has been recorded approximately 3 miles east of the Main Drain Canal, on the east side of Interstate 5 (CDFW 2014).
California red-legged frog	*Rana draytonii*	FT	SSC	Lowlands and foothills in or near permanent sources of deep water	No Potential. No suitable habitat for California red-legged frog was observed

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
				with dense, shrubby or emergent riparian vegetation. Requires 11 to 20 weeks of permanent water for larval development. Must have access to aestivation habitat, consisting of small mammal burrows and moist leaf litter.	within the proposed project sites. Furthermore, the proposed project sites are located outside the current known range and distribution of the species.
Western spadefoot	*Spea hammondii*	-	SSC	Grassland habitats but can be found in valley foothill hardwood woodlands. Requires vernal pools for breeding and egg-laying.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas of habitat in vicinity to the proposed project site (Interstate 5 corridor, areas adjacent to the West Side and Semitropic Canals, etc.). However, no suitable habitat was observed in the proposed project sites, as much of the area is used for water distribution and adjacent lands have been converted to agricultural use. No individual spadefoot toads were identified during biological surveys. The species has been recorded on the east side of the California Aqueduct, approximately 3 miles northwest of the proposed project site (CDFW 2014).

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Giant garter snake	*Thamnophis gigas*	FT	CT	A highly aquatic species that prefers fresh water marsh and low gradient streams. Has adapted to drainage ditches and irrigation canals.	No Potential. No suitable habitat for giant garter snake was observed within the proposed project sites. Furthermore, the proposed project sites are located outside the current known range and distribution of the species..
Birds					
Western burrowing owl	*Athene cunicularia*	-/BCC	SSC	Open grasslands, prairies, farmlands, and deserts.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites (Interstate 5 corridor, areas adjacent to the West Side and Semitropic Canals, etc.) and agricultural lands may be used as foraging habitat. However, no burrows were observed during biological surveys that were of appropriate size for potential use by this species. No individual burrowing owls or sign of their presence (i.e., whitewash, castings, feathers, etc.) were identified during biological surveys. The species has not been recorded within the boundaries of the proposed project sites. Numerous sightings of burrowing owls and several active burrows have been documented approximately 2-3 miles west of the project site, in valley saltbush scrub habitat along the California Aqueduct

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					(CDFW 2014). Burrowing owls are also known to occur on the Semitropic Ridge, 4.0 miles north of the proposed project site (CDFW 2014).
Swainson's hawk	*Buteo swainsoni*	-/ BCC	CT	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 grasslands, or alfalfa or grain fields supporting rodent populations.	Known to Occur. Two (2) Swainson's hawks were observed in flight over the West Side Canal during biological surveys. No nest sites were identified, however potential roosting and/or nesting habitat is present in areas surrounding the project sites that support riparian vegetation, tree (eucalyptus) stands, and/or large tamarisk. Riparian vegetation is present outside the project site, in the Kern River Flood Canal that occurs west of and parallel to the West Side Canal. Potential foraging habitat for the species is present in areas of agriculture planted to suitable crops (alfalfa, etc.). Swainson's hawk has been historically recorded 4.5 miles to the northwest (CDFW 2014). The species was more recently documented at a nest site approximately 6 miles to the southeast, in the Lokern Area (CDFW 2014)

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Western snowy plover	*Charadrius alexandinus nivosus*	FT/BCC	-/SSC	Occurs on sandy beaches, salt pond levees, and shores of large alkali lakes. The species needs sandy or gravelly soils that are friable for nesting.	Low Potential. No suitable foraging or nesting habitat for this species was observed in the proposed project sites. The species has not been recorded in the project site. Western snowy plovers have been documented approximately 1.8 miles to the east (CDFW 2014). Two adult birds were observed at this location and presumed to be nesting near Goose Lake Bed.
Le Conte's thrasher	*Toxostoma lecontei*	-/BCC	SSC	Alkali desert scrub and open desert wash, scrub, and succulent scrub habitats. Nests in dense, spiny shrubs or densely branches cactus, usually 2-8 feet above the ground.	Low Potential. Potential (nesting) habitat for this species is present in undisturbed/uncultivated areas in vicinity to the proposed project that support a shrub component. These areas were observed along Interstate 5 and portions of the Semitropic Canal, Goose Lake Canal, and West Side Canal. Le Conte's thrashers have not been recorded in the project sites; however the species has been historically documented 4.2 miles to the northeast and 7 miles to the south of the proposed project site (CDFW 2014).
Mammals					
San Joaquin (Nelson's) antelope squirrel	*Ammospermophilus nelson*	-	CT	Found in the western San Joaquin Valley from 150 to 3,600 feet in elevation. Found on dry sparsely vegetated loam soils.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. These areas were observed

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
				This species digs burrows or uses other rodent (kangaroo rat or California ground squirrel) burrows. Requires widely scattered shrubs, forbs, and grasses in broken terrain with gullies and washes.	along Interstate 5 and portions of the Semitropic Canal and West Side Canals. However, no suitable habitat or small mammal burrows suitable for use by this species were observed within the boundaries of the proposed project sites. No San Joaquin antelope squirrels have been documented in the project sites; the nearest recorded occurrence of the species is 1 mile to the west, in Valley Saltbush Scrub habitat adjacent to the West Side Canal (see Figure 3a). The species has also been identified in locations approximately 1.8 miles to the north (Semitropic Ridge), 1.8 miles to the southeast (east of Interstate 5) and 5 miles south, in the Lokern Area (CDFW 2014).
Giant kangaroo rat	*Dipodomys ingens*	FE	CE	Prefer annual grassland on gentle slopes of generally less than 10°, with friable, sandy-loam soils. However, most remaining populations are found on poorer, marginal habitats which include shrub communities on a variety of soil types and on slopes up to about 22°. Giant kangaroo rats develop burrow systems with one	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. These areas were observed along Interstate 5 and portions of the Semitropic Canal, Goose Lake Canal, and West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. No potential

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
				to five or more separate openings. Utilize two types of burrow: 1) a vertical shaft with a circular opening and no dirt apron, and 2) a larger, more horizontally-opening shaft, usually wider than high with a well-worn path leading from the mouth.	burrows were observed during biological surveys and no sign of giant kangaroo rat presence (i.e., mowing, hay stacking, seed caching, vertical burrow entrances, etc.) was identified. This species has not been documented within the boundaries the proposed project sites. The nearest occurrence of giant kangaroo rat to the project site is documented 2.5 miles southwest, on the west side of the California Aqueduct (CDFW 2014). The species has also been recorded 5.4 miles south of the project, south of Lokern Road and approximately 7.4 miles to the southeast (CDFW 2014).
Short-nosed kangaroo rat	*Dipodomys nitratoides brevinasus*	-	SSC	Permanent resident of alkali desert scrub habitat and herbaceous habitats with scattered shrubs. Currently found mainly in the southwestern San Joaquin Valley at elevations up to 1800 ft. Forages on open round and under shrubs, eating mainly seed for annual forbs and grasses. Requires sandy loam soils for excavation of burrows.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. These areas were observed along Interstate 5 and portions of the Semitropic Canal, and West Side Canals. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. No potential burrows were observed in the project sites during biological surveys. Short-nosed kangaroo rats have been documented

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					2.2 miles to the west (see Figure 3a). The species has been identified in Valley Saltbush Scrub habitat on the west side of the California Aqueduct (CDFW 2014). Short-nosed kangaroo rats have also been confirmed over 5 miles south of the project sites, in the Lokern area, and 6 miles to the northeast, on the Semitropic Ridge (CDFW 2014).
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	FE	CE	Saltbush scrub and sink scrub communities in the Tulare Lake Basin of the Southern San Joaquin Valley. Requires soft, friable soils which escape seasonal flooding. This species digs burrows in elevated soil mounds often at the bases of shrubs.	Known to Occur. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. Areas of suitable habitat (Valley Saltbush and Sink Scrub) were observed around Interstate 5, the Semitropic Canal, and west of the West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. No burrows suitable for use by the species were observed in the project sites during biological surveys. Tipton kangaroo rats have not been recorded within the project sites; however, the species has been (historically) documented near Goose Lake, in areas of habitat 2.3 miles east and 3 miles southeast of the project site

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					(see Figure 3a). The species has also been identified in Semitropic Ridge to the north and Lokern Area to the south (CDFW 2014).
Western mastiff bat	*Eumops perotis californicus*	-	SSC	Open, semi-arid to arid habitats. Conifer and deciduous woodlands, Coastal scrub, chaparral, and grasslands. This species roosts in crevices on cliff faces or high buildings, and in trees or tunnels.	Low Potential. Potential foraging habitat is present in the proposed project sites. The species may potentially roost in tree stands that occur in proximity, however no suitable roosts were observed in the proposed project sites. No individuals were observed during biological surveys and the species has not been documented in the project sites. The Western mastiff bat was historically recorded approximately 1.3 miles southwest of the project site in a location near McKittrick (CDFW 2014).
Tulare grasshopper mouse	*Onychomys torridus tularensis*	-	SSC	Found in the hot, arid portions of the southern San Joaquin Valley, Ceirvo-Panoche Region in Fresno and San Benito counties, and adjacent interior valleys of the Coast Ranges (e.g., Cuyama Valley and Carrizo Plain). Occurs in a variety of habitats including blue oak woodland, upper Sonoran subshrub scrub, alkali sink and mesquite	Low Potential. Potential habitat is present in undisturbed/uncultivated areas surrounding the proposed project sites. Areas of suitable habitat (valley saltbush and sink scrub) were observed around Interstate 5, the Semitropic Canal, and west of the West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project site. The species has not been recorded in

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
				associations (on the valley floor), and grasslands (at the base of the foothills).	the project sites (see Figure 3a). Tulare grasshopper mouse has been documented in a few locations south of the project site, near Lokern and on the south side of the California Aqueduct (CDFW 2014).
San Joaquin pocket mouse	*Perognathus inornatus inornatus*	-	SSC	Found in grasslands and blue oak savannahs. Requires friable soils for digging.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. Areas of suitable habitat were observed around Interstate 5, the Semitropic Canal, and west of the West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. The species has not been recorded in the project sites (see Figure 3a). San Joaquin pocket mouse has been documented 5.7 miles to the south, near Lokern, and 7.5 miles west of the project site, west of the California Aqueduct (CDFW 2014).

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	FE	SSC	Marshlands and riparian areas in the Tulare Basin. Uses stumps, logs, and litter for cover. Prefers moist soil.	Low Potential. Riparian habitat is present outside the project sites, along the Kern River Flood Canal that may serve as potential for this species. No suitable habitat for this species was observed in the proposed project sites. The species has not been documented within the boundaries of the proposed project sites (CDFW 2014).
American badger	*Taxidea taxus*	-	SSC	The species is found in a variety of open herbaceous and shrub vegetation types/habitats with dry, friable soils. It is widely distributed in California, with the exception of the humid coastal belt, occurring from sea-level to alpine meadows and coniferous forests.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas surrounding the project sites. Areas of suitable habitat (valley saltbush and sink scrub) were observed around Interstate 5, the Semitropic Canal, and west of the West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. No burrows that were of appropriate size for use by badger or sign (i.e., scat, tracks, digging, prey remains, etc.) of the species was observed during biological surveys. Badgers have been documented approximately 7.5 miles southeast of the project sites, foraging in an area of saltbush scrub habitat.

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
San Joaquin kit fox	*Vulpes macrotis mutica*	FE	CT	Inhabit annual grasslands or grassy open stages with scattered shrubby vegetation. Require loose-textured sandy soils for burrowing, and a suitable prey base.	Low Potential. Potential habitat is present in undisturbed/uncultivated areas in vicinity to the proposed project sites. Areas of suitable habitat (Valley Saltbush and Sink Scrub) were observed around Interstate 5, the Semitropic Canal, and west of the West Side Canal. However, no suitable habitat for this species is present within the boundaries of the proposed project sites. No individual San Joaquin kit fox, burrows that were of appropriate size for potential use by the species, or other sign (i.e., scat, tracks, digging, prey remains, etc.) of activity were observed during biological surveys.. No San Joaquin kit fox have been documented within the boundaries of the proposed project sites (see Figure 3a). The closest record of the species to the project site is 1 mile east of Main Drain Canal; this observation record is of dens or kit fox that were observed in 1988 (CDFW 2014). Numerous sightings of individual kit fox (including road kills), and active dens have been documented in the CNDDB in proximity to the project sites (see Figure 3a).
Invertebrates					

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Vernal pool fairy shrimp	*Branchinecta lynchii*	FT	-	Found in short-lived seasonal cool-water vernal pools with low to moderate dissolved solids.	No Potential. No suitable habitat (vernal pools) was observed within the proposed project sites. This species has not been documented within the boundaries of or in proximity to the proposed project sites (CDFW 2014).
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	-	Occurs only in the Central Valley of California, in association with blue elderberry (*Sambucus mexicana*). Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for stressed elderberry shrubs.	No Potential. No suitable habitat (elderberry bushes) was observed within the proposed project sites. This species has not been documented within the boundaries of or in proximity to the proposed project (CDFW 2014).
Plants					
Horn's milk-vetch	*Astragalus hornii var. hornii*	-	Rank 1B.1	Playas, meadows and seeps. Found along lake margins, and in alkaline soils. Elevation range: 60 to 850 meters. Blooming period: May through October.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat may be present in undisturbed/uncultivated areas in vicinity to the proposed project sites. No individuals were observed during biological surveys. Horn's milk-vetch has not been documented within the boundaries of the proposed project sites (CDFW 2014); however, the species has been recorded approximately 1.6 miles north of the project sites and is presumed extant in

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					the Semitropic quadrangle (CNPS 2014).
Earlimart orache	*Atriplex cordulata var. erecticaulis*	-	Rank 1B.2	Valley and foothill grassland. Elevation range: 40 to 100 meters. Blooming period: April to November.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat may be present in undisturbed/uncultivated areas in the project vicinity. No individuals were observed during biological surveys. Earlimart orache has not been documented within the boundaries of the proposed project sites; however the species has been recorded approximately 4 miles to the east (CDFW 2014) and is presumed extant in the Semitropic quadrangle (CNPS 2014).
Heartscale	*Atriplex cordulata var. cordulata*	-	Rank 1B.2	Chenopod scrub, valley and foothill grassland, meadows, and seeps. Found on alkaline flats and scalds in the Central Valley, and on sandy soils. Elevation range 0 to 560 meters. Blooming period: April through October.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat may be present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. Heartscale has not been documented within the boundaries of the proposed project site; however the species has been recorded approximately 7 miles south of the project sites (CDFW 2014).

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
Crownscale	*Atriplex coronata var. coronata*	-	Rank 4.2	Chenopod scrub, valley and foothill grassland, and vernal pools. Found in alkaline and clay soils. Elevation range 1 to 590 meters. Blooming period: March through October.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat may be present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. Crownscale has not been documented within the boundaries of the proposed project sites (CDFW 2014) but is presumed extant in the Semitropic and Lost Hills quadrangles (CNPS 2014).
Lost Hills crownscale	*Atriplex coronata var. vallicola*	-	Rank 1B.2	Chenopod scrub, valley and foothill grassland, and vernal pools. Found in powdery, alkaline soils that are vernally moist with *Frankenia*, *Atriplex* spp., and *Distichlis*. Elevation range: 0 to 605 meters. Blooming period: April through August.	Known to Occur. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. Potentially suitable habitat is present Interstate 5, near the Semitropic and West Side Canals. No suitable habitat for this species is present within the boundaries of the proposed project sites. No individuals or evidence of the species were observed during biological surveys. Lost Hills crownscale has not been documented within the boundaries of the proposed project sites; however the species has been recorded along the Main Drain Canal and near the south end of the project (see Figure 3b). The species is presumed extant in

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					the Semitropic, Lost Hills, and Lokern quadrangles (CNPS 2014) and in areas of valley saltbush scrub habitat that persist along the West Side Canal and the Kern River Flood Canal (CDFW 2014).
California jewel-flower	*Caulanthus californicus*	FE	CE, Rank 1B.1	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland. The species was historically distributed throughout the Central Valley and Carrizo Plain. Found on sandy soils. Elevation range: 61 to 1,000 meters. Blooming period: February through May.	No Potential. The proposed project is located outside the known range and current distribution of the species, as no natural extant populations persist in Kern County. (USFWS 2014b). This species has not been documented within the project sites (CDFW 2014).
Slough thistle	*Cirsium crassicaule*	-/	Rank 1B.1	Chenopod scrub, marshes and swamps (sloughs), and riparian scrub. Elevation range: 3 to 100 meters. Blooming period: May through August.	Known to Occur. Potential habitat for this species is present in vicinity to the proposed project site (in undisturbed/uncultivated areas of habitat around Interstate 5, and along the Kern River Flood Canal). No suitable habitat for this species is present within the boundaries of the proposed project sites. No individuals were observed during biological surveys. Slough thistle has not been documented within the boundaries of the proposed project sites; however, the species was historically recorded

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					between the Main Drain Canal and Goose Lake Canal (CDFW 2014) (see Figure 3b). Furthermore, slough thistle is presumed extant in the Semitropic quadrangle (CNPS 2014).
Recurved larkspur	*Delphinium recurvatum*	-/	Rank 1B.2	Chenopod scrub, Cismontane woodland, Valley and foothill grassland. Found on alkaline soils. Elevation range: 3 to 790 meters. Blooming period: March through June.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. This species has been documented approximately 1.9 miles east of the proposed project sites (CDFW 2014) (see Figure 3b) Recurved larkspur is presumed extant in the Semitropic and Lokern quadrangles (CNPS 2014).
Kern mallow	*Eremalche kernensis*	FE	Rank 1B.1	Chenopod scrub, valley and foothill grassland. Elevation range: 70 to 1,290 meters. Blooming period: March through May.	Known to Occur. The species has been recorded in areas of Valley Saltbush Scrub habitat that persist along the West Side Canal and adjacent to the Kern River Flood Canal (CDFW 2014). Potential habitat is present in undisturbed/uncultivated areas in the project vicinity (along the Interstate 5 corridor, etc.). No suitable habitat for this species is present within the boundaries of the proposed project

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					sites. No individuals or evidence of the species were observed during biological surveys. Kern mallow has not been documented within the boundaries of the proposed project sites; however the species has been recorded near the south end of the project along the West Side Canal (CDFW 2014) (see Figure 3b).
Hoover's eriastrum	*Eriastrum hooveri*	Delisted	Rank 4.2	Chenopod scrub, pinyon and juniper woodlands, and valley and foothill grasslands. Elevation range: 50 to 915 meters. Blooming period: March through July.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. The species has been recorded along I-5, approximately 2.4 miles to the east, and in a location 2.9 miles northwest of the Main Drain Canal (CDFW 2014).
Munz's tidy-tips	*Layia munzii*	-	Rank 1B.2	Chenopod scrub, valley and foothill grasslands. In alkaline clay soils. Elevation range: 150 to 700 meters. Blooming period: March through April.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. Munz's tidy-tips has been recorded approximately 4.7 miles northwest of

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					the Main Drain Canal (CDFW 2014). The species is also presumed extant in the Semitropic and Lost Hills quadrangles (CNPS 2014).
Showy golden madia	*Madia radiata*	-	Rank 1B.1	Cismontane woodland, valley and foothill grassland. Elevation range: 25 to 1,215 meters. Blooming period: March through May.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. Showy golden madia has not been documented in the project site; however, the species has been recorded approximately 3.4 miles south of the project, in Valley saltbush scrub habitat along the California Aqueduct ROW (CDFW 2014).
San Joaquin woollythreads	*Monolopia congdonii*	FE	List 1B.2	Chenopod scrub, valley and foothill grasslands of the western San Joaquin Valley. Elevation range: 60 to 800 meters. Blooming period: February through May.	Low Potential. No suitable habitat for this species is present within the boundaries of the proposed project sites. Potential habitat is present in undisturbed/uncultivated areas in the project vicinity. No individuals or were observed during biological surveys. This species was not observed during biological surveys. This species has not been documented within the project site (see Figure 3); however populations of

Table 3.3
Special-Status Species Potentially Occurring in the Proposed NAP area.

Common Name	Scientific Name	Federal Status	State Status	Habitat/Requirements	Potential to Occur in Project Sites
					San Joaquin woollythreads have been documented in two (2) areas west of the project site that support saltbush scrub habitat (CDFW 2014) (see Figure 3b). CDFW 2014)

3.2.1 Environmental Consequences

3.2.1.1 No Action

Under the No Action Alternative, Section One of the NAP will not receive a WaterSMART grant and there will be no impact to biological resources.

3.2.1.2 Proposed Action

The habitat assessment conducted for the BVWSD NAP found that no suitable habitat for special-status animal or plant species is present within the boundaries of the Proposed Action area; however, native habitats and natural lands are present in undisturbed/uncultivated areas in proximity to the project sites. No riparian, wetland, vernal pool, streams, or other sensitive community types were observed within the boundaries of the proposed project sites during biological surveys. The proposed NAP would avoid directly impacting riparian areas, designated wetlands, and potential wetland areas, as they occur outside the boundaries of the proposed project sites. Since the proposed project would be conducted mainly within the Main Drain Canal ROW and along existing canal banks, no sensitive habitats that were observed in proximity would be impacted.

Based on habitats present in areas surrounding the project sites and conditions that were observed during the biological surveys, several special-status wildlife species have some potential, albeit low, to occur in the proposed project sites. Special-status animal species including, but not limited to, blunt-nosed leopard lizard, Western burrowing owl, Le Conte's thrasher, San Joaquin antelope squirrel, San Joaquin pocket mouse, Tulare grasshopper mouse, American badger, and San Joaquin kit fox may occur in natural lands and uncultivated areas in the project vicinity. Habitats observed during biological surveys were generally present in uncultivated areas surrounding Interstate 5, the Semitropic Canal, along the Kern River Flood Canal, and adjacent to the West Side Canal. Although no habitat features (burrows, dens, or nests) were observed that may serve as potential shelter or be used for refuge and/or breeding, there is potential for these species to occasionally pass through and/or to forage portions of the project sites. Therefore, avoidance measures to protect special-status wildlife species during pipeline construction and installation are recommended (See Section 2.2.1 Environmental Commitments).

3.3 Air Quality

Section 176 (c) of the Clean Air Act (CAA) (42 U.S.C. 7506 (c)) requires that any entity of the Federal government that engages in, supports, or in any way provided financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable State Implementation Plan (SIP) required under Section 110 (a) of the CAA (42 U.S.C. 7401 (a)) before the action is otherwise approved. In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality

Standards (NAAQS) and achieving expeditious attainment of those standards. Each federal agency must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact conform to the applicable SIP before the action is taken.

On November 30, 1993, the U.S. EPA promulgated final general conformity regulations at 40 CFR 93 Subpart B for all Federal activities except those covered under transportation conformity. The general conformity regulations apply to a proposed federal action in a non-attainment or maintenance area if the total direct and indirect emissions of the relevant criteria pollutant(s) and precursor pollutant(s) caused by the Proposed Action equal or exceed certain threshold amounts, thus requiring the Federal agency to make a determination of general conformity.

The SJVAPCD has established thresholds of significance for criteria pollutant emissions at the project level. Using project type and size, the district has pre-quantified emissions and determined a size below which it is reasonable to conclude that a project would not exceed applicable thresholds of significance for criteria pollutants (SJVAPCD 2012).

Projects that fit the descriptions and project sizes provided in the table Table 3.4 below are deemed to have a less than significant impact on air quality.

Table 3.4: Small Project Analysis Level by Vehicle Trips

Land Use Category	Project Size
Residential Housing	1,453 trips/day
Commercial	1,673 trips/day
Office	1,628 trips/day
Institutional	1,707 trips/day
Industrial	1,506 trips/day

3.3.1 Affected Environment

The proposed NAP is located within the southern San Joaquin air-shed, surrounded by approximately 50,000 acres of agricultural fields, dirt roads and earthen canals to convey water for irrigation. The San Joaquin air-shed is in non-compliance for federal and state air quality standards for ozone and Particulate Matter (PM) 10 microns or less and PM 2.5 microns or less (SJVAPCD 2014). Ozone is primarily a product of more concentrated motor vehicle traffic on a regional scale. Particulate matter is generated from vehicle tailpipes, industry, wood combustion and fugitive dust from unpaved surfaces.

3.3.2 Environmental Consequences

3.3.2.1 No Action Alternative

Under the No Action Alternative, Reclamation would not award BVWSD with a WaterSMART grant to help fund construction of Section One of the NAP. Therefore, there would be no impact to air quality.

3.3.2.2 Proposed Action

The Project would involve 7 construction vehicles during the 8-month project implementation phase for the delivery of materials and equipment, and excavation of soil to bury the new pipe. Using project size and type based on the Small Project Analysis Level in Table 3.4, the BVWSD's NAP would not exceed the established significance threshold of 1,673 vehicle trips a day for Commercial projects. Construction vehicles would travel once per day to the construction site, and as each portion of Section One is completed, the vehicles would travel to the next construction area to resume digging, trenching and installation of the pipe. An over estimation of vehicle trips to and from the project area per day would be 4 per vehicle for a total of 28 trips per day. Equipment and vehicles used would be subject to state mobile source emissions controls. Due to the mobile nature of the pipeline construction, any emission issues would last only a few days at each site.

The primary air quality concern for the proposed project is Particulate Matter emissions (fugitive dust) from ground disturbance and vehicular traffic on unpaved surfaces. The construction of the project would be subject to standard SJVAPCD permitting requirements, which includes an approved Dust Control Plan. With the employment of Dust Control Plan, the proposed project is not expected to contribute substantially to existing levels of particulate matter or conflict with the SJVAPCD's air quality plan. There are no sensitive receptors in the area as it is remote and with very few residents. The BVWSD would contact the SJVAPCD to determine if an Indirect Source Review – Air Impact Assessment (ISR) is required for construction vehicle emissions. An ISR determination letter and/or mitigation plan would be submitted with the project's Dust Control Plan for construction.

The operation phase of the project would rely on gravity flow and electric pumps to move the water to the places of use. Since the proposed project would not have a significant increase in electrical demand than the existing operations, the project would have no adverse impacts to air quality during the operations phase.

3.4 Cultural Resources

Cultural resources is a broad term that includes prehistoric, historic, architectural, and traditional cultural properties. Title 54 U.S.C. 300101 et seq., formerly and commonly known as the National Historic Preservation Act (NHPA) is the primary legislation for Federal historic preservation. Section 106 of the NHPA (54 U.S.C. 306108) requires Federal agencies to take into consideration the effects of their undertakings on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment. Historic properties are those cultural resources that are listed on or eligible for inclusion in the National Register of Historic Places (National Register). The implementing regulations at 36 CFR Part 800 for Section 106 describe the process that the Federal agency takes to identify historic properties within the area of potential effects and to assess the effects that the proposed undertaking will have on those historic properties, through consultations with the

State Historic Preservation Officer, Indian tribes, and other identified consulting and interested parties.

Reclamation proposes to award a WaterSMART Water Use Efficiency Grant to the BVWSD to construct approximately 10 miles of pipeline in the northern portion of their service area. The expenditure of Federal funds is an undertaking as defined in 36 CFR § 800.16(y) and is a type of activity that has the potential to cause effects on historic properties under 36 CFR § 800.3(a).

3.4.1 Affected Environment

In an effort to identify historic properties, BVWSD contracted ASM Affiliates to conduct a cultural resources survey to assist in the identification of historic properties (Whitley et al. 2015). Whitley et al. (2015) conducted a records search at the Southern San Joaquin Valley Information Center, and a pedestrian survey of the APE on October 22 and 23, 2014. Three cultural resources were identified within the APE for proposed action: Main Drain Canal, 17 Extension Canal, and the L Canal, which are part of the Kern River Flood Canal District (Whitley et al. 2015:Figure 4). Twelve isolated artifacts were also documented during survey along the Main Drain Canal within the APE: seven waste flakes (lithic debitage), two unifacially-flaked tools, two bifacially-flaked tools, and one cobble hammerstone (Whitley et al. 2015:35). These isolates were all located within the constructed earthen berm of the Main Drain Canal.

ASM Affiliates recorded and evaluated the segments of the Main Drain Canal, 17 Extension Canal, and the L Canal within the APE for this undertaking. The Kern River Flood Canal District was not recorded, but was described in detail by Whitely et al. (2015) within the historic context. While the scope of their entire survey resulted in recording and updating records for additional segments of district features, recording the entire system was outside the scope of this project. Reclamation believes that the information in the report supports a determination that the segments of the Main Drain Canal, 17 Extension Canal, and the L Canal within the APE are eligible as contributing elements to the larger system under Criterion A given that the canal segments have retained integrity of location, setting, feeling, and association (Whitely et al. (2015).

For the purposes of this project, Reclamation is treating the Kern River Flood Canal District as eligible for inclusion in the National Register. Reclamation considers it eligible under Criterion A for local contributions to the history of early settlement, reclamation, and agriculture in Kern County. The system as a whole has retained integrity of location, setting, feeling, and association. The system still functions for the original purpose for which it was constructed, in a very similar agricultural setting as existing during the time of its original construction and development, and along nearly the same alignments as its original construction. The historic context presented by Whitley et al. (2015) demonstrates the association of the Kern River Flood Canal District with “Theme 1: Development of Irrigated Agriculture in the San Joaquin Valley, 1852-1964” (Whitley et al. 2015:18). The physical features of the Kern River Flood Canal District, taken together, convey the property's historic character.

The only identified historic properties within the APE are the Main Drain Canal, 17 Extension Canal, and the L Canal. Reclamation applied the criteria of adverse effect [36 CFR § 800.5(a)] and found that the proposed action would result in no significant alterations to the historic characteristics that make the Main Drain Canal, 17 Extension Canal, and the L Canal eligible for the National Register as contributing elements to the Kern River Flood Canal District. The proposed actions of installing a new pipeline and retrofitting modern pump stations on the Main Drain Canal will not alter any physical characteristics of the canal or its berm. Upon completion, the Main Drain Canal, 17 Extension Canal, and the L Canal rights of-way and embankments will be recontoured to their pre-construction form. Since there will be no alterations to the Main Drain Canal, 17 Extension Canal, and the L Canal, the Kern River Flood Canal District will also be unaffected.

Utilizing these identification efforts, Reclamation entered into consultation with the California State Historic Preservation Officer (SHPO) in May 2015, seeking their concurrence on a finding of "no adverse effect to historic properties pursuant to 36 CFR § 800.5(b)." A response from SHPO is pending.

3.4.2 Environmental Consequences

3.4.2.1 No Action Alternative

Under the no action alternative, Reclamation would not award BVWSD with a WaterSMART grant to help fund the construction of Section One of the NAP. There would be no change in operations. Conditions related to cultural resources would remain the same as existing conditions.

3.4.2.2 Proposed Action

The Proposed Action is the type of activity that has the potential to affect historic properties. A records search, a cultural resources survey, and Tribal consultation identified historic properties within the APE. Reclamation determined that there will be no adverse effect to historic properties pursuant to 36 CFR § 800.5(b); therefore, no cultural resources would be affected as a result of implementing the Proposed Action.

3.5 Cumulative Impacts

3.5.1 Affected Environment

The BVWSD has received a grant from DWR for funding Sections Two and Three of the NAP. Construction of these two sections began in April of 2015 and is expected to conclude in the fall of 2015. Section Two would begin at a new pumping station on the West Side Canal at Canal 29, the very southern end of the project area. The new 8-mile section of the pipeline would run north to Lerdo Highway and terminate at the southern end of Section One. Section Two would provide water to specific areas in the southern portion of the BVWSD. Additionally, another 4 miles of new pipeline would be constructed along the East Side Canal, and connect to an existing BVWSD pipeline that runs parallel to the Semitropic Canal (Figure 2).

Section Three would consist of approximately 3 miles of new pipeline connected to existing district facilities and private facilities. The new pipeline would service agricultural lands in specific areas in the northern portion of the BVWSD (Figure 2). The short lateral included in Section Three, in the northern portion of the project area (approximately 0.5 mile north of the existing Semitropic 120-inch line), would connect to a private pipeline which parallels the Main Drain, in which BVWSD has a capacity interest.

3.5.2 Environmental Consequences

BVWSD prepared an Initial Study and Mitigated Negative Declaration as required under the California Environmental Quality Act for the NAP. The BVWSD has evaluated the environmental effects of the entire NAP and mitigation measures similar to measures established within this EA have been established for Sections Two and Three. Construction of the other sections of the NAP would not have a significant cumulative effect to resources in the Proposed Action area if mitigation measures are followed during construction of each Section of the NAP.

In order to reduce impacts to groundwater quality, the BVWSD will adopt a mitigation program (see Section 2.2.1). Most of California is experiencing Exceptional Drought (Svoboda 2014). The additional water available for irrigation, through project implementation, would be a benefit during drought situations as seepage that will be eliminated from the East Side and West Side canals (in the Project area) is estimated to be approximately 15,400 AF/y. Improvements in the water conveyance system would provide additional water and reliability that is needed for agricultural production.

Additionally, the Brackish Groundwater Remediation Program (BGRP) is a probable future project that would mitigate for the increase in salt concentrations to the perched aquifer. The BVWSD has applied for a state grant for the BGRP to provide funding to install approximately 60 wells, 200 feet apart, along the west side within the existing ROW of the NAP. The wells would extract brackish, unpalatable water from a shallow supply in the area. The brackish water would be blended with better quality water and supplied to local agricultural users (Figure 5). An Environmental Impact Report (EIR) for the BVWSD Water Management Program (State Clearinghouse No. 2009011008) was prepared in 2009 for the BGRP (in addition to three other proposed projects). Construction of the BGRP would last approximately 8 months and would overlap with the construction period for the proposed NAP by approximately four months. There would be 4 additional construction type vehicles including a backhoe, two pickup trucks, and a drilling rig mounted on semi-truck operating during the 4 month overlap period. Using project type and size (Table 3.4) it is reasonable to conclude that the cumulative effects of the construction periods overlapping would not exceed applicable thresholds of significance for criteria pollutants. Therefore, no cumulative impacts to air quality are expected. Equipment and vehicles used would also be subject to state mobile source emissions controls.

The addition of 4 construction type vehicles to the Project action area during the period of overlapping between the NAP and the BGRP may temporarily increase noise levels but it would not create an appreciable increase from the construction noise of Section One.

Greenhouse gas impacts are considered to be cumulative impacts since any increase would add to the existing inventory of gases that could contribute to climate change. Construction activities and vehicle type and number would be similar for Sections Two and Three of the NAP. The emissions from construction activities from 7-11 vehicles for construction periods that last approximate a year, would not meet the 25,000 metric tons EPA reporting threshold as 25,000 is roughly equivalent to the annual emissions of 4,400 passenger vehicles per year (EPA 2014). Emission from the construction vehicles would be temporary and in large area without any other major sources nearby. Because these activities would be similar to existing conditions, for both construction and operation, and will be far below the reporting threshold level for emissions, the project GHG emissions would not represent a substantial change and would not conflict with the Kern County's GHG emissions reduction program.

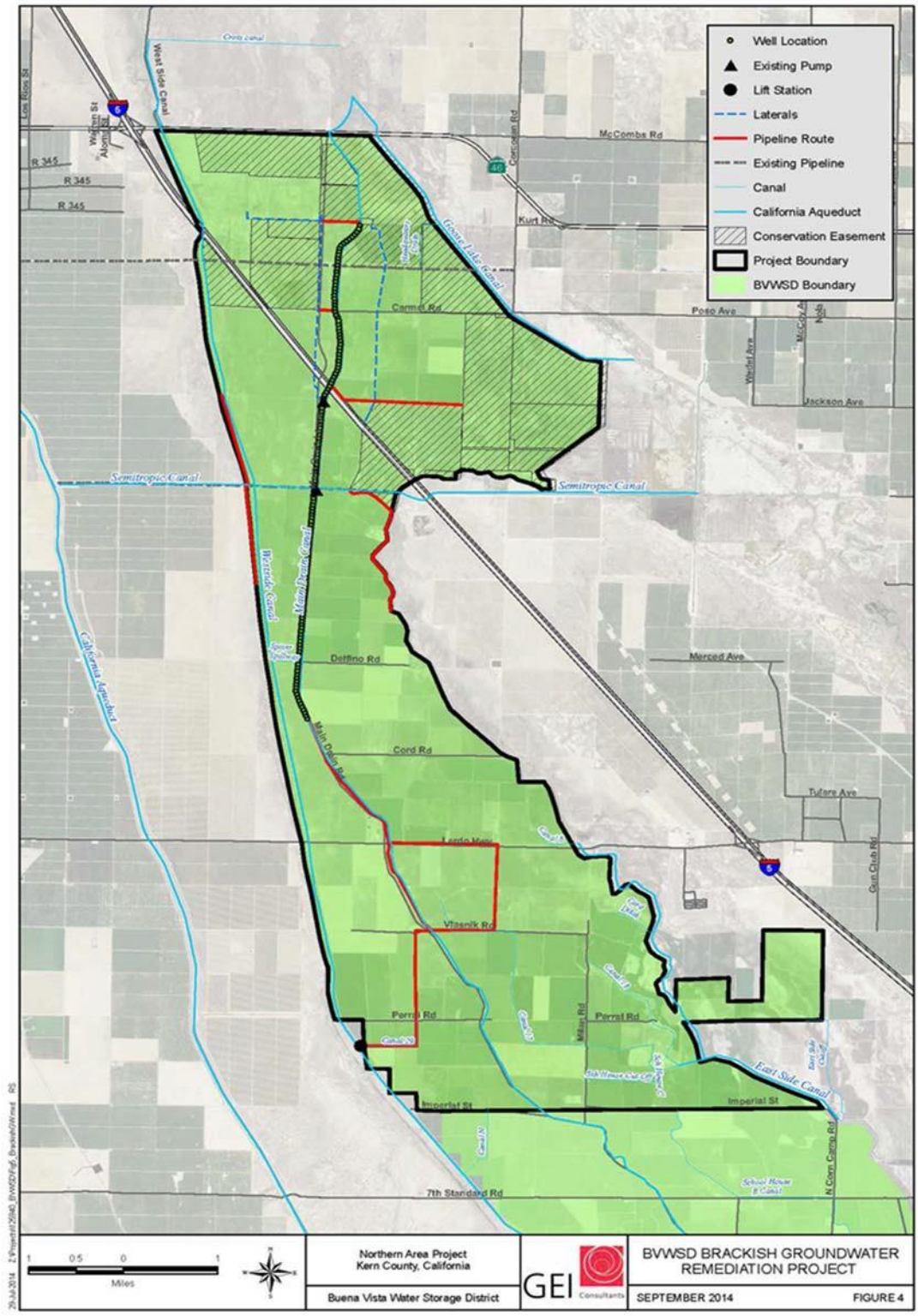


Figure 5: BVWSD Brackish Ground Water Remediation Project.

4.0 Consultation and Coordination

4.1 Public Review Period

In accordance with the California Environmental Quality Act, the BVWSD conducted an Initial Study for the NAP. The Findings and the Proposed Mitigated Negative Declaration was submitted to the California State Clearinghouse on September 22, 2014. The following agencies and sovereign entities provided comments: California Department of Transportation, CDFW, Native American Heritage Commission, Tejon Indian Tribe, and Wanda Allen. The comments were incorporated into the Final Initial Study and the Mitigation Monitoring and Reporting Program.

Reclamation will provide the public with an opportunity to comment on this EA and a Finding of No Significant Impact.

4.2 Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the ESA requires Federal agencies, in consultation with the Secretary of the Interior, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species.

On May 19, 2015, Reclamation requested USFWS concurrence that the Project may affect, but is not likely to adversely affect the San Joaquin kit fox**.**

4.3 Cultural Resources

Title 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (formerly 16 U.S.C. 470 et seq.), requires Federal agencies to consider the effects of their undertakings on historic properties, properties determined eligible for inclusion in the National Register, and to afford the Advisory Council on Historic Preservation an opportunity to comment. Compliance with Section 106 follows a series of steps, identified in its implementing regulations found at 36 CFR Part 800, that include identifying consulting and interested parties, identifying historic properties within the area of potential effect, and assessing effects on any identified historic properties, through

consultations with the SHPO, Indian tribes and other consulting parties. Reclamation initiated Section 106 consultation with the California SHPO, and made a finding of "no adverse effect to historic properties," pursuant to 36 CFR §800.5(b), for the proposed undertaking.

5.0 References

Boyd, W.H. 1997. Stagecoach Heyday in the San Joaquin Valley (1853-1876)

Buena Vista Water Storage District. 2014. *Initial Study and Proposed Mitigated Negative Declaration for Buena Vista Water Storage District, Northern Area Project*, prepared for Buena Vista Water Storage District by GEI Consultants. September 2014.

California Department of Conservation. 2014. http://www.quake.ca.gov/gmaps/WH/regulatorymaps.htm.

California Department of Fish and Game (CDFG). 2004. Approved survey methodology for the blunt-nosed leopard lizard. Unpublished protocol, California Department of Fish and Game, Sacramento, California. 4 pp.

California Department of Fish and Game (CDFG). 2012. *Staff Report on Burrowing Owl Mitigation*. State of California Natural Resources Agency. Department of Fish and Game. March 2012.

California Department of Water Resources (DWR). 2004. California's Groundwater. Bulletin 118 – Update 2003.

California Department of Transportation (Caltrans). 2000.*Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*, prepared jointly by JRP Historical Consulting Services and Caltrans, Sacramento, California, December 2000.

CNPS (California Native Plant Society). 2001. Botanical survey guidelines of the California Native Plant Society. Fremontia. 29:3-4.

CNPS (California Native Plant Society) Rare Plant Program. 2014. Inventory of Rare, and Endangered Plants of California, (online edition, v8-02). California Native Plant Society. Sacramento, California. Website http://www.rareplants.cnps.org [accessed July 15, 2014).

Cook, S. F. (1978). Historical Demography. In *California*, edited by R. F. Heizer, pp. 91-98. Handbook of North American Indians, Vol. 8, W. C. Sturtevant, general editor. Smithsonian Institute, Washington, D.C.

Pacific Legacy, Inc. (2006). *Southern San Joaquin Valley Oil Fields Comprehensive Study*. Manuscript on file, BLM Bakersfield office.

San Joaquin Valley Air Pollution Control District (SJAPCD) 2012. http://www.valleyair.org/transportation/CEQA%20Rules/SPALTables61912.pdf

San Joaquin Valley Air Pollution Control District (SJAPCD). 2014. http://www.valleyair.org/aqinfo/attainment.htm.

Svoboda, M. 2014 .United States Drought Monitor. http://droughtmonitor.unl.edu/.

United States Environmental Protection Agency (EPA). 2014. Greenhouse Gas Reporting Program. http://www.epa.gov/ghgreporting/.

United States Fish and Wildlife Service (USFWS). 2011. U.S. Fish and Wildlife Service Standardized Recommendations For Protection Of The Endangered San Joaquin Kit Fox Prior To Or During Ground Disturbance. Prepared by the Sacramento Fish And Wildlife Office, January 2011. 9 pp.

United States Fish and Wildlife Service (USFWS). 2014a. Online Inventory of Threatened and Endangered Species. Available online at: http://sacramento.fws.gov/es/spp_lists/QuickList.cfm.

Whitley, David S., Peter A. Carey, Shannon Davis, Jennifer Gorman
2015 *Phase I Survey/Class III Inventory, BVWSD Northern Pipeline Project, Kern County, California*. Prepared for GEI Consultants Incorporated by ASM Affiliates. Tehachapi, California.

Appendix A: Hydrogeologic Report

Assessment of Potential Groundwater Impacts

Northern Pipeline Project

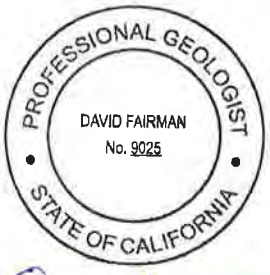
Prepared for:
Buena Vista Water Storage District

Date: September 15, 2014
Project No: 125941

ASSESSMENT OF POTENTIAL GROUNDWATER IMPACTS
NORTHERN PIPELINE PROJECT

Certifications and Seals

This report and analysis was prepared by the following GEI Consultants Inc. professional geologists.



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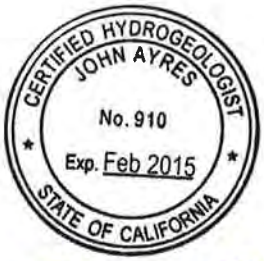

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1 Introduction

The Buena Vista Water Storage District (BVWSD or District) is seeking to improve their water distribution system, reduce seepage and evaporation losses from canals, and to increase water use efficiency to potentially lower perched groundwater levels beneath the northern portion of the Buttonwillow Service Area (BSA) of the BVWSD. The Northern Area Project (NAP), occurring in the BSA, consists primarily of the installation of 19 miles of buried pipeline and retirement of existing canals. The pipeline would be buried adjacent to the Main Drain Canal and other district facilities, including portions of the East Side and West Side canals. Six miles of lateral canals within the Project area would be buried and may be reclaimed as farmland. **Figure 1** shows the extent of the Project area.

Upon completion of the pipeline, the use of the existing West and East Side canals would be minimized in the Northern Area. The East Side and West Side canals would be left intact and would continue to be maintained, but would remain dry except during flood conditions when they could act as groundwater recharge facilities. Portions of the East Side Canal may be reclaimed and placed into conservation at a later date, depending on landowner agreement. The Main Drain Canal would continue to function as a conveyance and drainage facility for irrigation and storm water.

This report evaluates the potential changes to groundwater beneath the Project area as a result of decreasing canal seepage and how it could affect areas outside of BVWSD. The approach used was to evaluate 3 typical years that represent different water supply conditions and then distribute those typical years over a base period. BVWSD identified 2008 as a normal year; 2011 as a wet year; and 2013 as a dry year (BVWSD, 2014) based on their allocation of surface water and precipitation. 2008 was selected as representative of normal operating conditions with a 35 percent from the California Aqueduct allocation, Kern River runoff that was 71 percent of average and annual precipitation approximating the long-term median. 2011 was selected as representative of wet year operating conditions with an 80 percent from the California Aqueduct allocation, Kern River runoff that was 202 percent of average and with precipitation levels that were above average. 2013 was selected as representative of dry year operating conditions with a 35 percent California Aqueduct allocation and Kern River runoff that was 22 percent of average.

1.1 Project Location

BVWSD is located west of Bakersfield along the western edge and southern portion of the San Joaquin Valley and covers a total of about 78.3 square miles west. The BVWSD is lies entirely within Kern County and is subdivided into two separate service areas, the BSA and the Maples Service Area. The BSA covers about 45,000 acres on the west side of the southern San Joaquin Valley groundwater basin. The elongated, northwest-trending BSA is

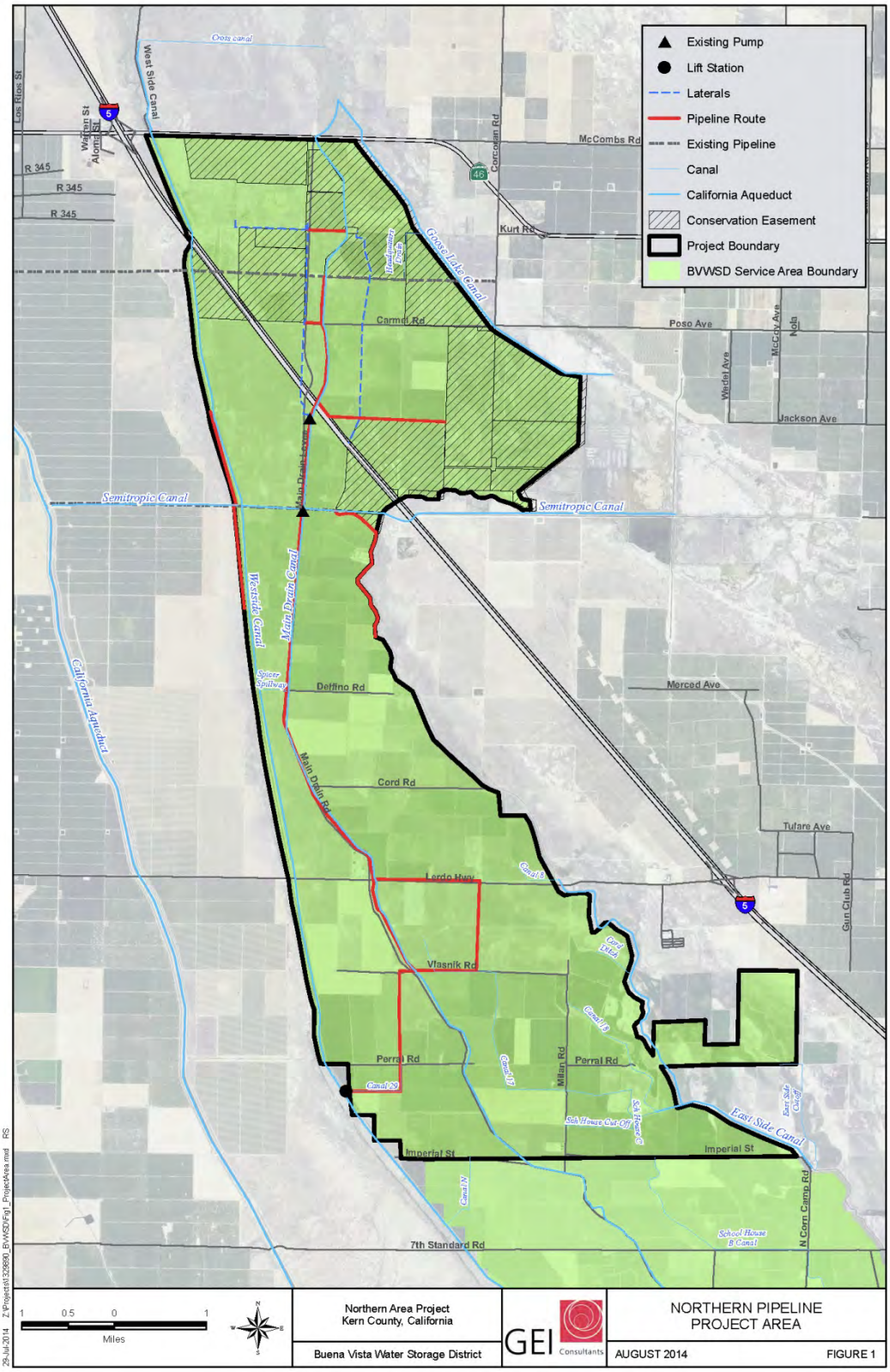
about 3 miles wide and 24 miles long and bounded to the east by the East Side Canal and to the west by the West Side Canal. The Project is located in the northern half of the BSA. **Figure 1** shows the Project location.

The topography of the BSA allows drainage to flow to the center of the service area as the land surface falls to the north towards the former Tulare Lake via the historic low point slough which is now the Main Drain Canal, shown in **Figure 1**. The Main Drain Canal is over 20 miles long and flows at a gradient of about 2 feet per mile from the southeast portion of the BSA before leaving the District at Highway 46 where it merges with the Goose Lake Canal which conveys water to and beyond the Kern National Wildlife Refuge, approximately eight miles downstream from Highway 46.

The former Tulare Lake is located north of the Project area in Kings County. It was a freshwater dry lake with residual wetlands and marshes. The lake dried up after its tributary rivers were diverted for agricultural irrigation and municipal water uses.

The Goose Lake Slough area is an area extending through the northeastern portion of the Project area and outside the Project area to the southeast. This area now consists of undeveloped land on the San Joaquin Valley floor between the Buttonwillow and Semitropic ridges. Land uses in the area include generally dry habitat lands; three wildlife management areas managed by California Department of Fish and Game; marginal farmlands; and managed wetlands that receive water from nearby canals.

Figure 1 Project Location



1.2 Hydrologic Setting

The Central Valley of California consists of the San Joaquin and the Sacramento valleys. The San Joaquin Valley, forming the southern two-thirds of the Central Valley, is a broad structural trough. It is bordered on the east by the Sierra Nevada and on the west by the Diablo and the Temblor ranges, which are a part of the Coast Ranges. The valley extends 220 miles southeastward from the confluence of the San Joaquin and the Sacramento rivers to the Tehachapi and the San Emigdio Mountains. The width of the valley ranges from 25 miles in the northern portion of the valley to 55 miles in the southern portion, and averages about 35 miles (USGS, 1972).

BVWSD is located in the southwestern portion of the San Joaquin Valley. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern lakes.

BVWSD is located within the western edge of the Kern County groundwater subbasin (DWR, 2004). The subbasin is bounded on the north by the Kern County line and the Pleasant Valley, Tulare Lake, and Tule groundwater subbasins, on the east and southeast by the Sierra Nevada foothills and Tehachapi Mountains, and on the southwest and west by the San Emigdio Mountains and Coast Ranges. Principal rivers and streams include Kern River and Poso Creek. **Figure 2** shows the groundwater subbasin and the BVWSD service area.

The Kern County groundwater subbasin has been proposed to be further divided into multiple subbasins solely based on geologic structures (Pacific, 1991). **Figure 3** shows the proposed subbasins. The subbasins are bounded by distinct structural highs due to folding and faulting. Some of these structural highs are expressed by the slight topographic relief of the Buttonwillow and Semitropic ridges which rise above the valley floor and are located just east of the BSA. These subbasins may contain isolated or partially isolated hydrogeologic systems. BVWSD is predominantly within the proposed Buttonwillow subbasin. The subbasin is defined on its east and west sides by anticlines but there may be low areas along some boundaries where communication between subbasins may occur.

The Kern County subbasin has been classified by DWR as a critically overdrafted groundwater basin (DWR, 2004). However, as described above, data on local geology and groundwater conditions within BVWSD suggest that the District is substantially isolated from much of the Kern County groundwater subbasin and that this isolation, coupled with the District's access to surface water, leads to groundwater supply conditions within the District's boundaries that differ from those characteristic of many other locations within Kern County. Groundwater levels beneath the entire BVWSD service area rose about 6.8 feet since 1974 (CEC, 2013) indicating that the Buttonwillow subbasin is not in overdraft.

Figure 2 Groundwater Subbasins

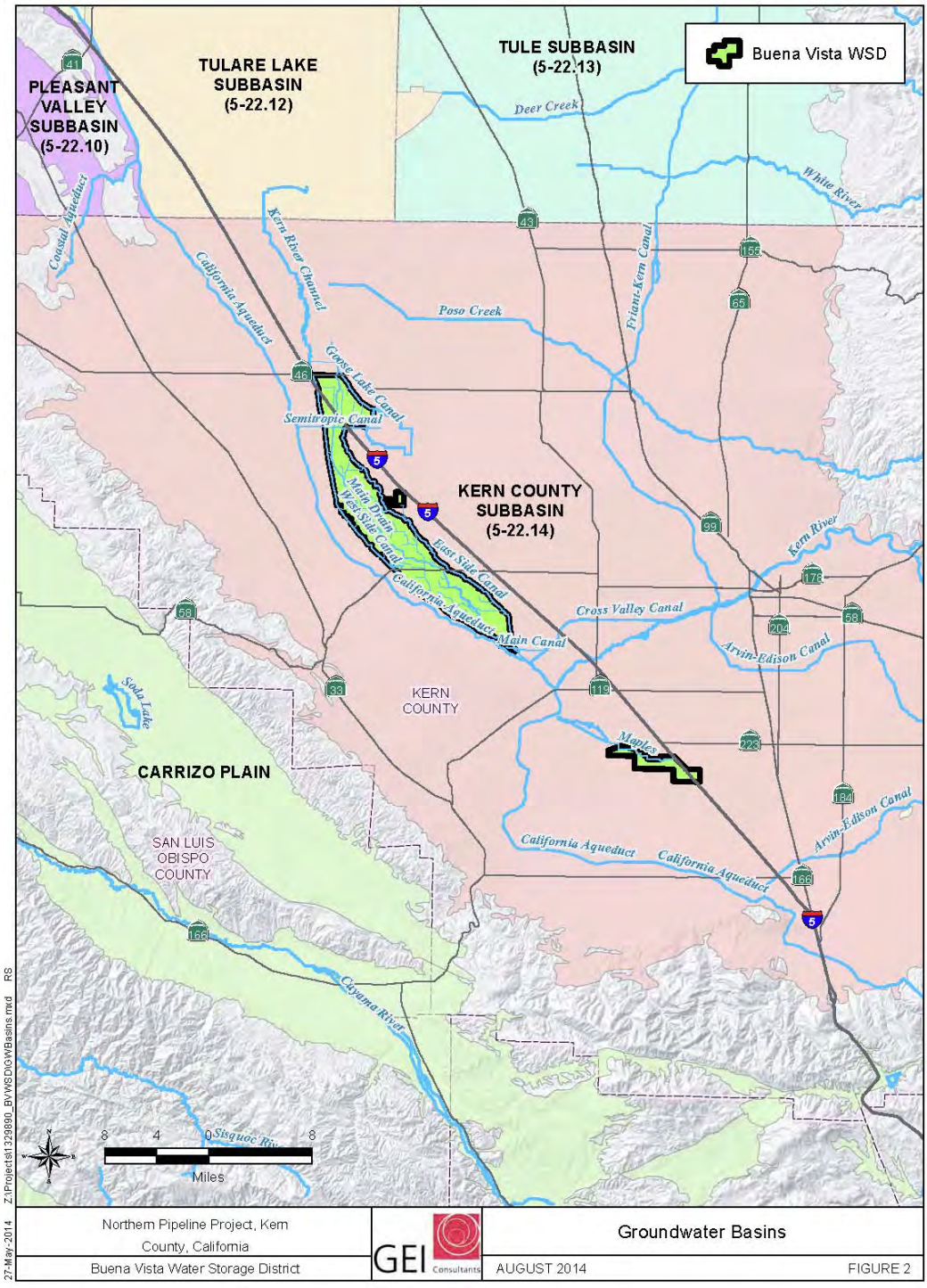
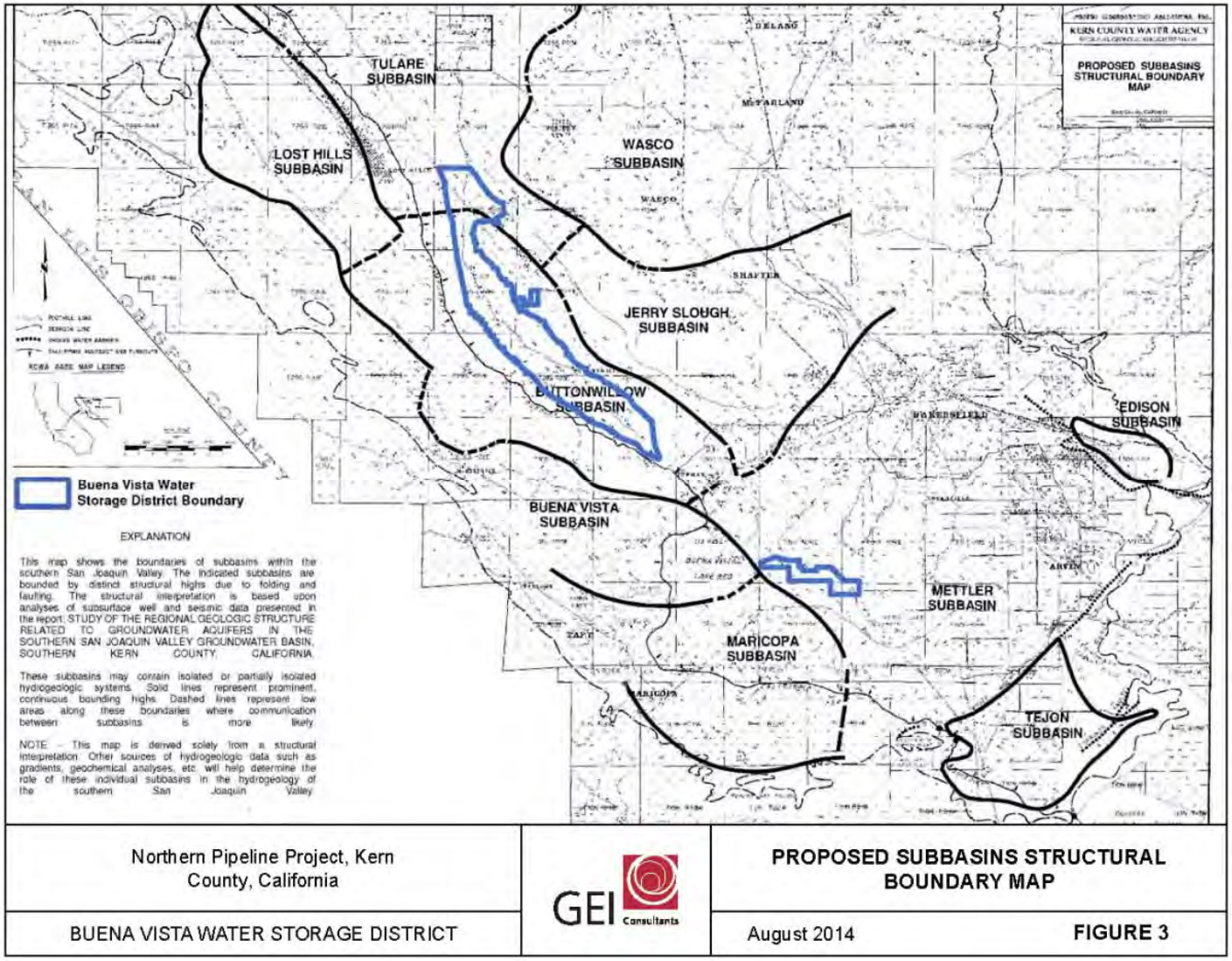


Figure 3 Proposed Groundwater Subbasins



2 Geologic Conditions

The San Joaquin Valley represents the southern portion of the great Central Valley of California. The San Joaquin Valley is a structural trough filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the valley's structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

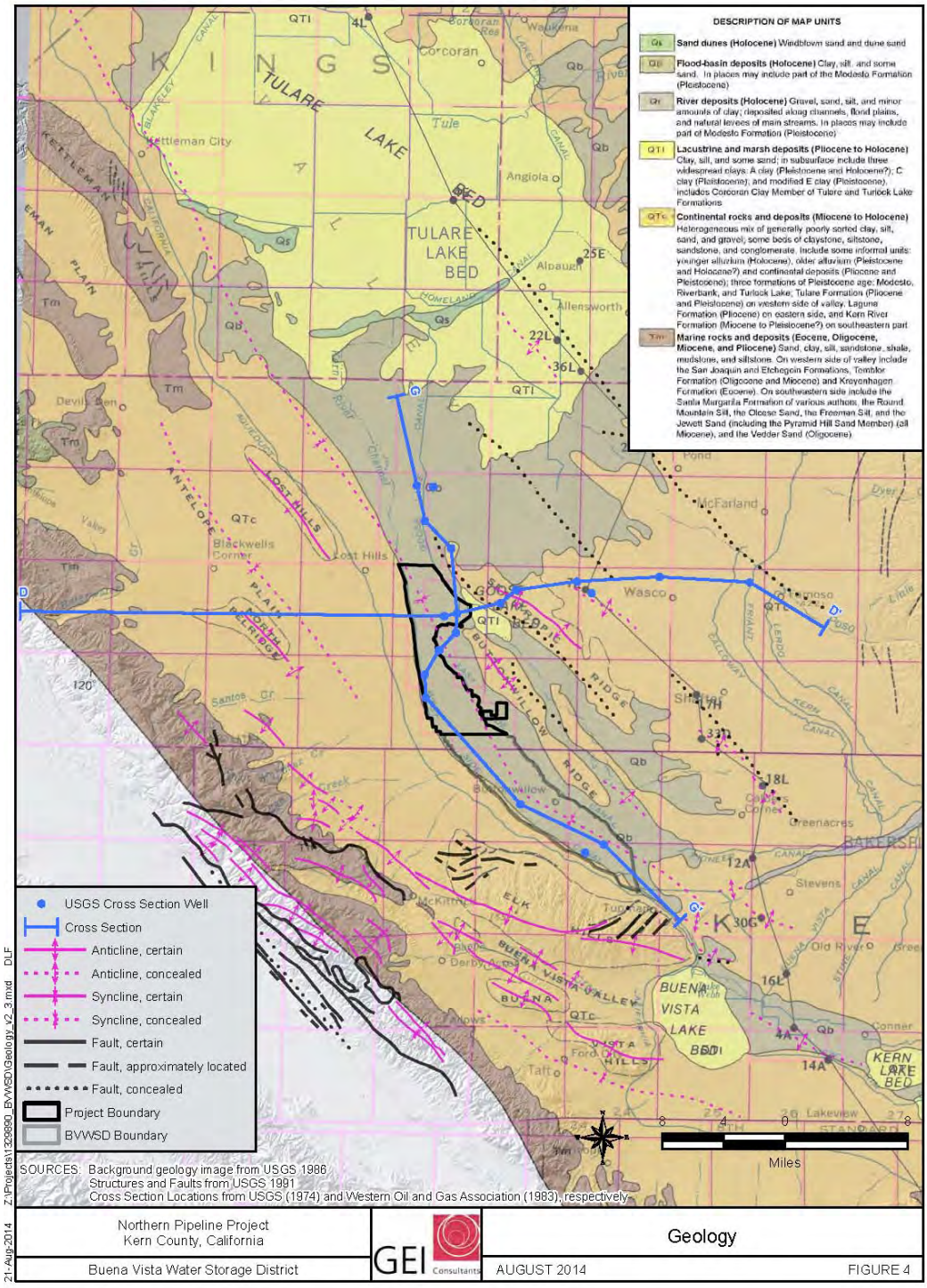
2.1 Regional Geology

The southern part of the San Joaquin Valley is a broad structural trough of mostly interior drainage. The Sierra Nevada on the east is composed of consolidated igneous and metamorphic rocks of pre-Tertiary age (basement complex). The surface of these rocks slopes 4 to 6 degrees south-westward from the foothills and underlies the valley. The Coast Ranges on the west consist mostly of complexly folded and faulted consolidated marine and non-marine sedimentary rocks of Jurassic, Cretaceous, and Tertiary age, which dip eastward and overlie the basement complex (USGS, 1972). These deposits are considered non-water bearing.

Unconsolidated deposits of Late Pliocene to Holocene age, blanket the underlying consolidated rocks in the valley and are the source of most of the fresh groundwater. The unconsolidated deposits are divided into informal stratigraphic units on the basis of source of sediment, environment of deposition, and texture (USGS, 1972).

The unconsolidated sediments that comprise the shallow to intermediate depth water-bearing deposits in the Kern County groundwater subbasin are primarily of continental origin. From youngest to oldest the informal stratigraphic units consist of flood basin deposits, continental rocks and deposits, and marine rocks and deposits. **Figure 4** shows the regional geology (Page, 1986).

Figure 4 Geology



The continental rocks and flood basin deposits in the San Joaquin Valley groundwater basin contains five identified clay layers. The clay layers were designated, from shallowest to deepest as the A-clay, B-clay, C-clay, D-clay, and E-clay (including the Cocoran Clay Member). A sixth layer, the underlying F-clay, has limited extent and is generally present just beneath the former Tulare Lake (Croft, 1968). The C-clay through F-clays have been deformed, warped into broad, gentle northwesterly trending structural highs (anticlines) and lows (synclines). The A-clay and B-clay are not deformed in a similar pattern as the underlying clays. The top of the continental deposits (Tulare Formation) is considered to be the uppermost deformed bed (Woodring, 1940), or the C-clay. Therefore, the A- and B-clays are considered to be part of the flood basin deposits, and C-, D-, and E-clays are part of continental deposits. The A-, C-, and E-clays, lie beneath large areas of the southern part of the valley and are projected to occur beneath all or portions of the BVWSD.

Flood Basin Deposits

This Holocene-age unit varies in character and thickness throughout the subbasin. The flood basin deposits consist of silt, silty clay, sandy clay, and clay interbedded with poorly permeable sand layers. At the eastern and southern subbasin margins the unit is composed of up to 150 feet of interstratified and discontinuous beds of clay, silt, sand, and gravel. In the southwestern margin it is finer grained and less permeable as it grades into fine-grained flood basin deposits underlying the historic beds of Buena Vista and Kern lakes (Hilton et. al., 1963; Wood and Dale, 1964). These flood basin deposits are difficult to distinguish from underlying fine-grained older alluvium and the total thickness of both units may be as much as 1,000 feet (Wood and Dale, 1964). Flood basin deposits include the A- and B-clays, as described below:

- A-clay. The A-clay is the uppermost of the clay layers. It occurs 40 to 50 feet below land surface in the Tulare Lake groundwater subbasin and underlies about 300 square miles. The presence of the clay is indicated by shallow groundwater levels in shallow wells. The thickness of the layer ranges from 20 to 50 feet. Forces that warped the clay layers below the B-clay apparently did not warp the A-clay.

- B-clay. The B-clay is about140 feet below land surface. It interfingers laterally with the older alluvium. Its areal extent is about from the Tulare Lake Bed to Corcoran and Lemoore and is not expected to occur in the BVWSD area. The clay is about 15 feet thick. The structure contour map indicates that the B-clay was not affected by the forces that warped the lower tongues.

Continental Rock and Deposits

These deposits consist of a heterogeneous mix of generally poorly sorted clay, silt, sand, and gravel; some beds of claystone, siltstone, sandstone, and conglomerate. The unit includes some informal units: younger alluvium, older alluvium, and continental deposits; four formations of Pleistocene age: Modesto, Riverbank, Turlock Lake, and Tulare

formations. Beneath the BVWSD, only the Tulare Formation is present (Rector, 1983) and is the primary fresh water bearing formation in the area and much of the Kern County groundwater subbasin. Continental deposits include the C-, D-, and E-clays, described below:

- C-clay. The C-clay occurs about 100 to 210 feet above the D-clay. The thickness of the C-clay ranges from about 10 feet near Riverdale to about 100 feet near Corcoran and averages about 30 feet. Warping of the C-clay has formed troughs and shelves that are nearly identical in position to the troughs and shelves in the D-, E-, and F-clays. However, the intensity of deformation is less than the deformation in the lower clay layers.

- D-clay. The D-clay occurs 60 to 190 feet above the E-clay. This clay zone was mapped in a narrow belt, which extends from Lemoore to Corcoran and is not expected to occur in the BVWSD area. The clay layer ranges from 5 to 20 feet thick.

- E-clay (in part equivalent to the Corcoran Clay Member of the Tulare Formation). The dark greenish blue-gray, silty, diatomaceous E-clay is one of the largest confining beds in the area. The beds were deposited in a prehistoric lake that occupied the San Joaquin Valley and underlies about 3,500 square miles of bottom land in the valley and into the western slopes (Croft, 1972). The extent of the E-clay was further updated in 1986 and showed a greater areal extent. In recognition of these differences the name “modified E-clay” was proposed to describe the mapped clay unit (Page, 1986).

Marine Rocks and Deposits

These deposits consist of sand clay, silt, sandstone, shale, mudstone, and siltstone. On the western side of valley these deposits include the San Joaquin, Etchegoin, Temblow and Kreyenhagen formations. They are exposed in the surrounding watershed to the west of BVWSD and underlie the freshwater bearing continental deposits and overlie the bedrock. These sediments are considered to be non-water bearing.

2.2 Geologic Structures

The sediments deposited in the Kern County groundwater subbasin were deposited into a large trough that has since been compressed and subsided which has resulted in the sediments being folded into troughs and ridges, known in geologic terms as synclines and anticlines, respectively. In general, the anticlines are the Bakersfield arch, and the Buttonwillow and Semitropic ridges. The Buttonwillow and Semitropic ridges are surface expressions of two prominent north-south trending anticlines. **Figure 4** shows their locations. The intervening topographic troughs are the surface expressions of prominent

synclines (Croft, 1968). The synclines or troughs typically contain a significantly thicker sequence of young sediments than do the anticlines or broad highs (Pacific, 1991).

Associated with the Buttonwillow and Semitropic anticlines are two concealed faults (CGS, 1991) that dip to the west. The faults are not active and do not extend to ground surface.

2.3 Local Geology

The BSA is located between the Buttonwillow and Semitropic ridges (topographic features) on the east, and the Coast Ranges on the west. The BSA is underlain by Tulare Formation and contains sand from about 200 to 400 feet below ground surface (bgs), which is used by most wells in the region to supply water.

Three of the clay layers identified in regional geology are present in the BSA area. The A-clay extent was poorly defined but was estimated to be at depths of about 20 to 30 feet bgs and is the cause of shallow groundwater levels in the Tulare Lake groundwater subbasin, which adjoins the Kern County groundwater basin to the north (Croft 1972). The Tulare Lake formation in the area also contains the C-clay and E-clays. **Figures 5 and 6** show geologic cross sections in the BSA area. In the cross sections, both the C-clay and E-clays are warped and folded into east-west trending troughs (synclines) and ridges (anticlines) different than the Buttonwillow Ridge and Semitropic Ridge anticline trends. The E-clay ranges from about 300 to 450 feet bgs beneath the northern portions of the BSA. To the west both the E-clay and C-clay pinch out and the coarse-grained sediments found elsewhere in the subbasin are separated are combined.

There are varying interpretations of the extent of the E-clay. Reports prepared in 1972 and in 1991 show the E-clay to be continuous across the Buttonwillow and Semitropic ridges and their associated anticlines (Croft, 1972; Pacific, 1991). However, work by the United States Geologic Survey (USGS), which was used to prepare the Central Valley Hydrologic Model (CVHM) groundwater flow model, shows the E-clay does not extend across the Buttonwillow and Semitropic ridges and their associated anticlines. **Figure 7** shows the extent of the modified E-clay and the contours of the top of the clay bed. It is possible the anticlines of the Buttonwillow and Semitropic ridges predate the E-clay and therefore the clay was not deposited onto these ridges. If this were the case, sedimentary beds on the east and west sides of the ridges would not be continuous unless they were deposited between the ridges.

Figure 5 Geologic Cross-Section G-G'

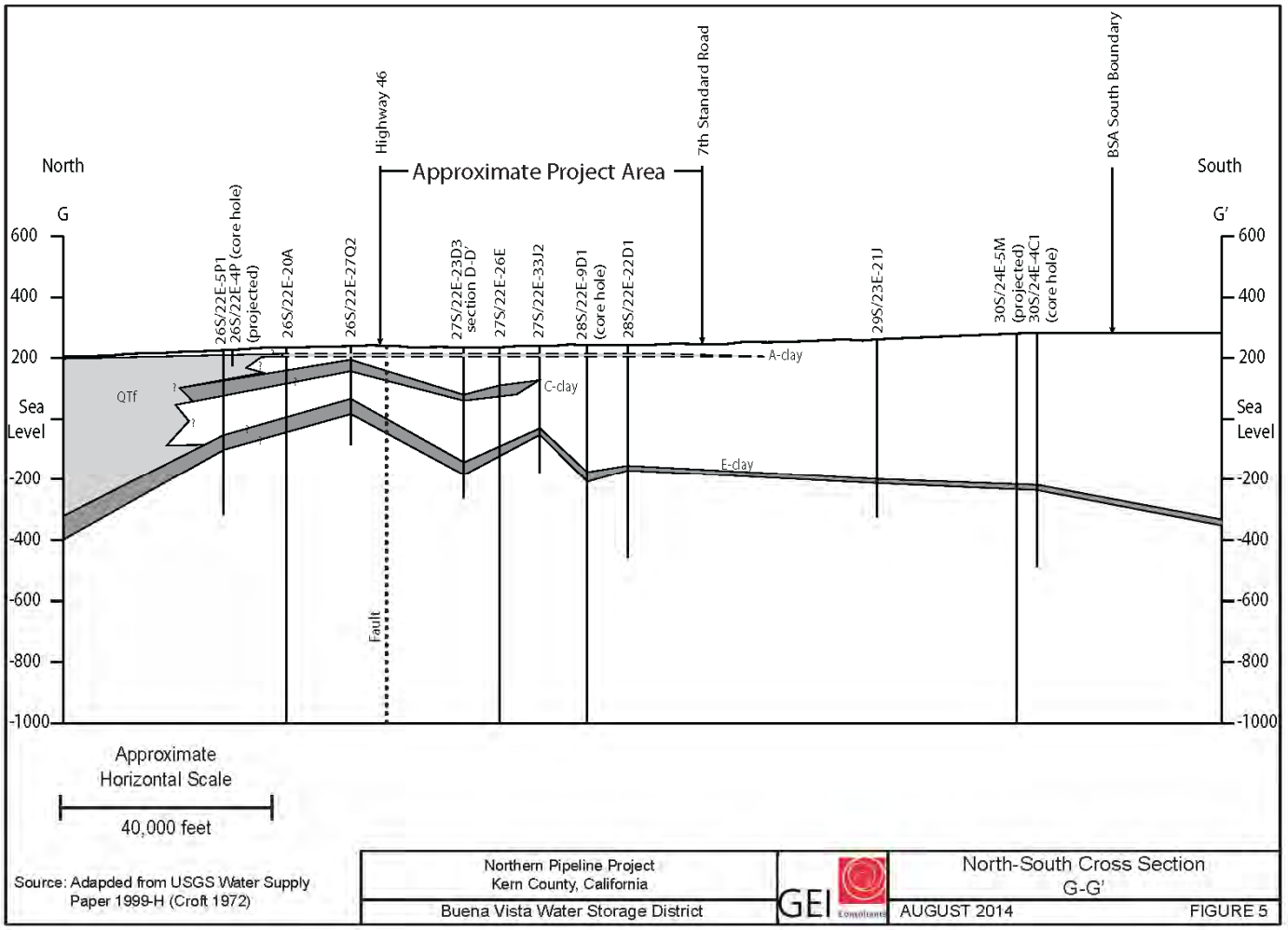


Figure 6 Geologic Cross-Section D-D'

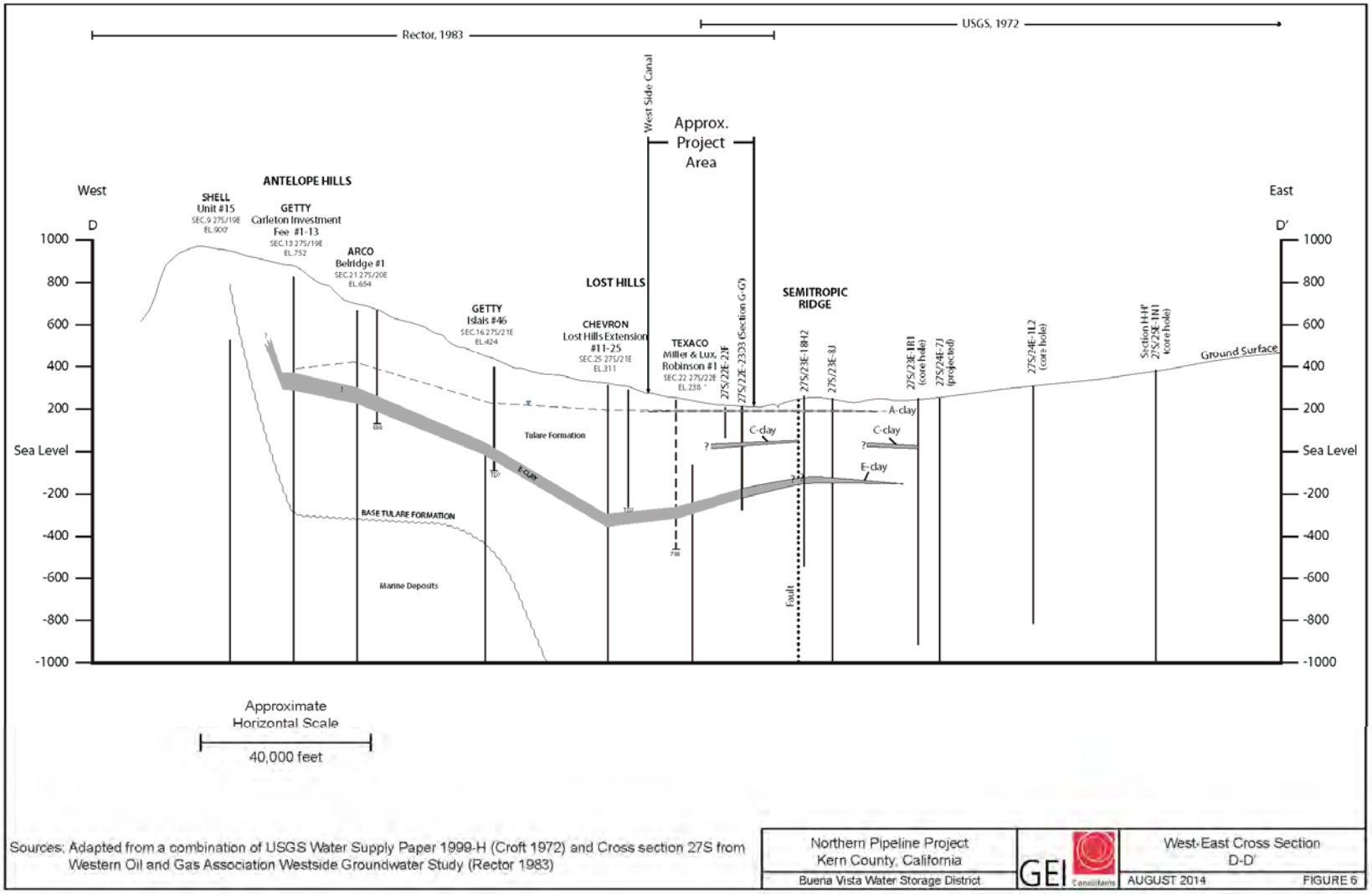
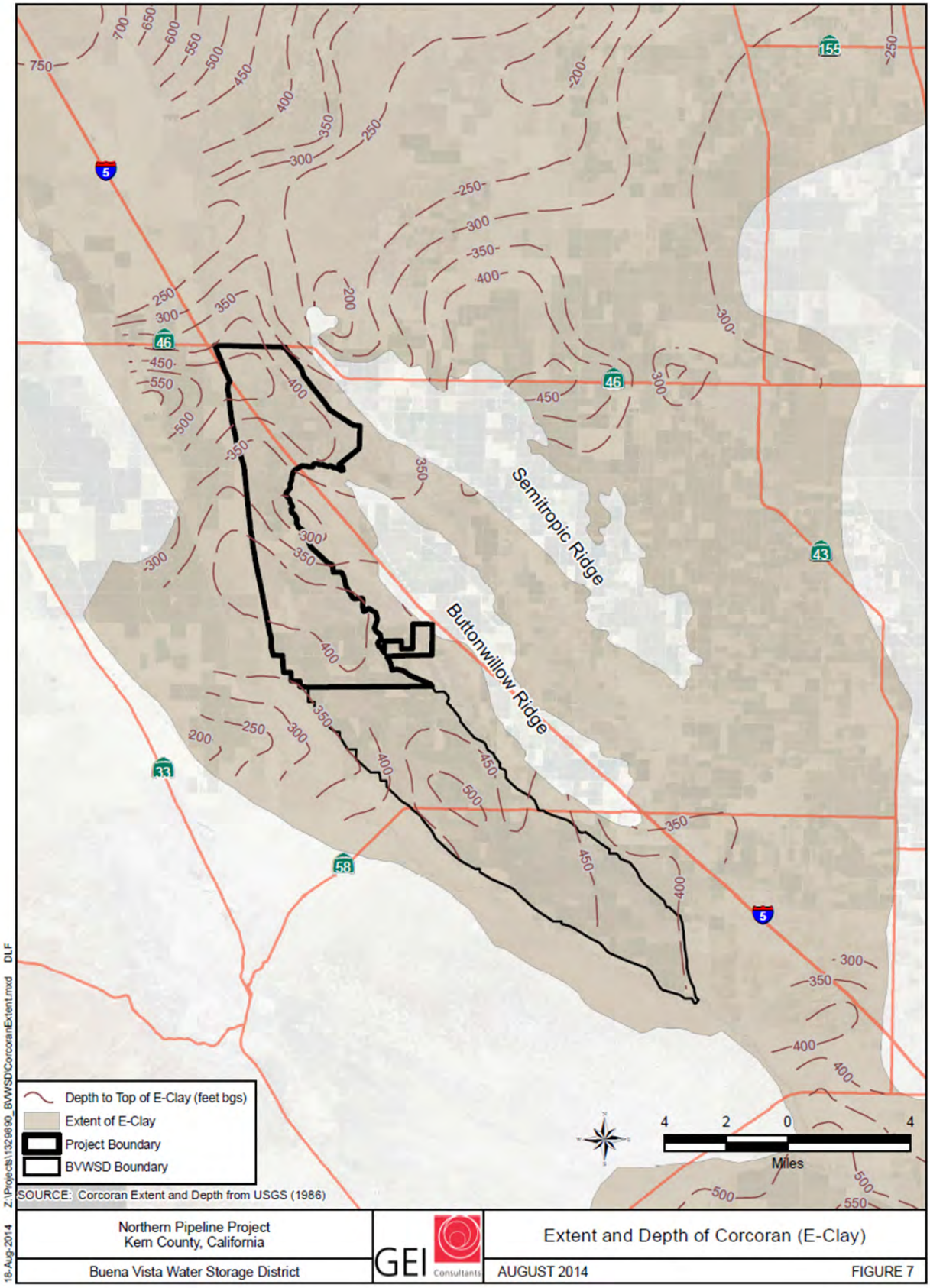


Figure 7 E-Clay Local Extent



3 Hydrogeologic Conditions

This chapter presents the definition and extent of aquifers present in the area, the depth and direction of groundwater flow, and the aquifer hydraulic characteristics. **Sections 3.1 through 3.4** describe the hydrogeologic character of the northern portion of the BSA from ground surface to depth. There are three main aquifers, the perched aquifer, the shallow aquifer, and the deep aquifer. **Sections 3.5 through 3.15** describe the groundwater levels, hydraulic characteristics, groundwater movement, and groundwater quality in these three aquifers. Water supply conditions area also discussed along with subsidence.

3.1 Perched Aquifer

The perched aquifer extends from near ground surface to about 20 to 30 feet below ground surface. The sediments in the perched aquifer consist of layered sequences of variable mixtures of fine-grained clays and silts and then some coarser-grained sediments (clayey sands to poorly-sorted sands) which may convey water horizontally into and out of the area. **Table 1** provides a summary of piezometers and depth to water in piezometers to estimate the saturated thickness of the sediments along the Project area boundaries where groundwater inflow or outflow may occur. The thickness can vary depending upon the actual depth of the A-clay, which cannot be established at this time. The top of the E-clay was assumed to be about 30 feet below ground surface at all locations. **Figure 8** shows the locations of the piezometers.

The extent of the perched water appears to have increased in size over time. **Figure 9** shows the extent of the perched groundwater (groundwater within 20 feet of ground surface) in 1974 and in 2011. The figure shows the perched water area appears to have expanded since 1974, suggesting there are sources contributing to this aquifer outside of the District. Perched water underlies most of the northern portion of the BSA and most of the Project area. It appears to be structurally controlled by the Buttonwillow Ridge but not by the Semitropic Ridge. About 12,000 to 15,000 acres within the northern portion of the BSA have crops affected by perched water (Provost and Pritchard, 2012).

Table 1 Perched Groundwater Body Permeable Sediment Thickness

Outflow or Inflow Reach	Piezometer No.	Piezometer Total Depth (feet)	Estimated Depth A-clay (feet)	Depth to Water (feet) 2008	2011	2013	Saturated Sediment Thickness (feet) 2008	2011	2013
West Side	BR01	20.0	30	6.3	8.7	11.1	23.7	21.3	18.9
	BR02A	20.0	30	-	-	-	-	-	-
	BR03	20.0	30	13.7	13.5	14.2	16.3	16.5	15.8
	BR04A	20.0	30	2.9	4.0	6.5	27.1	26.0	23.5
	BV07B	20.2	30	3.4	-	-	26.6		
	BV07C	22.8	30	-	-	-	-	-	-
	BR09	20.0	30	-	-	-	-	-	-
	BV34	22.0	30	2.0	4.0	12.6	28.0	26.0	17.4
	Average Saturated Thickness (feet)						**24.3**	**22.5**	**18.9**
North Side	BV02C	23.1	30	8.8	9.8	9.4	21.2	20.2	20.6
	BV02B	23.4	30	5.9	7.2	7.3	24.1	22.8	22.7
	Average Saturated Thickness (feet)						**22.7**	**21.5**	**21.7**
Northeast	BV05	25.0	30	4.8	6.1	9.1	25.2	23.9	20.9
	BV08B	20.9	30	1.5	4.3	4.2	28.5	25.7	25.8
	Average Saturated Thickness (feet)						**26.9**	**24.8**	**23.4**
Southeast	BV15	22.1	30	0.7	6.2	8.3	29.3	23.8	21.7
	BV16	20.0	30	0.9	5.6	8.0	29.1	24.4	22.0
	Average Saturated Thickness (feet)						**29.2**	**24.1**	**21.9**
South	BV34	22.0	30	2.0	4.0	12.6	28.0	26.0	17.4
	BV35	22.0	30	7.8	8.0	15.0	22.2	22.0	15.0
	BV30	21.0	30	7.4	8.1	14.3	22.6	21.9	15.7
	BV31	19.0	30	4.0	9.1	10.8	26.0	20.9	19.2
	BV32	20.0	30	11.3	11.9	13.6	18.7	18.1	16.4
	BV33	20.0	30	10.2	13.1	15.8	19.8	16.9	14.2
	Average Saturated Thickness (feet)						**22.9**	**21.0**	**16.3**

Figure 8 Monitoring Locations and Aquifer Characteristics Test Locations

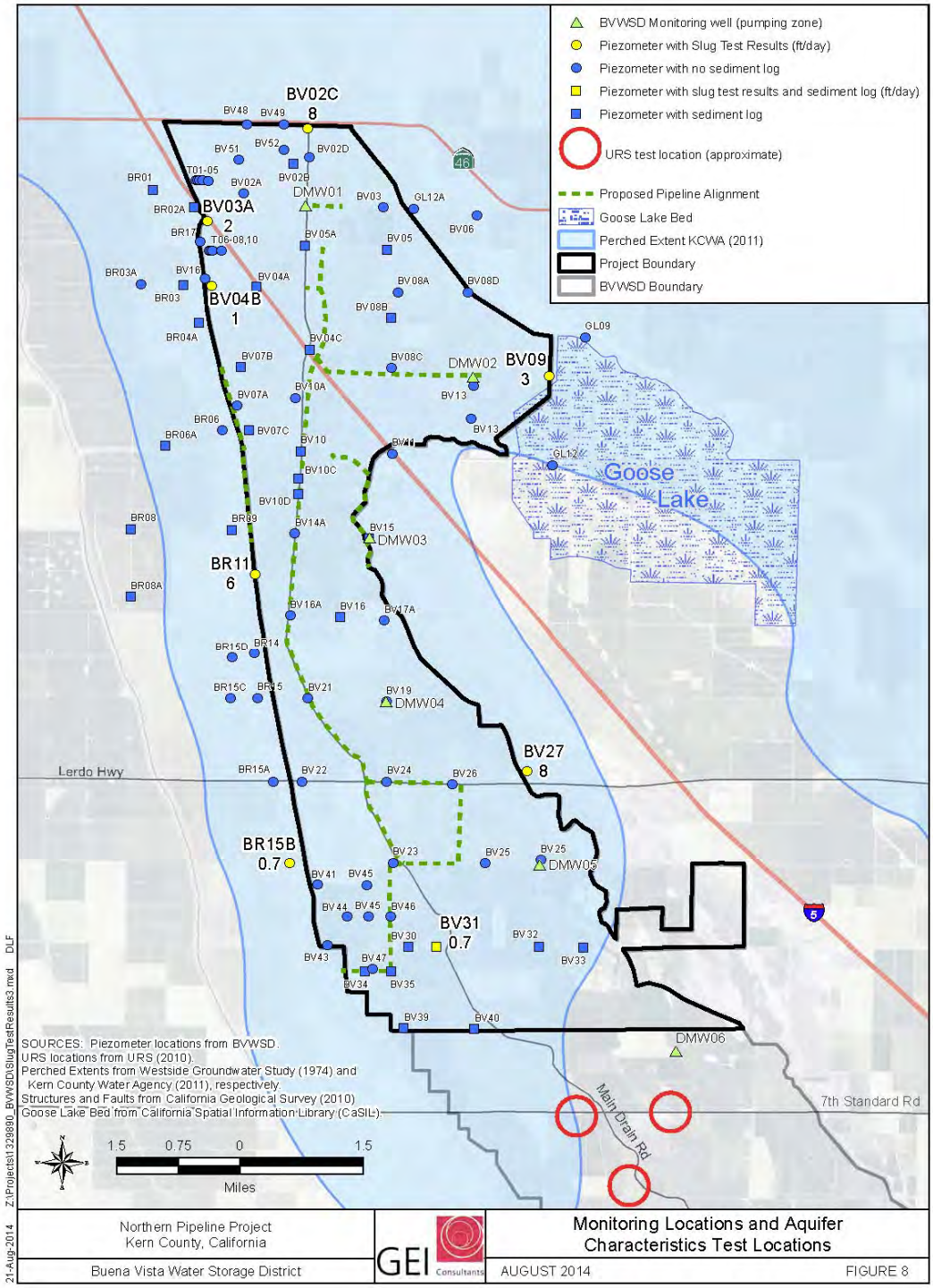
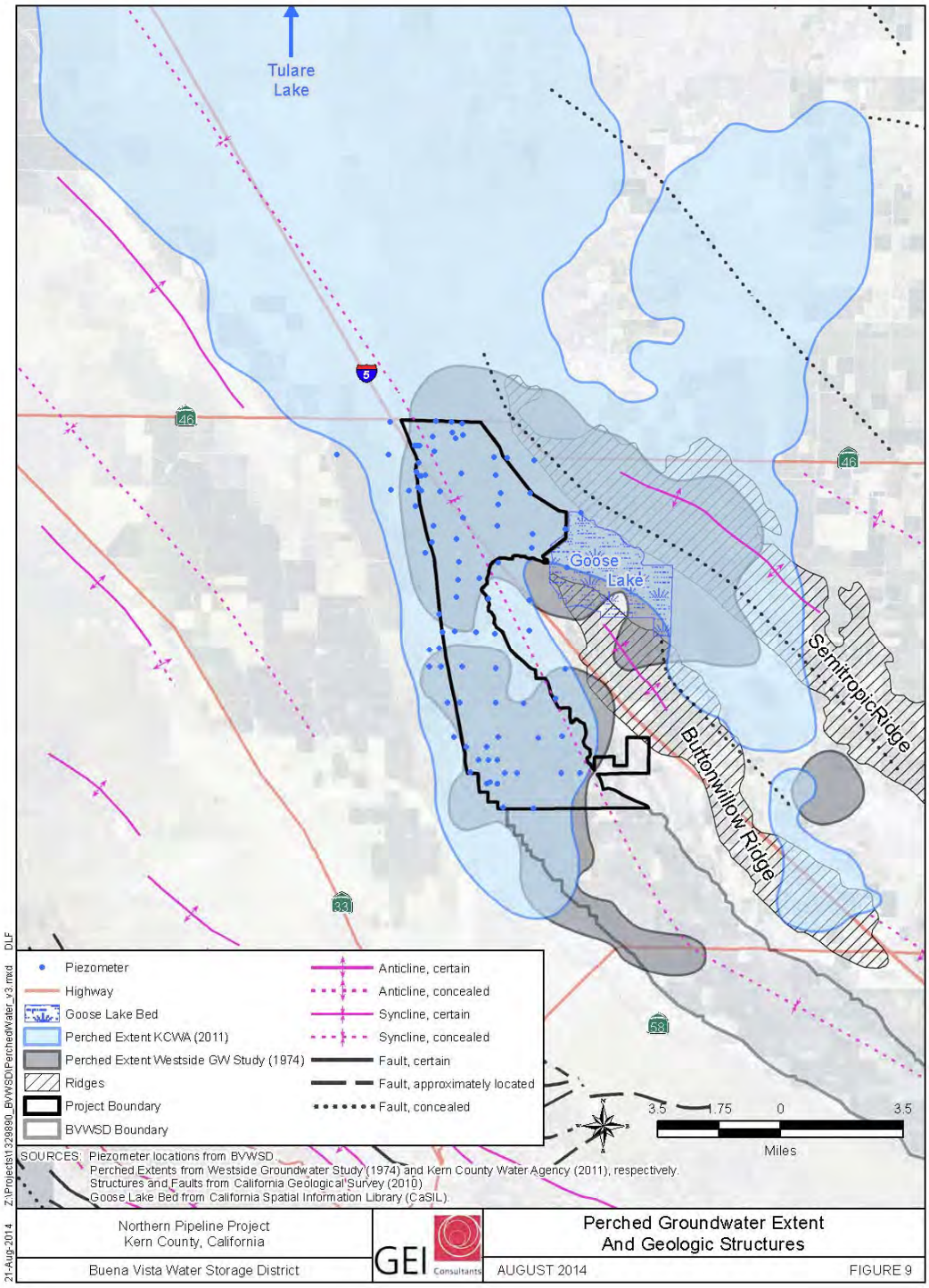


Figure 9 Perched Water Extent



3.2 Perching Bed

The A-clay layer is likely the perching bed. The A-clay has been shown to extend beneath this area at a depth of about 20 to 30 feet, but is poorly defined. The extent of the clay can be approximated to correlate with where perched water is occurring, as shown on **Figure 9**. The clay may extend beyond the outline shown for the extent of the perched water.

3.3 Shallow and Deep Aquifers

The groundwater aquifers under the BSA consist of sequences of interbedded, laterally discontinuous, sandy and silty sediments. The shallow aquifer extends from the base of the A-clay down to a depth of about 200 feet where silty sediments tend to predominate. The C-clay occurs at about this depth and may separate the shallow aquifer from the deep aquifer. The deep aquifer extends from about 200 to 400 feet with sandy and silty sediments occurring in approximately equal proportion. This deep aquifer is being used by most growers within BVWSD.

The majority of irrigation wells in the District are completed to depths between 200 and 500 feet with perforated intervals around 150 feet to the bottom (BVWSD, 2014). Wells in the area adjacent to BVWSD are also likely completed in this manner.

To the west both the C-clay and the E-clay pinch out and the coarse-grained sediments near the mountain front are continuous and allow deep percolation of precipitation runoff from the Coast Range bedrock and marine sediments to recharge the aquifers.

3.4 Confining Beds

The C-clay and E-clay are present beneath the northern portions of the BSA as shown on **Figure 5**. Little information is known about the C-clay and whether it may be a vertical barrier to groundwater flow. However, due to its relatively large extent and its approximately 30-foot thickness, it is likely to result in semi-confining conditions to the underlying deep aquifer beneath the BSA. Based on its depth beneath the BSA it may separate the shallow aquifer from the deeper aquifer.

The E-clay is known regionally to be a barrier to groundwater flow, but it is not impermeable. It generally divides the aquifers system into unconfined aquifers above and confined aquifers below. The clay layer is about 300 to 450 feet bgs beneath the northern portions of the BSA and is folded with two northwest-southeast trending troughs and ridges. Within the northern part of the BSA, where the deep aquifer is present and where the water quality is good, groundwater wells are typically constructed above the E-clay, but some wells appear to be constructed into sediments beneath the E-clay. Groundwater quality beneath the E-clay may be poor quality because of recharge from the marine sediments of the Coast Ranges. East of the Buttonwillow and Semitropic ridges wells are constructed both above and below the E-clay as the groundwater in this area is typically of better quality.

3.5 Groundwater Levels

BVWSD has been measuring groundwater levels since about 1991 in the perched aquifer and in the deep aquifer (for purposes of discussion, the shallow and deep aquifers hereafter are described as the "main aquifer."). No monitoring wells have been constructed to monitor just the shallow aquifer so it is being presumed that the shallow aquifer is behaving similarly to the deep aquifer.

The perched aquifer is monitored with a network of 58 piezometers. The piezometer locations are shown on **Figure 8.** Other piezometers in the network have been monitored quarterly since 2000, but not necessarily all piezometers were measured at a similar time.

The depth to groundwater in the perched aquifer in the northern portion of the BSA has ranged from about 2 to 12 feet bgs over the last 20 years (Provost and Pritchard, 2012). **Figures 10 through 14** show the groundwater levels within the Project area. Groundwater levels have been relatively constant through at least 2006 and in some cases up to 2012. The levels have typically been within 2 to 4 feet of ground surface in most piezometers. Groundwater levels since 2012 have declined predominately due to the extended drought. When the groundwater levels have been within 6 feet of ground surface, groundwater in the perched aquifer could discharge to the Main Drain Canal. In 2008, groundwater levels within the Project area were less than 5 feet bgs, over a large area of about 2,800 acres.

The depth to groundwater below ground surface in the main aquifer in the Project area is typically about 2 to 70 feet bgs with some deeper levels recorded during the summer peak pumping periods. The locations of monitoring wells (DMW series) are shown on **Figure 8.** **Figures 10 through 14** show the groundwater levels within the Project area. The groundwater levels remained relatively consistent from 1992 through about 2007. Since 2007, the groundwater levels have been about 10 feet lower in some areas but in other areas the decreases are much less, in some locations less than 2 feet. Generally groundwater levels within the entire BVWSD service area over the past 20 years appear to be stable in the north while declining in the south which suggests that the north-to-south gradient has been increasing (BVWSD, 2014).

The groundwater levels in the regional aquifer just east of the BVWSD are by as much as 170 feet deeper, than within the BSA.

Groundwater levels in the perched and deep aquifers vary throughout the Project area. **Figures 10 through 14** show the hydrographs for a deep aquifer monitoring well and nearby perched aquifer piezometers. **Figures 10 through 12** shows about a 15 to 20 foot difference in elevation between the perched and deep aquifers, which suggests the A-clay maybe an effective barrier to vertical flow in the northern portions of the Project area. Since about 2006 the groundwater levels appear to be at or below the A-clay suggesting that the deep aquifer is semi-confined to unconfined in this area. Near DMW04 and DMW05 (**Figures 13 and 14**), in the southern portion of the Project area, the groundwater

levels in the deep aquifer are close to the ground surface and have similar levels as the perched aquifer. This suggests that the perching bed may be locally absent and the two aquifers may be interconnected and also suggests that this area is where groundwater from the perched aquifer could recharge the underlying aquifers. The deep aquifer would be unconfined to semi-confined in this area.

Figure 10 Groundwater Level Comparison DMW01 and BV02D and BV05A

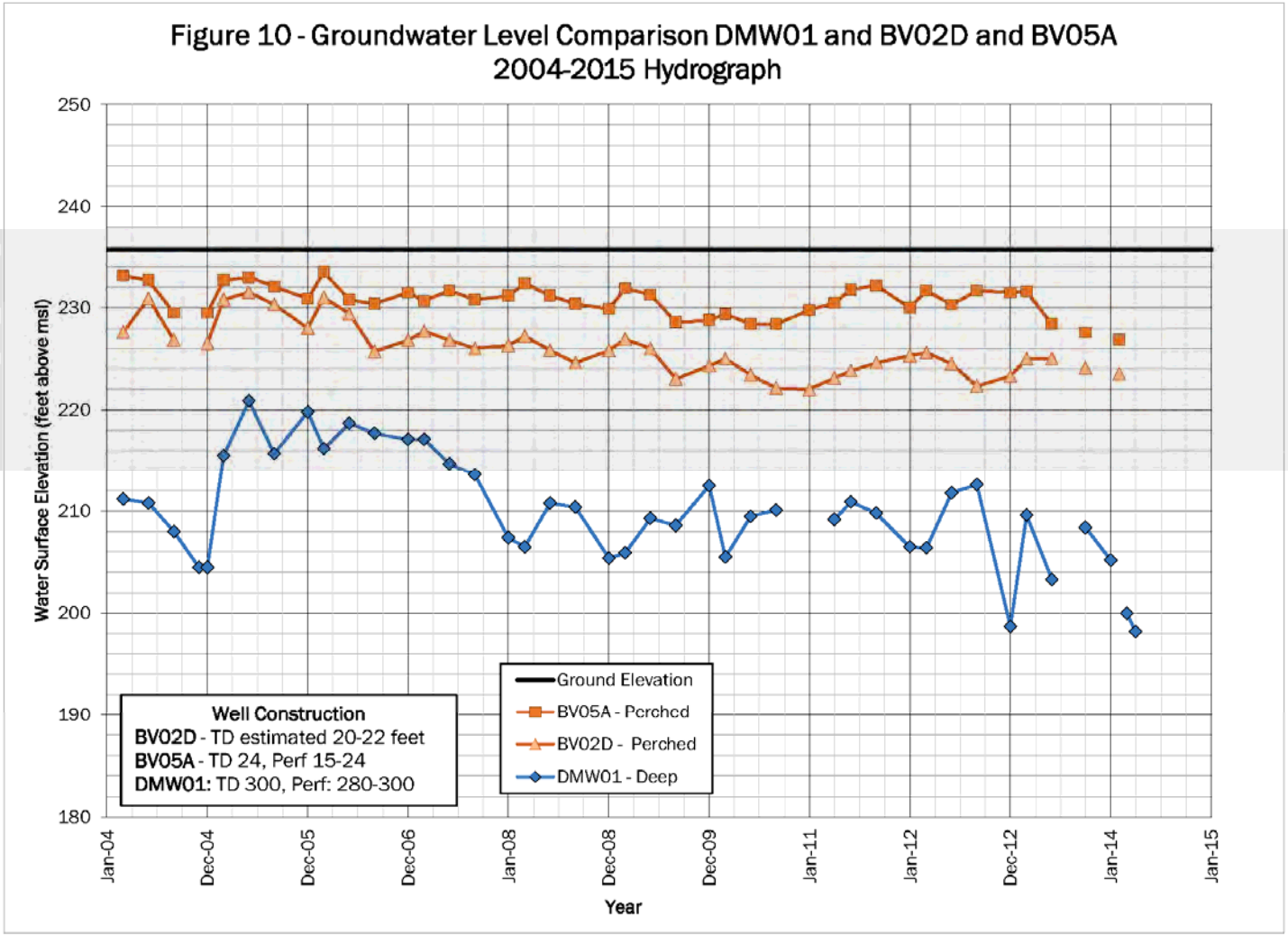


Figure 11 Groundwater Level Comparison DMW01 and BV02D and BV05A

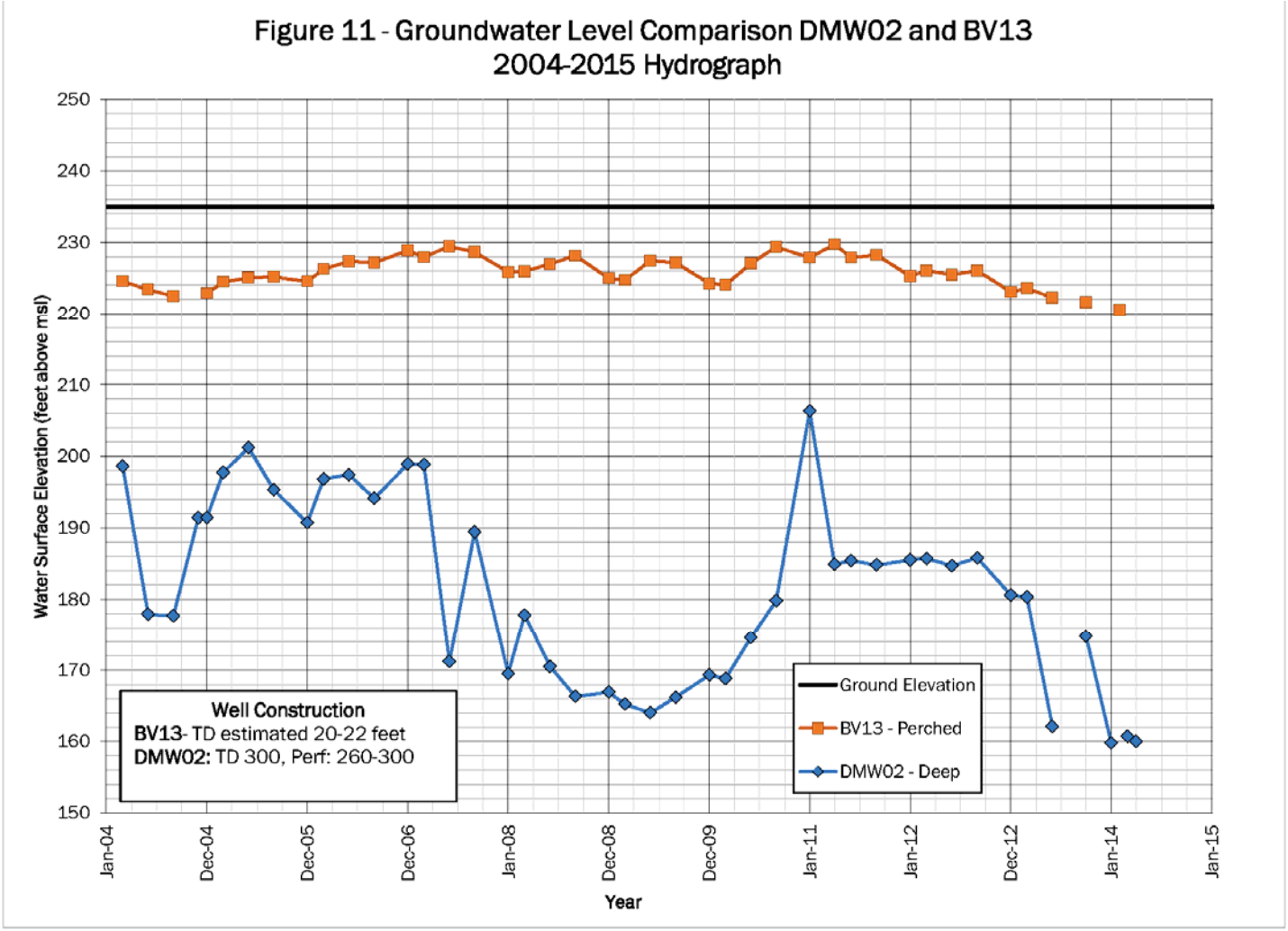


Figure 12 Groundwater Level Comparison DMW03 and BV15

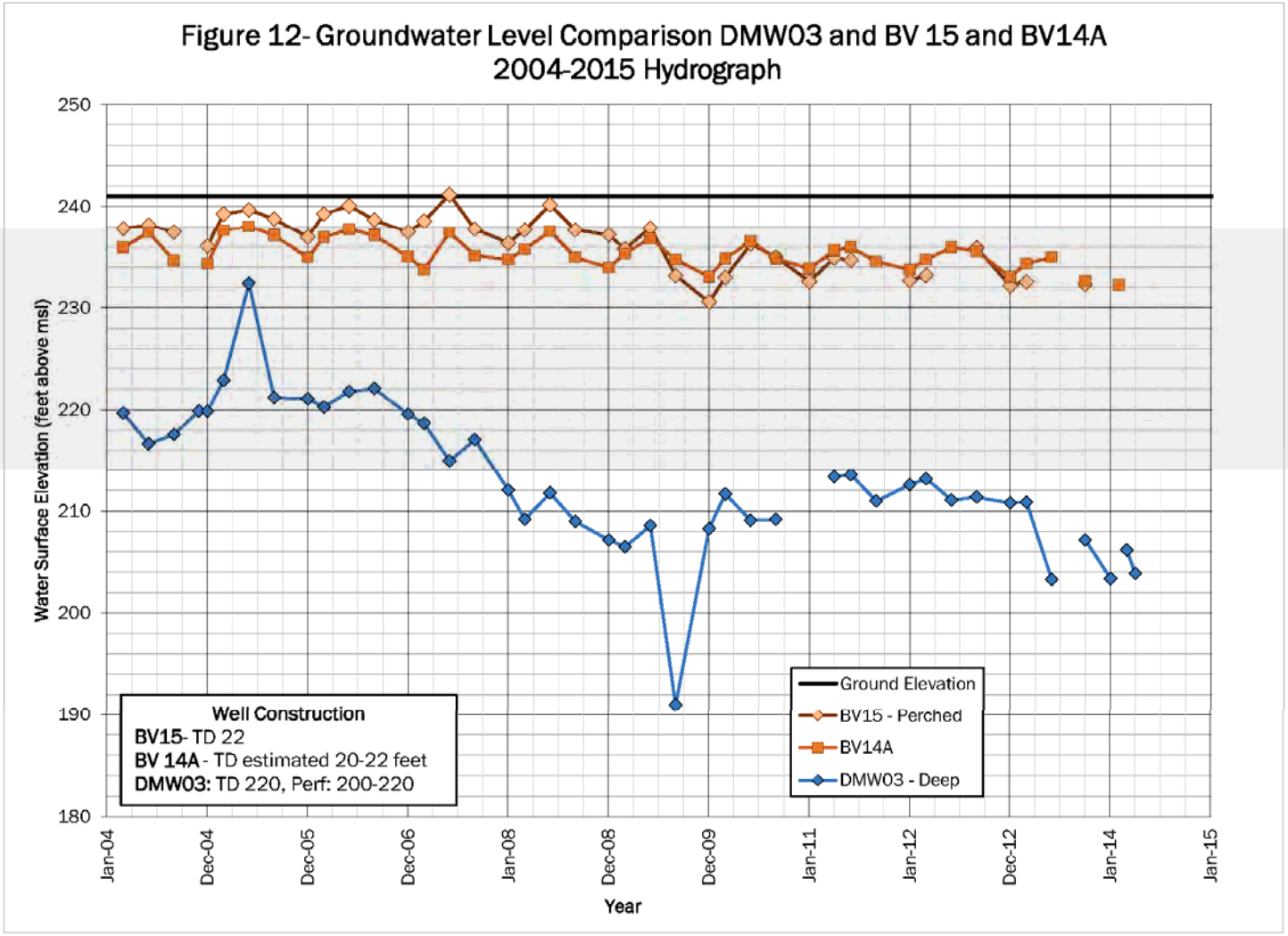


Figure 13 Groundwater Level Comparison DMW04 and BV24 and BV26

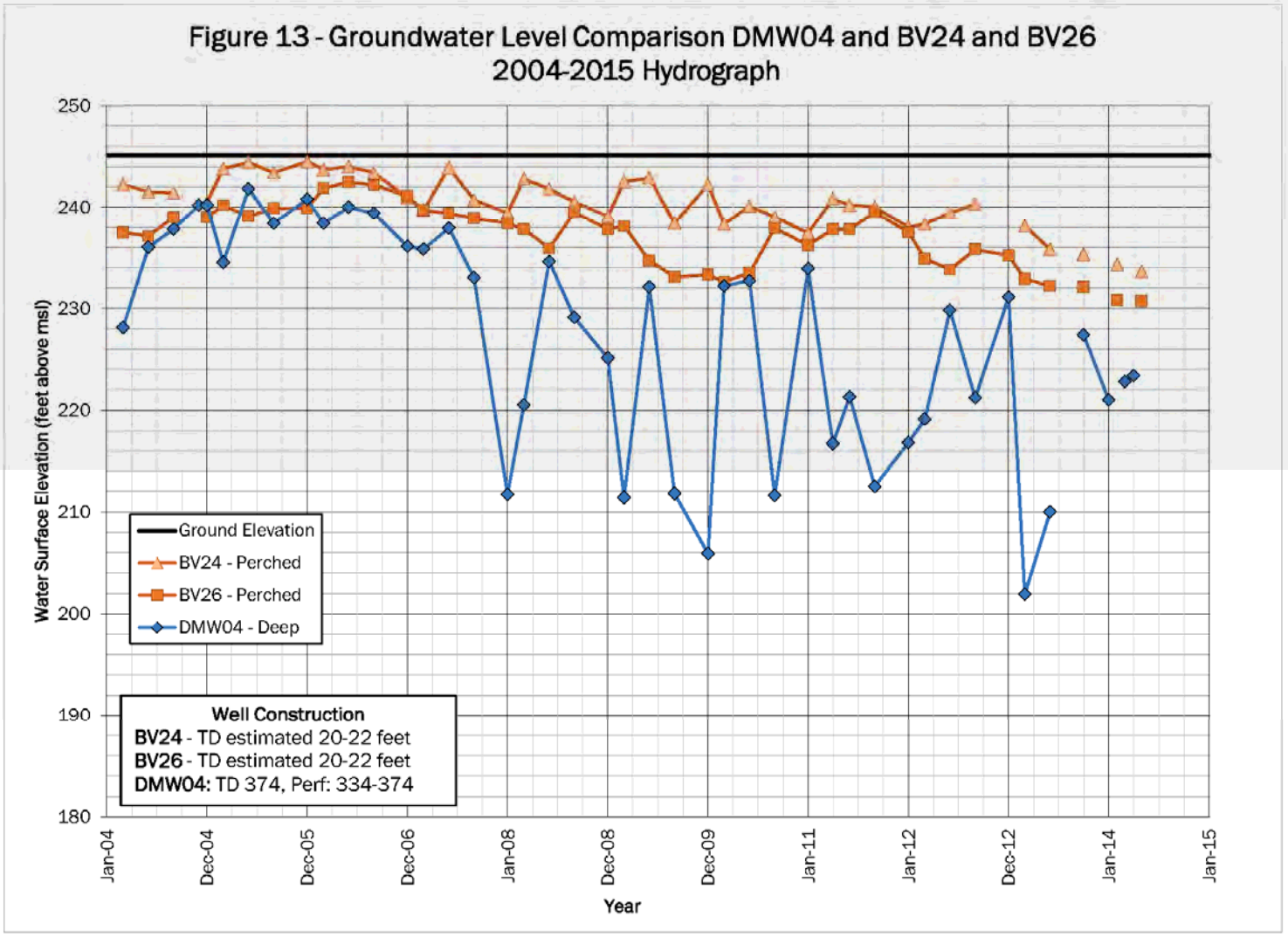
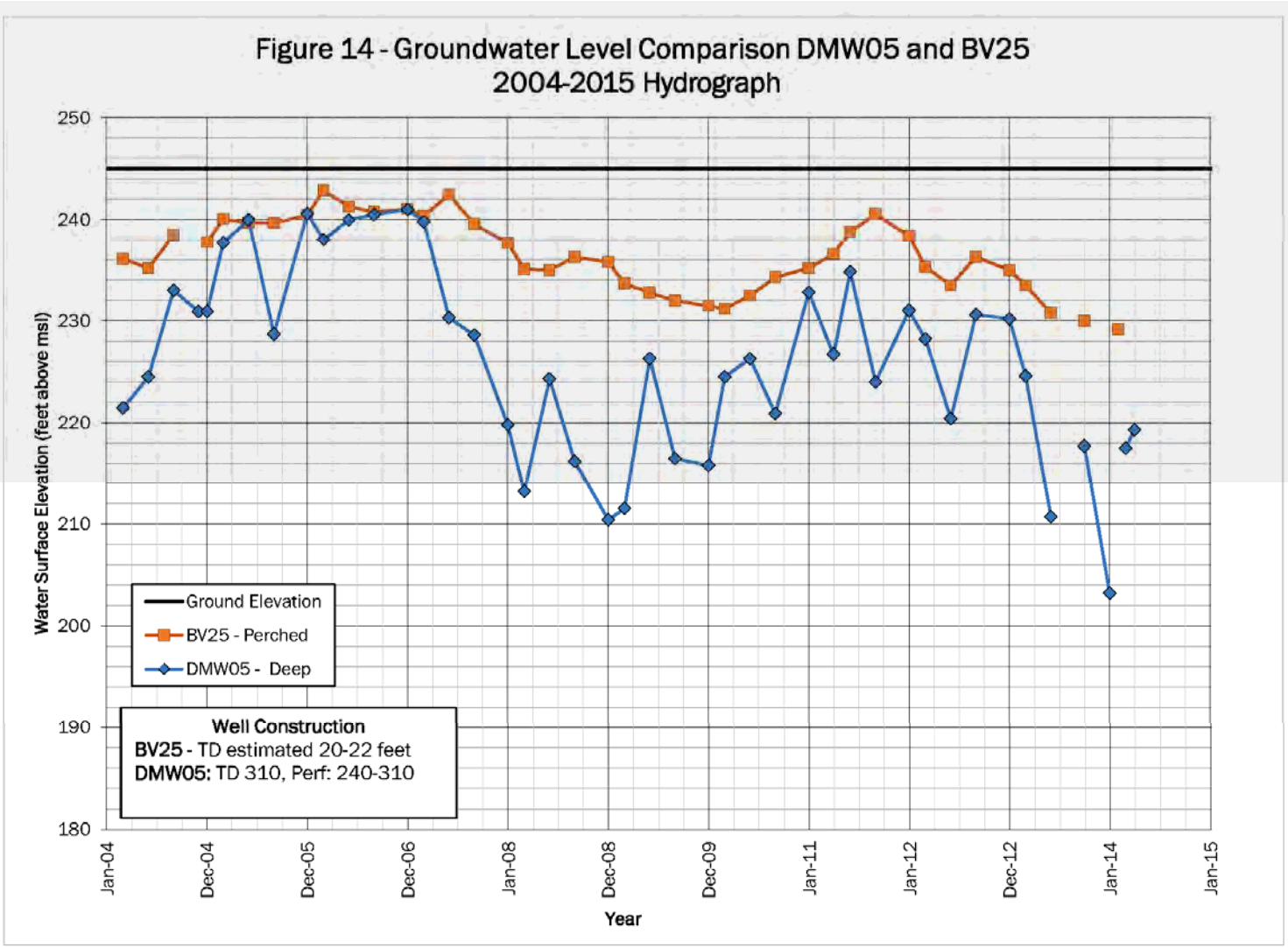


Figure 14 Groundwater Level Comparison DMW05 and BV25



3.6 Groundwater Flow Direction

The groundwater flow directions are interpreted from groundwater level elevation contours. Contour maps were attempted to be developed for 3 representative years, 2008, representing normal water supply conditions; 2011, representing wet conditions; and 2013, representing dry conditions. In 2011 and 2013 for the perched aquifer and for 2008 in the main aquifer sufficient groundwater level measurements were not available so maps could not be drawn. Monitoring wells outside of the District to the west were also incorporated into the analyses to better define conditions in the deep aquifer, however, the well construction details were not available for these wells. **Figures 15 through 17** show groundwater contour maps for the perched aquifer in 2008 and the deep aquifers in 2011 and 2013.

Groundwater flows from higher elevations to lower elevations in a direction that is perpendicular to contour lines. Where contours are 90 degrees to a feature such as the Buttonwillow Ridge and its concealed fault, they show that flow is not passing through that boundary. Also where linear groundwater features are observed, they suggest potential barriers to groundwater flow.

Groundwater contours for the perched water aquifer are limited to areas where shallow groundwater has been identified. **Figure 15** shows these groundwater contours and arrows showing the groundwater flow path. Overall, the flow direction is from the south to the north generally parallel to the ground surface. The contours show that there is limited groundwater inflow from the west to the perched aquifer, but further assessment of piezometers along this western area confirms that inflow takes place from this area along a 10-mile length. However, locally and seasonally conditions may change to produce outflow. Groundwater inflow is also occurring from the south into the Project area, over a 2.5-mile wide area. Groundwater outflow from the northern portion of the Project area occurs along about a 5-mile wide boundary to the east and a 2-mile wide boundary to the north, both areas being north of the Buttonwillow Ridge.

The groundwater contours for the deep aquifer beneath the Project area are shown on **Figures 16 and 17**. The contours show there is a groundwater high that is located near the southern end of the Project area. The groundwater high is potentially where groundwater recharge from the perched aquifer is reaching the main aquifer and functions as a divide with groundwater flowing to the south on one side of the high and to the north on the other side. North of the divide the groundwater moves to the northern end of the Project area where it then turns to the east to southeast to flow between the gap between the Buttonwillow and Semitropic ridges concealed faults. Throughout most of the BSA the contours are perpendicular to the Buttonwillow and Semitropic faults suggesting these faults are mostly barriers to groundwater flow. Groundwater inflow to the shallow and deep aquifer is from the west along a 10-mile-wide area and from the north along a 2-mile-wide area, but this is poorly defined due to the lack of monitoring wells.

Figure 18 shows this distinct change in groundwater levels between the Buttonwillow groundwater subbasin and areas to the east. The deeper groundwater levels are due to pumping both above and below the E-clay in the adjacent Semitropic Water Storage District (SWSD). The change in groundwater levels is occurring along a fairly straight line, coincident with the concealed faults associated with the Buttonwillow and Semitropic ridges. The fault associated with the Buttonwillow Ridge appears to be offset to the east of where the groundwater level change is occurring but the fault dips to the west so that at depth the fault would affect sediments to the west of its surface trace. Based on the change in groundwater contours this fault may extend to the south. The northern portions of the fault associated with the Semitropic Ridge appear to be a barrier to groundwater flow where the southern portions do not appear to affect groundwater flow.

Figure 15 Perched Groundwater Level Contours, June 2008

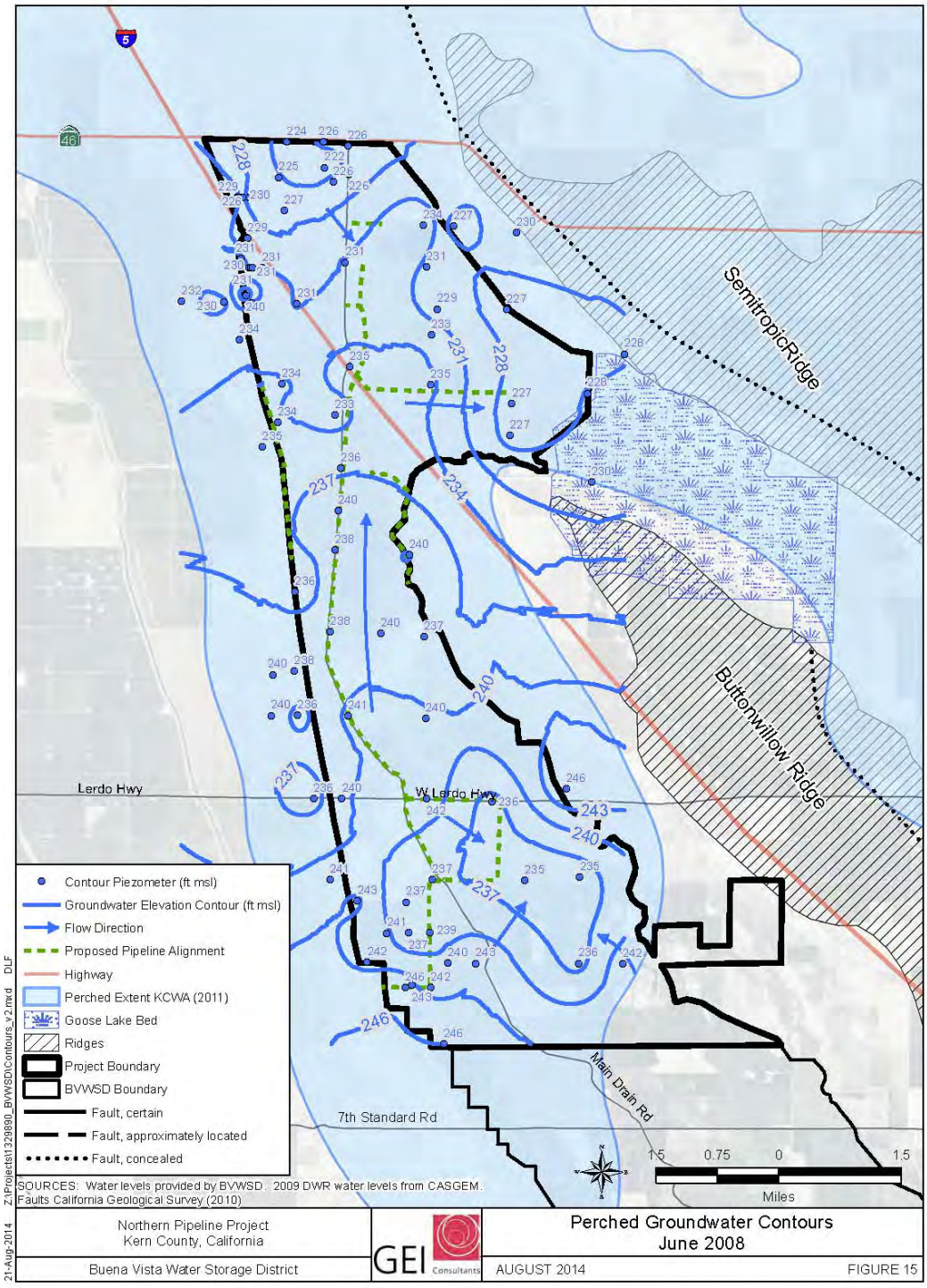


Figure 16 Main Aquifer Groundwater Contours, June 2011

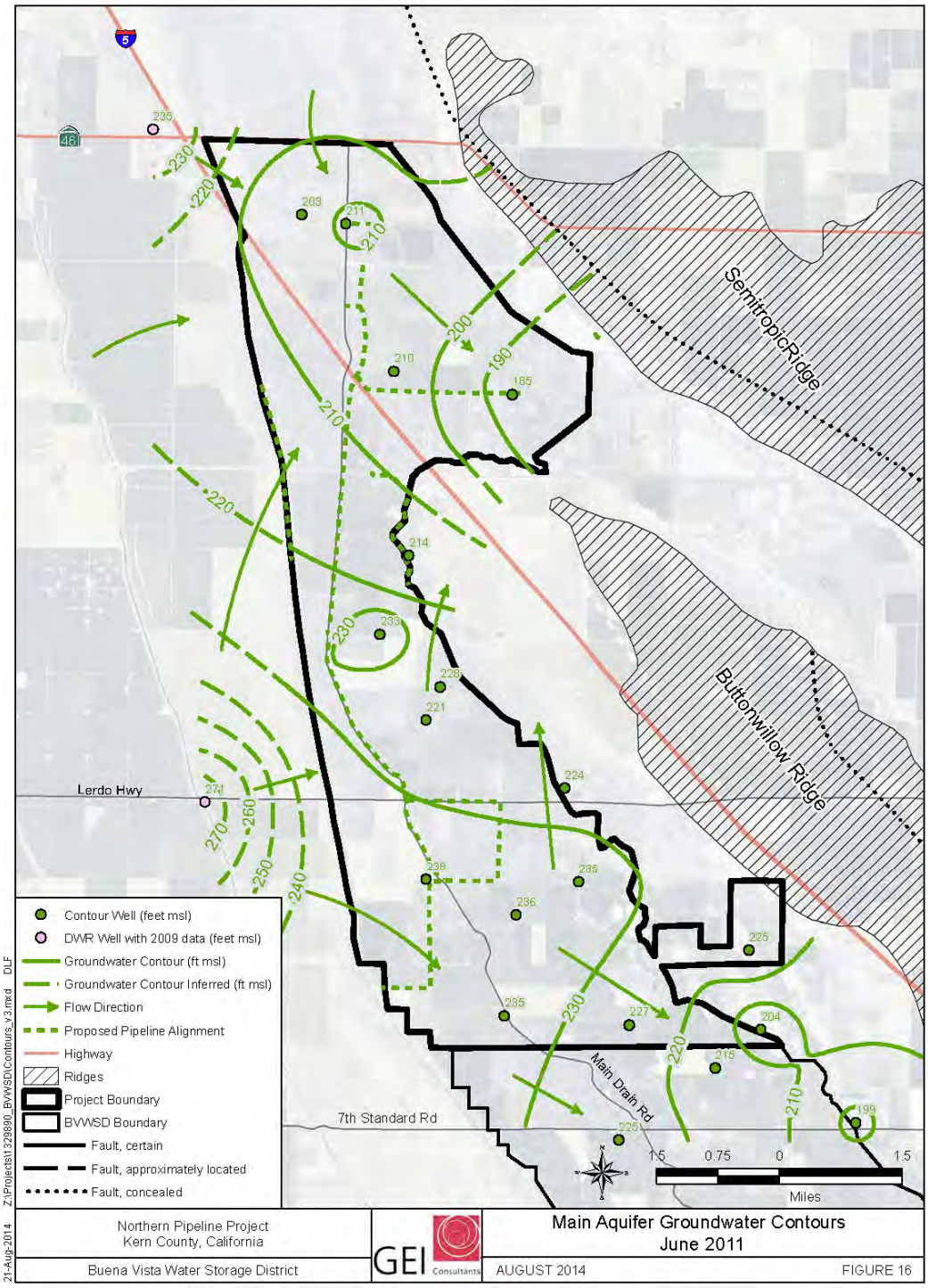


Figure 17 Main Aquifer Groundwater Contours, June 2013

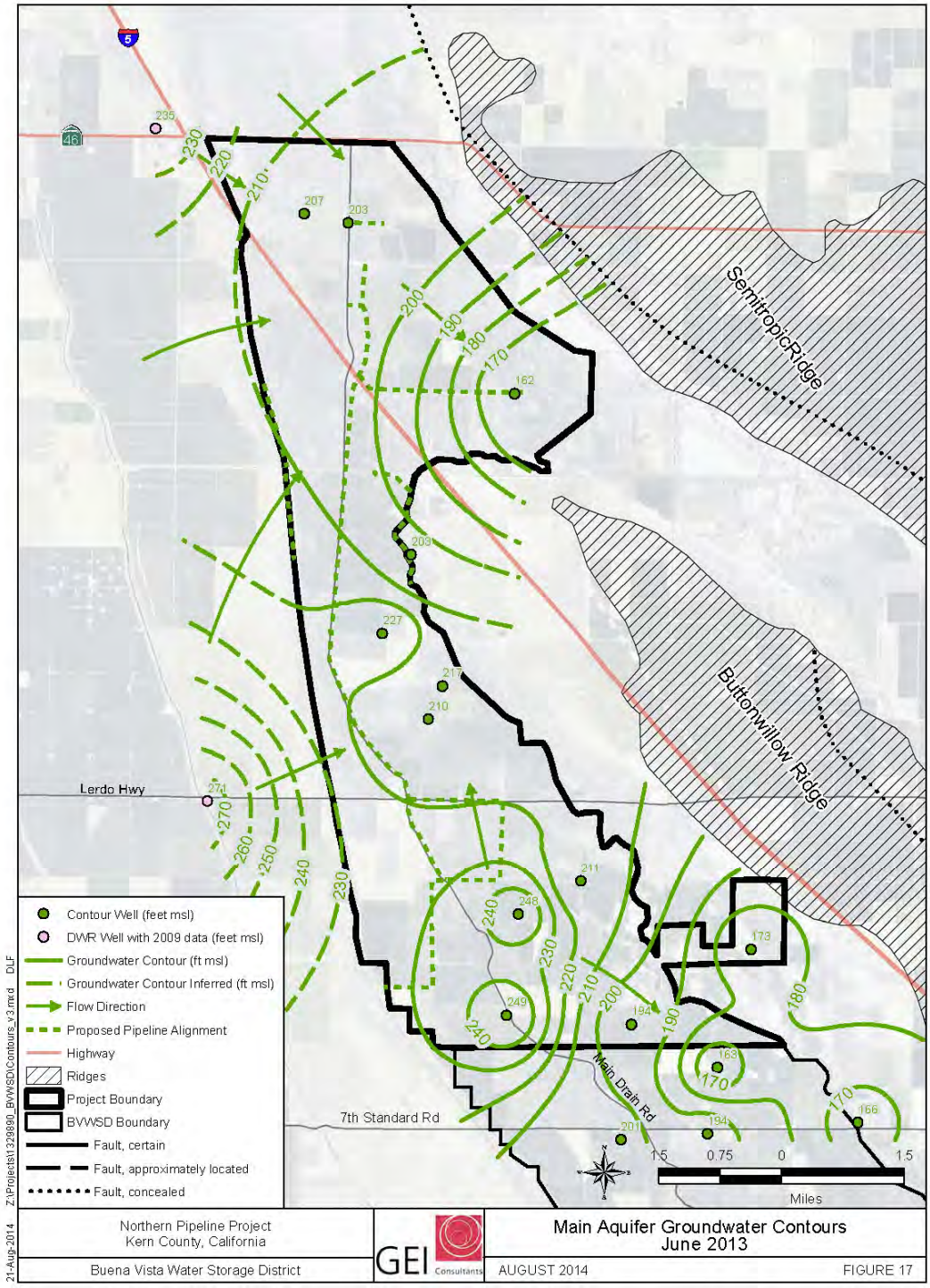
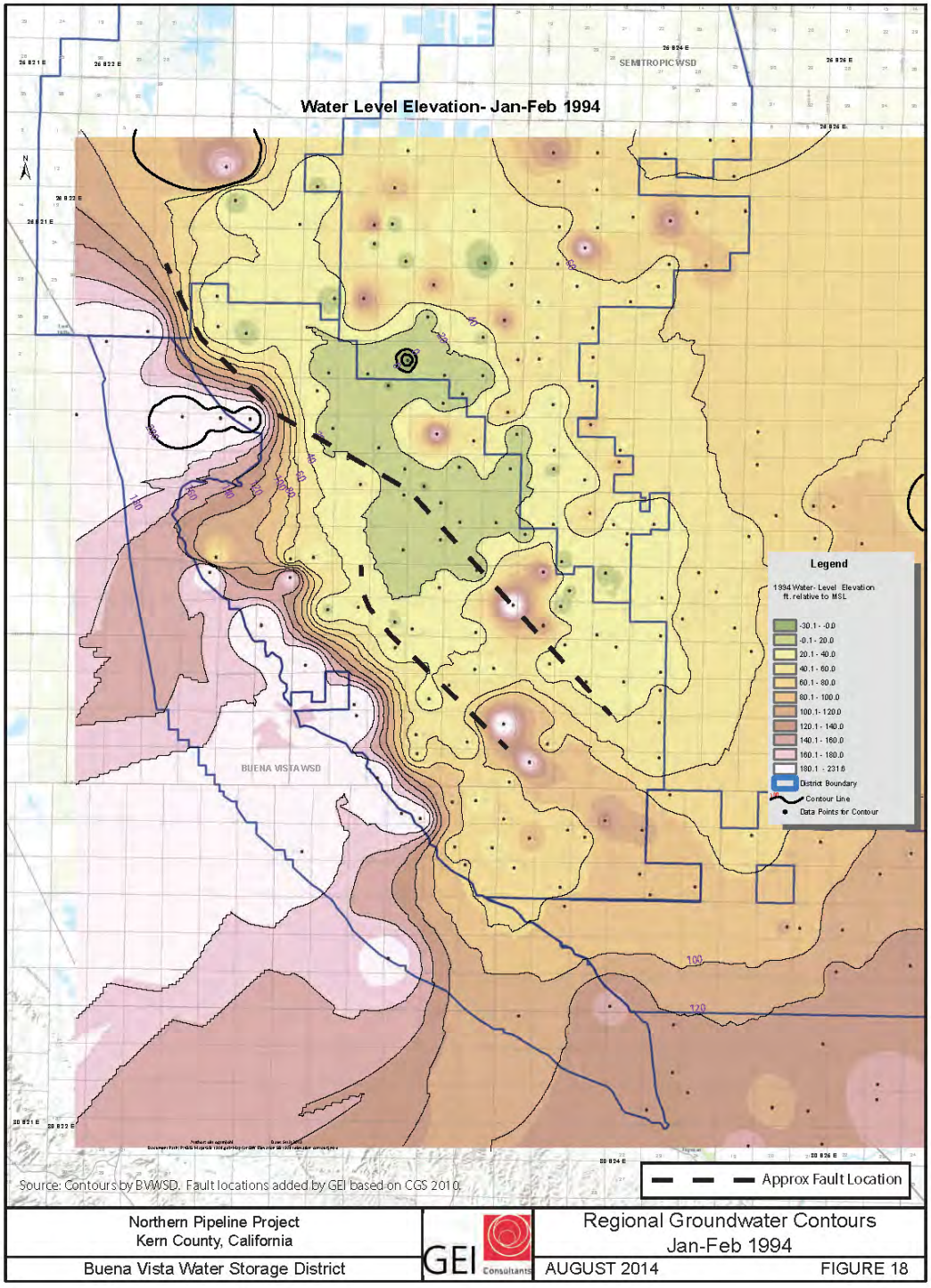


Figure 18 Regional Groundwater Contours, Jan-Feb 1994



3.7 Groundwater Gradients

The groundwater gradients in part govern the rate that groundwater will leave or enter the area. The perched and deep aquifers groundwater gradients were estimated from the groundwater contours shown on **Figures 15 through 17** for just those areas where inflow or outflow is projected to occur. Where insufficient measurements were available to develop groundwater contours, a pair of wells were used to estimate the gradient.

The groundwater gradient for the perched aquifer to the outflow areas to the north and east is flat, ranging from about 0.0002 to 0.0009. The groundwater gradient from the inflow area from the south also flat and is estimated to be about 0.001. The groundwater gradient from the west was about 0.003. The gradient of the ground surface from south to north in the Project area is about 0.0003.

The groundwater gradient in the deep aquifer at the northeast end of the Project area, between the Buttonwillow and Semitropic ridges is about 0.003. The groundwater gradient from the west and north are poorly defined and appears to be variable. For estimating purposes, a gradient of between 0.001 and 0.008 was assumed. Groundwater outflow is also occurring to the south and the gradient appears to be controlled by pumping in the aquifer just south of the Project area.

Groundwater contours presented on **Figure 18** shows there to be a very steep gradient associated with the Buttonwillow and Semitropic ridges' concealed faults. This steep gradient near the linear feature suggests that the faults are a barrier to groundwater flow, creating about 170 feet of difference in the groundwater levels over a short distance. For this reason, the outflow is likely to be very small due to this subsurface barrier to flow. The gap between the faults is a small area where groundwater outflow from the Project area to the east can occur.

3.8 Hydraulic Characteristics

The aquifer hydraulic characteristics govern the rate that water will recharge and move through the aquifers. **Figure 8** shows the locations where tests of the aquifer hydraulic characteristics were made. **Table 2** provides a summary of the aquifer characteristics.

In 2014, GEI Consultants, Inc. and BVWSD performed slug testing in piezometers to estimate the hydraulic conductivity of the perched water aquifer. The details and analyses of the slug testing are provided in **Attachment A**. The slug tests showed clayey to silty sediments had a hydraulic conductivity of 0.7 feet per day where silty to sandy sediments had a hydraulic conductivity of 3 to 8 feet per day.

Long-term aquifer tests were performed at three locations, using one pumping well and one observation well (URS, 2010). All of these tests were performed just south of the Project area as shown on **Figure 8**. This type of testing can provide highly reliable data if the test

conditions are valid. However, based on our review of the results it appears that only one of the test locations had valid testing conditions and only the results from this test have been used in the analysis in this study.

Specific yield estimates are best determined by aquifer testing with pumping and observation wells. However, none have been made within the Project area. The test made south of the Project area produced a very low value of 0.02, which would indicate the deep and shallow aquifers are unconfined in this area. Regional specific yield estimates made by the USGS for the San Joaquin Valley have an average specific yield of 0.15. Recent estimates made by the California Energy Commission for the BSA also used 0.15 as the specific yield (CEC, 2012).

Although the E-clay is a confining bed it is not impermeable. The vertical hydraulic conductivity of the clay is estimated to be about 0.0001 feet per day. It is estimated that this could allow about 500 acre feet per year (AFY) to seep from the deep aquifer through the E-clay in the Project area.

Table 2 Aquifer Hydraulic Characteristics

	Range		Average	
Aquifers	Thickness (feet)	Hydraulic Conductivity (feet/day)	Thickness (feet)	Hydraulic Conductivity (feet/day)
Perched [1]	0-30	1-8	23	4
Shallow	30-200	3-20	180 [2]	12 [3]
Deep [4]	200-400	30-80	200	47

Notes: [1] See Attachment A

[2] Total estimated thickness of aquifer less A- and E-Clay thicknesses

[3] Soils Engineering, 2011, hydraulic conductivity for top 100 feet of aquifer

[4] URS, 2010, from well N-4

3.9 Subsurface Inflow and Outflow Estimates

Subsurface inflow and outflow estimates were developed for the perched, shallow, and deep aquifers using the width of the inflow and outflow areas, thickness of the aquifer, gradient, and hydraulic conductivity information presented above. The results of the estimates are present in **Table 3**.

3.10 Groundwater Discharge to Surface Water

Groundwater could discharge to the Main Drain Canal in years where the groundwater levels are within 6 feet of ground surface. However, it is not possible to measure the

discharge directly. Water in the Main Drain Canal is from stormwater runoff; tailwater from agricultural fields; spilled water from canals; and groundwater.

Tailwater and storm runoff from the community of Buttonwillow are collected by drainage ditches which flow to the Main Drain Canal. Most of the water conveyed in the canal is reclaimed and re-used by District landowners; the remainder is either delivered by the Goose Lake Canal to non-District landowners to the north or pumped to SWSD to the east. The District has an interconnection with SWSD used to transfer water into Buena Vista's system and to transport reclaimed tailwater collected by the Main Drain Canal to SWSD's system. Agricultural runoff typically enters the Main Drain Canal during the January and February pre-irrigation season and the May through August irrigation season, but the canal can also carry flows during other months due to additional agricultural operations or storm runoff.

Table 3 Summary of Inflow and Outflow Estimates

Aquifer		Estimated Hydraulic Conductivity (feet/day)	Thickness of Permeable Sediments (feet)	2008 Estimated Gradient (feet/feet)	2008 Inflow or Outflow Area (feet)	2011 Estimated Gradient (feet/feet)	2011 Inflow or Outflow Area (feet)	2013 Estimated Gradient (feet/feet)	2013 Inflow or Outflow Area (feet)	2008-normal		2011 - Wet		2013 - Dry	
										Inflow AFY	Outflow AFY	Inflow AFY	Outflow AFY	Inflow AFY	Outflow AFY
Perched Water															
Inflow:	Sub Inflow From West	2	22	0.003	56,000	0.003	56,000	0.003	56,000	62		62		62	
	Sub Inflow from South	0.7	20	0.001	13,200	0.001	13,200	0.001	13,200	1.5		1.5		1.5	
Outflow:	Sub Outflow to North (toward Tulare Lake)	8	22	0.0005	11,880	0.0007	11,880	0.0004	11,880		8		12		7
	Sub Outflow to Northeast (toward Tulare Lake)	6	25	0.0009	18,480	0.0003	18,480	0.0003	18,480		6		6		6
	Sub Outflow to East (toward Goose Lake)	3	25	0.0005	13,200	0.0002	13,200	0.0010	13,200		4		2		8
Shallow Aquifer															
Inflow:	Sub Inflow From West	12	180	0.008	56,000	0.001	56,000	0.002	56,000	1,014		1,014		1,520	
	Sub Inflow from North	12	180	0.002	11,880	0.002	11,880	0.0008	11,880			407		181	
Outflow:	Sub Outflow to North (toward Tulare Lake)	12	170			-	11,880	-	11,880		-		-		-
	Sub Outflow to East (toward Goose Lake)	12	150			0.0032	13,200	0.002	13,200		628		628		485
	Sub Outflow to South	12	175			0.0013	11,880	0.007	11,880		264		264		1,452
Deep Aquifer															
Inflow:	Sub Inflow From West	47	200	0.008	56,000	0.001	56,000	0.002	56,000	4,411		4,411		6,616	
	Sub Inflow from North	47	200	0.002	11,880	0.002	11,880	0.0008	11,880			1,772		788	
Outflow:	Sub Outflow to North (toward Tulare Lake)	47	200			-	11,880	-	11,880		-		-		-
	Sub Outflow to East (toward Goose Lake)	47	180			0.003	13,200	0.002	13,200		2,954		2,954		2,279
	Sub Outflow to South	47	175			0.003	21,120	0.011	21,120		3,676		3,676		16,541
	Vertical through E-clay										529		529		529

The water from the Main Drain Canal is pumped and reused by growers and BVWSD. **Table 4** provides an estimate of the amount of water reused or allowed to flow out of the Project area. It establishes a maximum allowable amount of groundwater that could discharge to the canal.

Table 4 Main Drain Water Reuse Estimates

Main Drain Canal Water Reuse	Type of Year		
	2008 – Normal (AFY)	2011 – Wet (AFY)	2013 – Dry (AFY)
Outflow to outside of BVWSD	1,527	6,647	0
BV Grower Reclamation	4,431	3,134	5,175
BV Reclamation	5,658	5,731	2,148
Total	**11,616**	**15,512**	**7,323**

3.11 Evaporation

Because groundwater levels in the perched water aquifer have been within 6 feet of the ground surface and the soils are clayey, capillary action can wick moisture up from the groundwater surface and evaporate at ground surface. The capillary fringe for silts is greater than 6 feet (Todd, 1980) and could be even greater for clayey soils similar to those present beneath the Project area. When groundwater levels decline in excess of 6 feet of ground surface this evaporation would stop. In 2008 groundwater levels were within 5 feet of ground surface over an area of about 2,800 acres. Assuming the evaporation would be about 1 AFY per acre the estimated outflow from the perched aquifer due to evaporation could be about 2,800 AFY.

3.12 Groundwater Storage

For purposes of this analysis groundwater in storage is the amount of water between grains of sediment in the subsurface that can drain by gravity and be recovered. Groundwater in storage is calculated in aquifers by multiplying the area being studied by the thickness of permeable sediment and by the specific yield. Groundwater can also be stored in fine-grained sediments but this water is slow to drain; may not be replaced; and removal may cause clay compaction and subsidence, thus making removal undesirable. This groundwater storage was not included in our estimates.

Table 5 shows the estimated storage in the aquifers and the amount of groundwater storage per foot of saturated sediments. The total groundwater in storage just beneath the Project area is about 1.2 million acre feet (AF). Because the actual depth of the A-clay is poorly defined and is believed to be up to 30 feet below ground surface, an average thickness of 23 feet was chosen for the perched aquifer thickness based on **Table 1**. Even with this thickness, the volume of water in the perched water zone is relatively small due to the

thinness of the sediments and only represents about 6 percent of the total water in storage beneath the Project area.

Table 5 Summary of Groundwater in Storage Northern Portion of BSA

Aquifers	Average				Estimated Groundwater per Foot of Saturated Thickness (AF/foot)
	Permeable Sediment Thickness (feet)	USGS Specific Yield (unitless)	Area (acres)	Estimated Groundwater in Storage (AF)	
Perched	23	0.15	20,400	70,380	3,060
Shallow and Deep	380	0.15	20,400	1,162,800	3,060

3.13 Recharge Areas and Sources

Within the Kern County groundwater subbasin, groundwater recharge occurs from stream seepage along the eastern portion of the subbasin and the along the Kern River, as well as recharge from applied irrigation water (DWR 1995).

In BVWSD groundwater recharge occurs from precipitation within the BSA, subsurface inflow from aquifers west of the district, which results from precipitation in the watershed west of BVWSD, from district-owned spreading ponds, seepage from District and private canals and deep percolation from applied water. Estimates of the recharge from these sources are provided in **Table 6** along with estimates for just the Project area.

Irrigation water is conveyed from south to north by the East Side and West Side canals that define the BSA's eastern and western boundaries. Water is diverted from these canals to irrigated fields via a system of smaller lateral canals and private ditches which are interconnected by manually-operated weirs and turnouts operated by District staff. Average annual seepage from the East Side and West Side canals was estimated to be about 15,400 AFY (BVWSD, 2014).

Table 6 Estimated Groundwater Recharge

All Values in Acre-Feet

Location	Type of Year 2008 - Normal	2011 - Wet	2013 - Dry
BVWSD Total Area [1]			
Deep percolation rainfall [5]	2,758	2,493	849
District Spreading Ponds	-	67,917	-
District Canal Seepage	33,137	55,720	16,595
Main Drain Canal Seepage	Unknown	Unknown	Unknown
Deep Percolation Applied Water	5,596	6,273	5,243
BVSWD Total	**41,491**	**129,910**	**21,838**
BSA Total Estimate (92% of total BVWSD area)			
Deep percolation rainfall	2,538	2,294	781
District Spreading Ponds	-	-	-
District Canal Seepage [2]	30,486	53,491	15,931
Main Drain Canal Seepage	Unknown	Unknown	Unknown
Deep Percolation Applied Water [4]	5,148	5,771	4,824
BSA Total	**38,172**	**59,262**	**20,755**
Project Area Estimate (44% of total BSA)			
Deep percolation rainfall	1,117	1,009	344
District Spreading Ponds	-	-	-
District Canal Seepage [3]	13,414	23,536	7,010
Main Drain Canal Seepage	3,105	Unknown	Unknown
Deep Percolation Applied Water	1,544	1,731	1,447
Project Area Total	**19,179**	**25,267**	**8,456**

Sources: [1] BVWSD, 2014

[2] Sierra Scientific Services, 2012, 37,000 AFY average year seepage losses for BSA canals

[3] BVWSD, 2014, WaterSMART Grant Application, used for normal year projection, remainder are based on percent of service area

[4] BSA is 92% of total BVWSD project area.

[5] Average annual rainfall times area times assumed deep perc of 10%

Annual precipitation typically ranges from less than 1 to 9 inches. The average annual precipitation is about 5.643 inches per year (BVWSD, 2014). Recharge from precipitation was estimated based on the total area of BVWSD and assuming about 10 percent of the precipitation becomes deep percolation.

3.14 Water Supply

About 40,000 acres of land are used for growing crops in the BSA. The primary water demand within the District is irrigation for agriculture. The crop water demand is met by the in-season delivery of surface water from seasonally regulated flows of Kern River

water; schedulable deliveries of State Water Project (SWP) water through the California Aqueduct; and occasional purchases or exchanges for water from the federal Central Valley Project, delivered to the Kern River Channel via the Friant-Kern Canal from westward flowing Sierran drainages north of Kern County. Irrigation demand that cannot be met by surface water deliveries must be satisfied by groundwater pumping. **Table 7** shows water supplies used in the BVWSD for normal, wet, and dry years.

Table 7 contains estimates for the entire BVWSD, in order to estimate the amount of water supplies used just within the Project area. For the period of 2000 to 2009 the annual District surface supply was 63,700 AFY of which 5,300 AFY was delivered to the Maples Service Area. Based on ratio of these delivers about 92 percent of the surface water supplies were delivered to the BSA area. The northern portion of the BSA where the Project area is located is about 44 percent of the total BSA area so the surface water pumping was proportioned in this manner.

The total number of District and privately owned wells in the BSA area is 165 wells, with 36 wells being within the Project area. The total pumped volume was distributed based on the percent of wells in the Project area.

Table 7 Water Supply Estimates

Source		Type of Year 2008 - Normal (Acre-Feet)	2011 - Wet (Acre-Feet)	2013 - Dry (Acre-Feet)
BVWSD Total Area [1]				
Groundwater - within BVWSD				
	District Deep Wells	6,100	219	2,905
	Non-District Deep Wells			
	Estimate Private Wells	40,313	35,729	54,572
	Subtotal	**46,413**	**35,948**	**57,477**
Imported Surface Water and Groundwater				
	Imported Groundwater (Olces	10,000	-	6,924
	KR/ST Exchanges (total) [2]	32,232	66,919	41,539
	SWP	25,786	53,535	33,231
	Friant-Kern	6,446	13,384	8,308
	Kern River	42,610	93,674	1,018
	Subtotal	**84,842**	**160,593**	**49,481**
BSA Total Estimate				
	Groundwater	**42,700**	**33,072**	**52,879**
	Imported Surface Water and Groundwater	**77,814**	**147,290**	**45,382**
Project Area Estimate				
	Groundwater	**8,796**	**7,795**	**11,907**
	Imported Surface Water and Groundwater	**34,238**	**64,807**	**19,968**

Source: [1]BVWSD 2014

3.15 Subsidence

Land subsidence has occurred throughout much of the San Joaquin Valley. Most of the subsidence is attributed to groundwater extractions and dewatering of relatively thick clay layers, including the E-clay. Subsidence has occurred within the Kern County groundwater subbasin along the east side of the subbasin both north and south of Bakersfield. Little, if any, recent or historic subsidence has occurred due to groundwater extractions beneath BVWSD (Luhdorff and Scalamni, 2014).

4 Water Quality

The District receives their surface water supplies from the Kern River, the State Water Project, and occasionally the federal Central Valley Project. The average total dissolved solids (TDS) concentrations for each of these water sources is shown in **Table 8.** Information in **Table 8** is based on data provided from the Kern County Water Agency from BVWSD files and other reports.

Table 8 Summary of Surface Water Quality

		Range	Average	Type of Year - Inflow or Outflow		
		TDS	TDS	2008 - Normal	2011 - Wet	2013 - Dry
Sources		mg/L	mg/L	mg/L	mg/L	mg/L
Imported Water [1]						
	SWP	350-450	400	400	400	400
	Kern River	90-120	105	105	105	105
	Friant-Kern		50	50	50	50
	Olcese Wells		264	264	264	264
Weighted Average based on Mixtures of Imported Water				**236**	**228**	**375**
Perched Water						
Inflow:	Sub Inflow From West			4915	4915	4915
	Sub Inflow from South			1715	2015	2315
Outflow:	Sub Outflow to North (toward Tulare Lake)			1733	2600	2800
	Sub Outflow to Northeast (toward Tulare Lake)			3068	2600	2800
	Sub Outflow to East (toward Goose Lake)			950	1100	1100
Shallow Aquifer						
Inflow:	Sub Inflow From West			3000	3000	3000
Outflow:	Sub Outflow to North (toward Tulare Lake)			1600	1400	1400
	Sub Outflow to East (toward Goose Lake)			2300	2100	2500
	Sub Outflow to South			1500	1500	1500
Deep Aquifer						
Inflow:	Sub Inflow From West			3000	3000	3000
Outflow:	Sub Outflow to North (toward Tulare Lake)			1600	1400	1400
	Sub Outflow to East (toward Goose Lake)			2300	2100	2500
	Sub Outflow to South			1500	1500	1500
Main Drain [1]						
	Tailwater	1920-3129	2525	458	458	2525

Sources: [1]BVWSD, GMP 2012, and AWMP 2014

Groundwater quality varies by location and depth. There are some suggestions in different reports that the water quality in the aquifers has the highest TDS near the Coast Ranges. As groundwater migrates from the Coast Ranges to the east into the valley, the TDS concentrations decrease (Rector, 1983). However, the well screen intervals are unknown so the data are not specific to a single aquifer and could be related to groundwater beneath the E-clay and the underlying marine sediments.

Ten wells were sampled in 2010 that obtained water from various depths (URS, 2010). The TDS ranged from 860 mg/L up to 4,300 mg/L. The highest concentration appears to have well screens below the E-clay.

Electrical conductivity measurements, which can be used to approximate the TDS, are made by BVWSD in their piezometers and deep aquifer monitoring wells. Measurements are only obtained once annually generally in the spring of each year but in some cases in the fall or not at all. **Figure 19** shows salinity contours for the perched aquifer, prepared from March 2012 monitoring data. **Figure 20** shows salinity contours for the deep aquifer, prepared from March 2012 monitoring data. The contours show the concentrations are highly variable throughout the Project area. These figures were used to estimate the TDS for each of the groundwater inflow and outflow areas.

Figures 21 through 25 show the trend in TDS concentrations over time at deep wells and nearby piezometers. The trends in the concentrations for the perched and main aquifer are quite different from location to location but overall the trend is flat. The perched aquifer has a much wider range of concentrations from as low as 350 mg/L where piezometers are adjacent to and are influenced by canal water seepage to as high as 5,000 mg/L. **Figure 8** shows the locations of piezometers and deep monitoring wells.

Figure 19 Perched Groundwater TDS Contours, March 2012

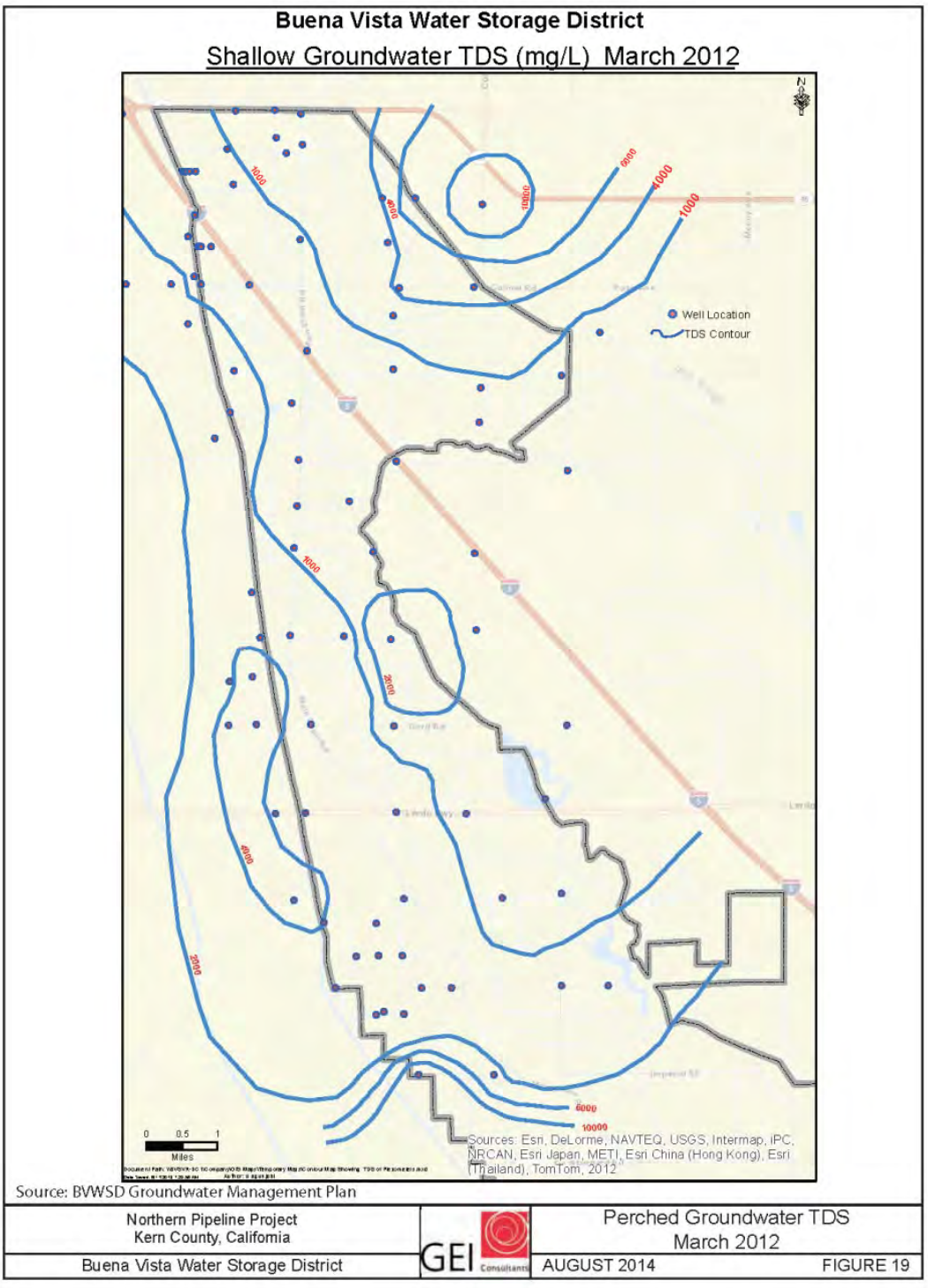


Figure 20 Main Aquifer TDS Contours, March 2012

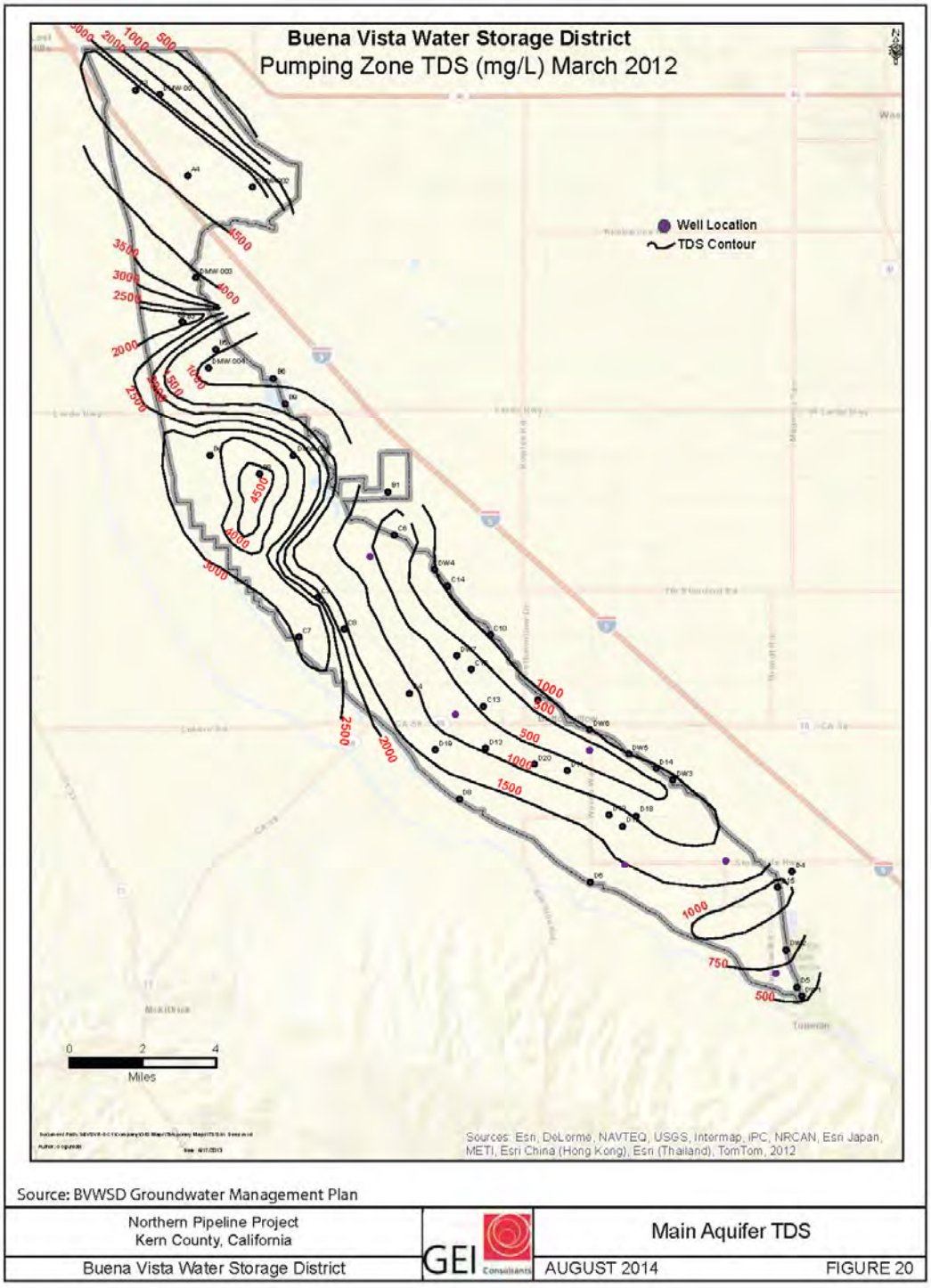


Figure 21 TDS Comparison DMW01 and BV02D and BV05A

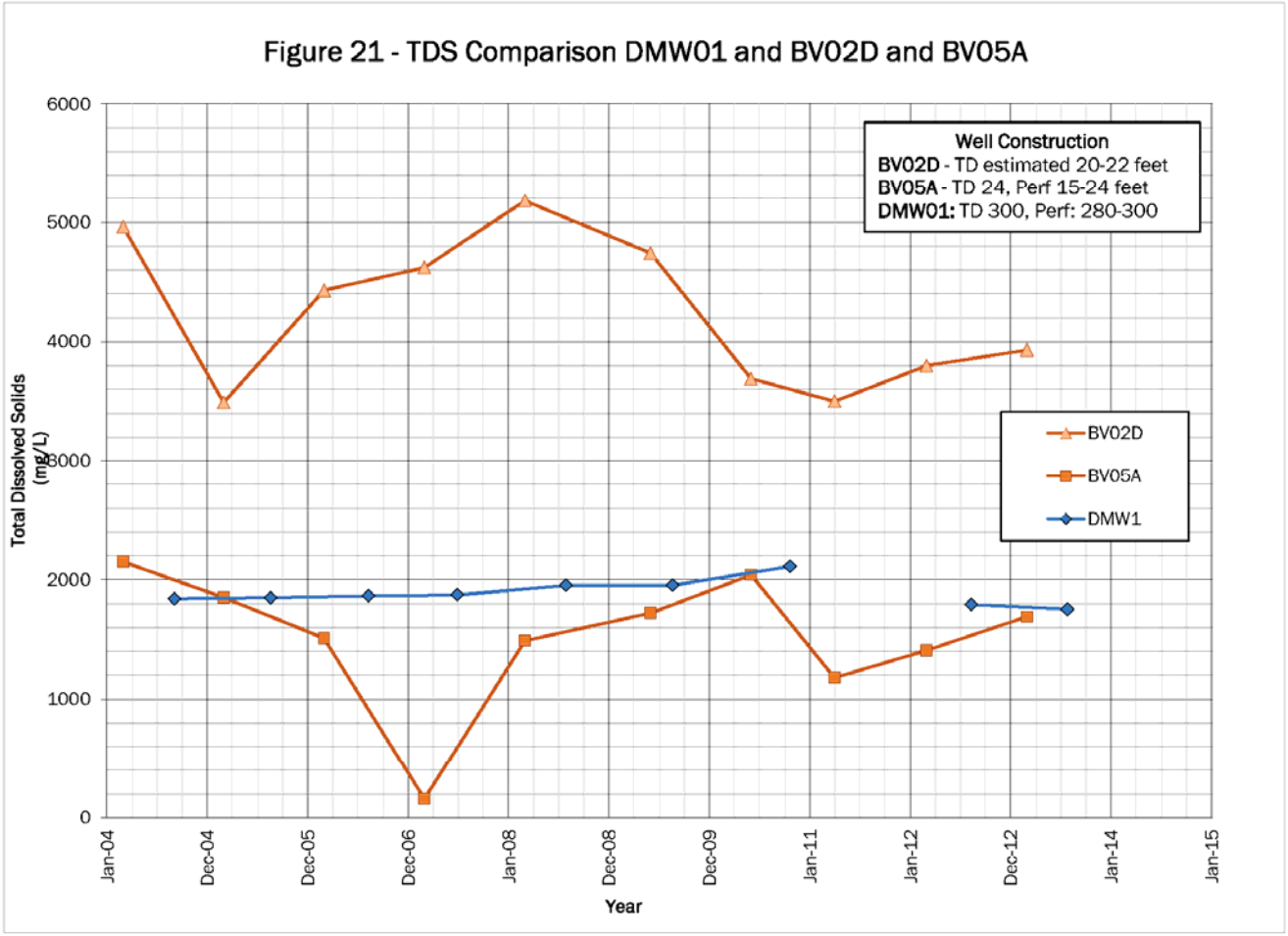


Figure 22 TDS Comparison DMW02 and BV13

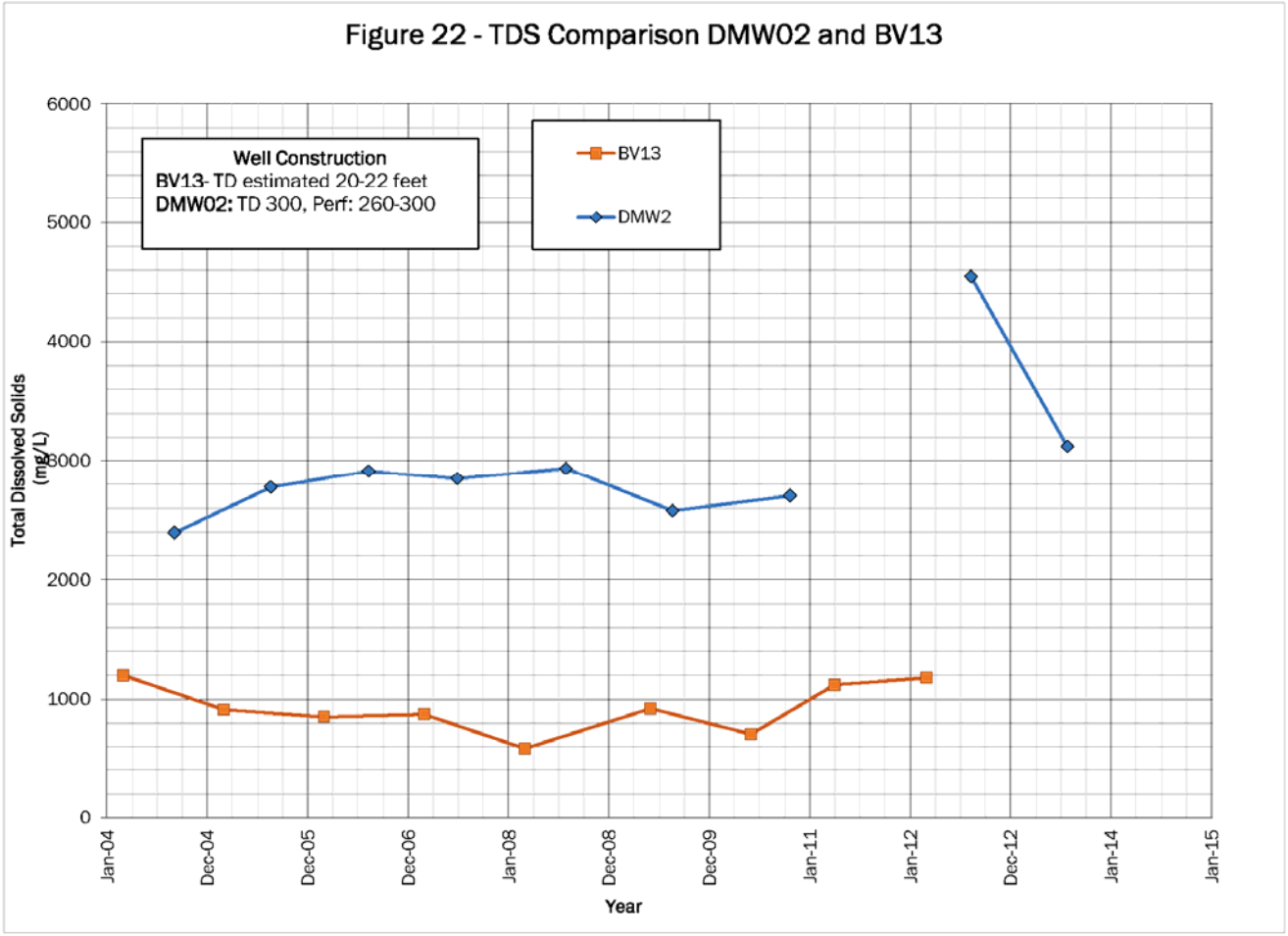


Figure 23 Groundwater Level Comparison DMW03 and BV15

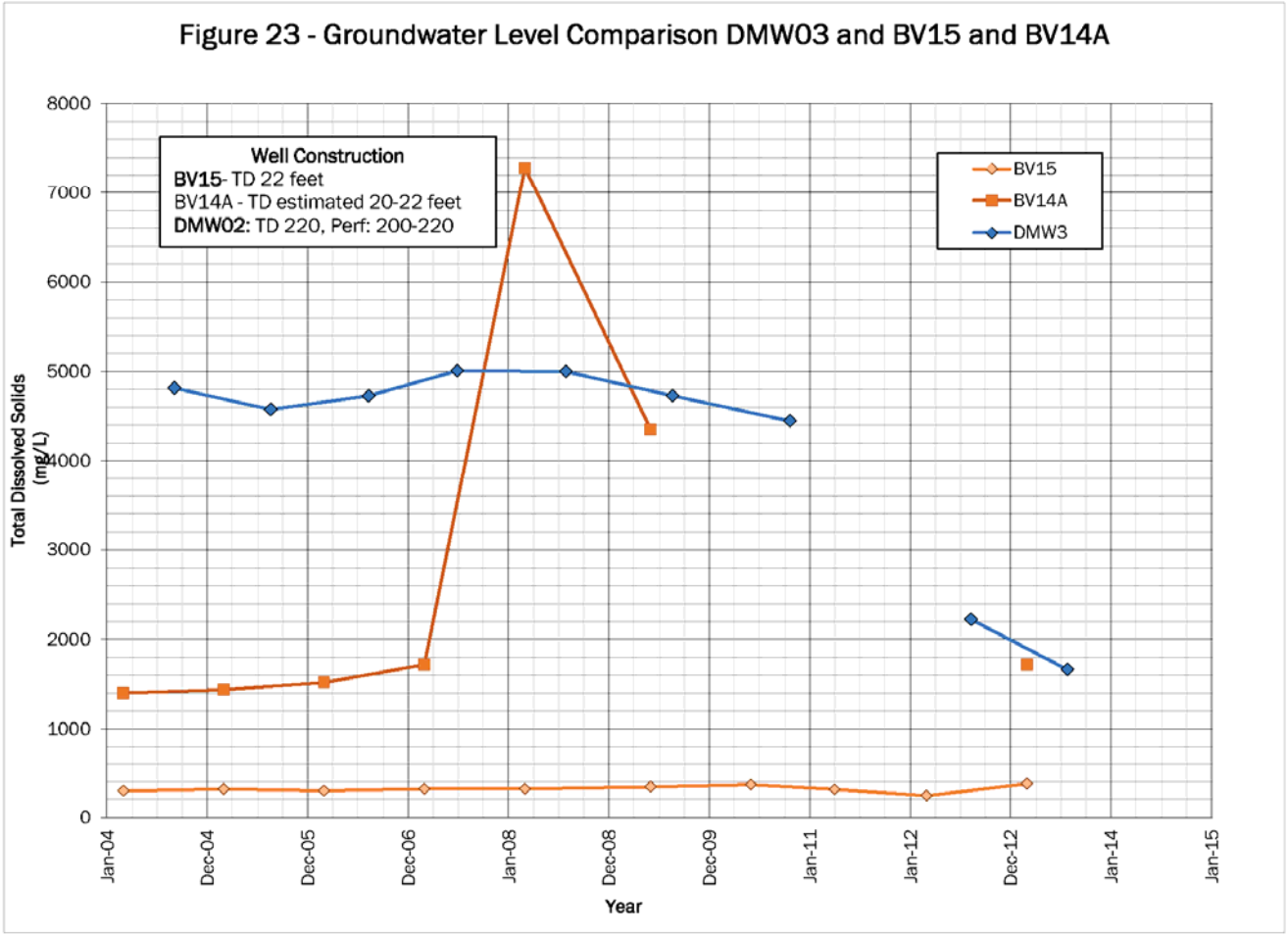


Figure 24 Groundwater Level Comparison DMW04 and BV24 and BV26

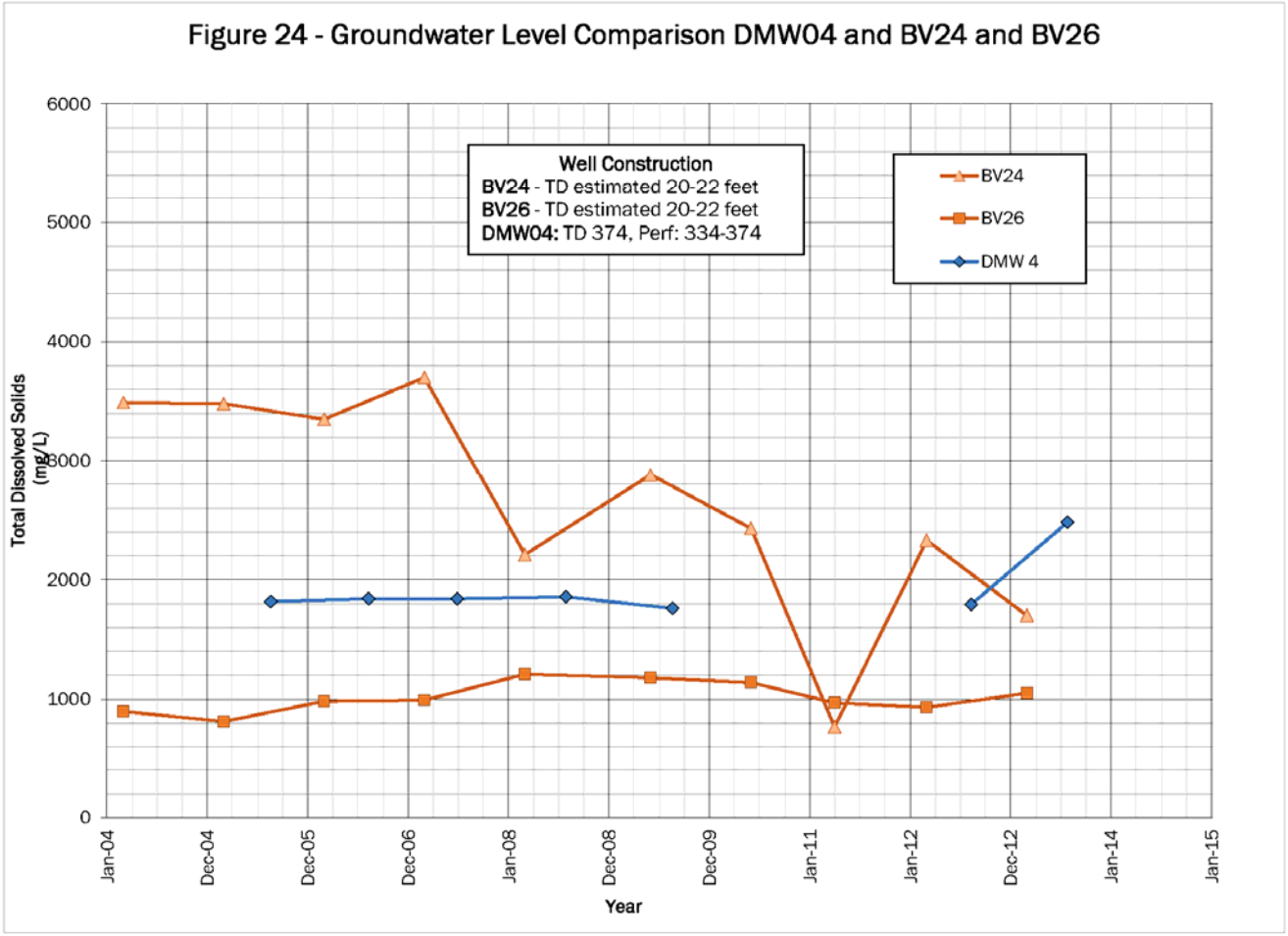
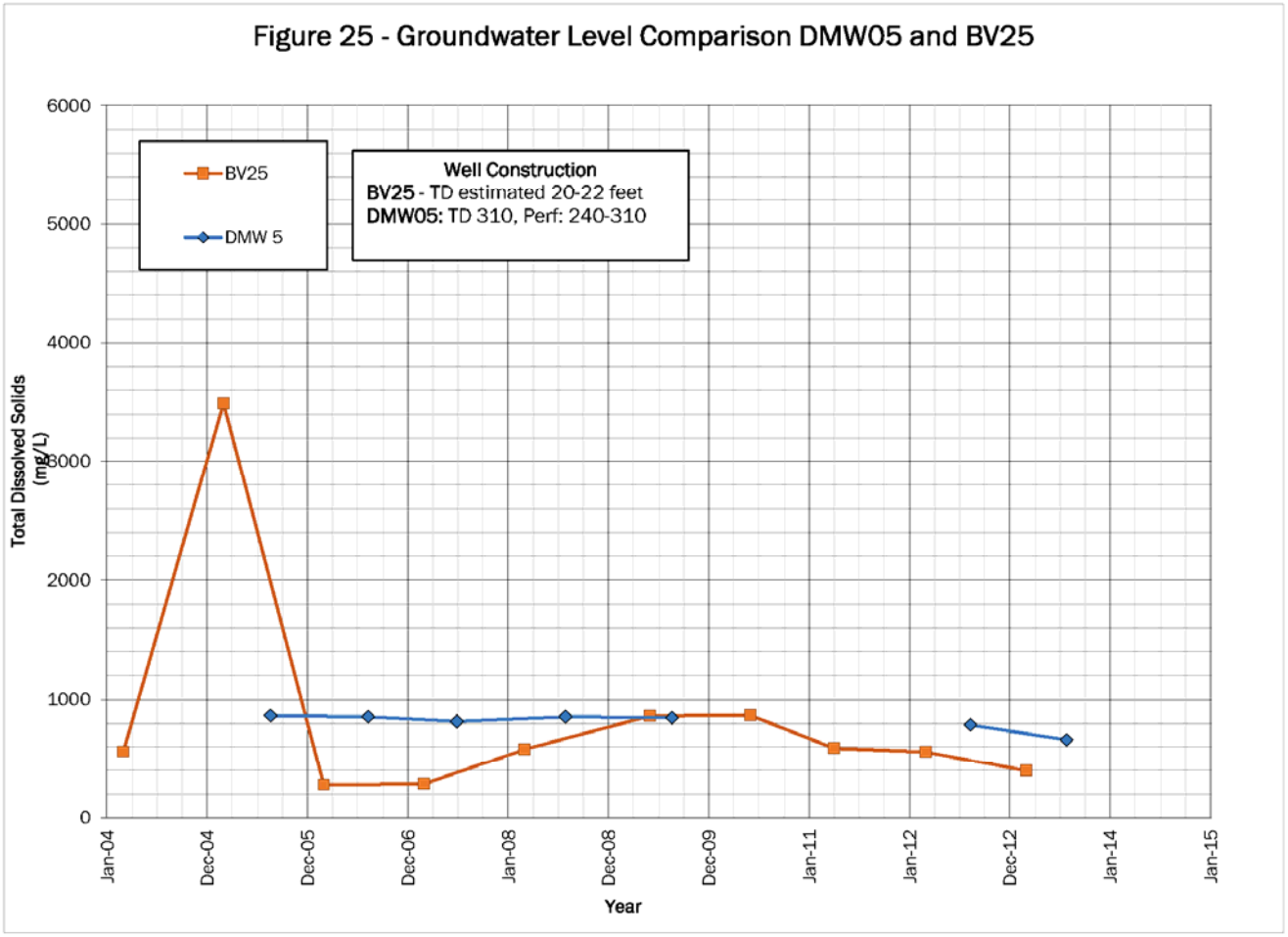


Figure 25 Groundwater Level Comparison DMW05 and BV25

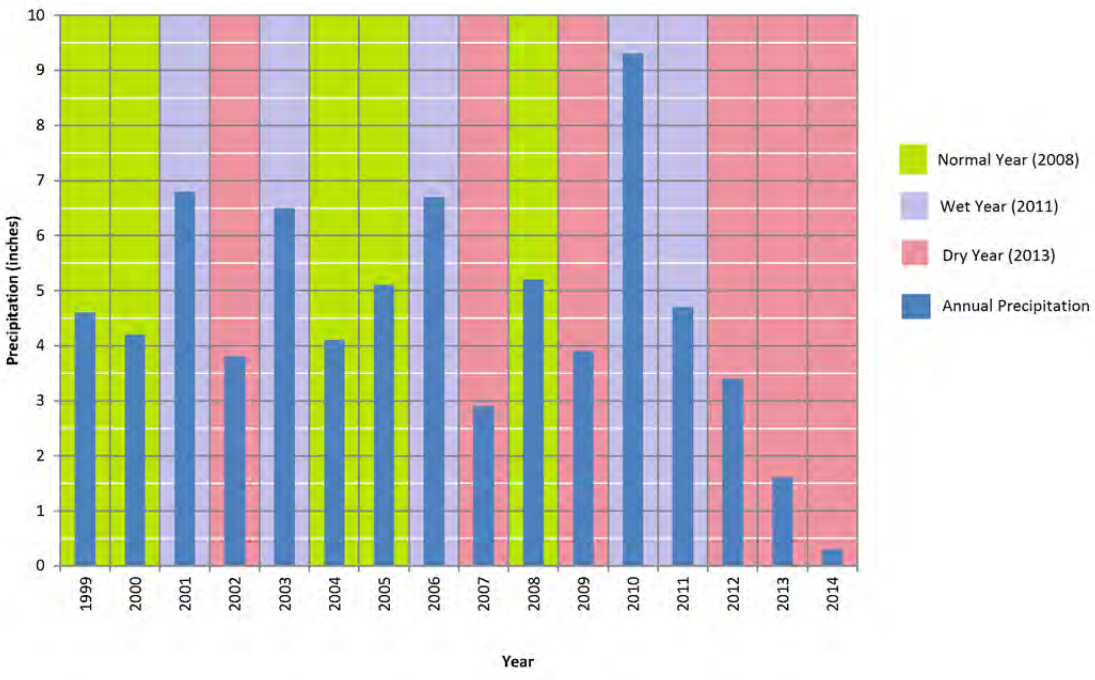


5 Baseline Conditions

Baseline groundwater level and salinity levels were developed using water and salt balances to establish current conditions. The baseline balances were then changed to reflect groundwater conditions due to implementation of the Project and cumulative effects of other foreseeable projects in the area to forecast the potential affects. The forecasted future effects are compared to the baseline conditions to assess the potential impact of the proposed Project.

The balances were developed using three typical water supply years, 2008 as the normal water supply year; 2011 to represent a wet year; and 2013 to represent a dry year. These representative years were then assigned to other similar types of years during a 15-year historic base period, from 1999 to 2014. **Figure 26** shows the distribution of the typical years to the entire base period. The baseline water and salt balances results were then calibrated and reviewed against measured groundwater levels and salt concentrations in Project area piezometers and groundwater monitoring wells to further calibrate the results. Both the water and salt balances were developed with multiple iterations until a reasonable match to the physical data was obtained.

Figure 26 Year Types and Precipitation



It should be noted that during the 15-year base period, the last 3 years were drought years and have not been present in the historic record for over 40 years, since 1976 and 1977, when two back-to-back critically dry years occurred.

The projected 15-year groundwater level and salt concentrations from the balances were compared to conditions measured at piezometer and monitoring well BV14A and DMW03 as these are located near the middle of the Project area. Although BV15 is adjacent to DMW03, piezometer BV15 is located next to and is affected by the East Side Canal. The groundwater from BV15 had a TDS of 350 mg/L, which indicates that it is affected by water in the canal. This makes it a less desirable location for comparison to the water and salt balances, so piezometer BV14A was used for calibration purposes. Locations for the monitoring wells are shown on **Figure 8**. **Figure 12** shows the hydrograph of groundwater levels in these piezometers and wells. **Figure 23** shows salinity over time for these piezometers and wells.

5.1 Baseline Water Balance

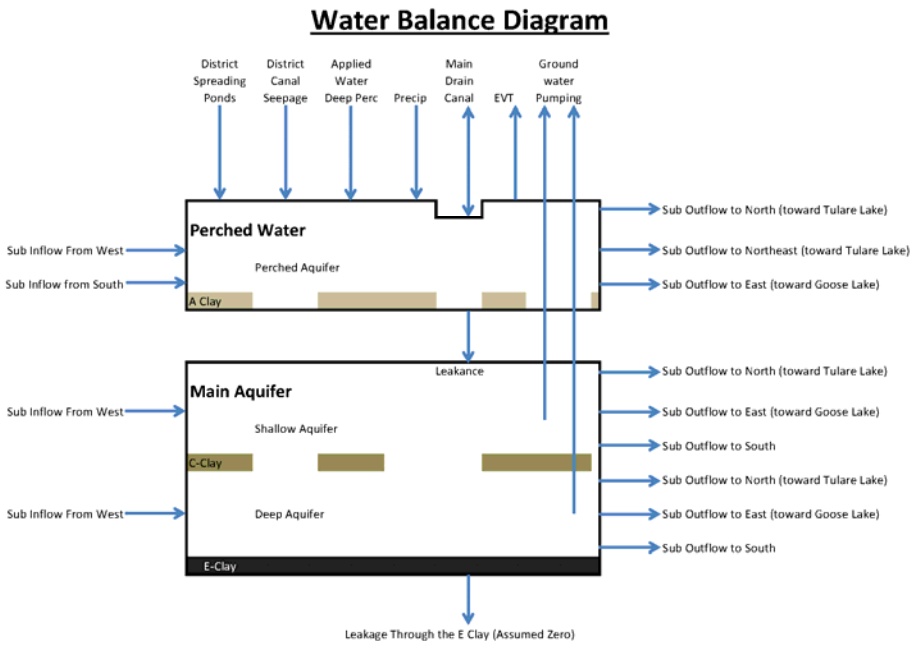
A groundwater body balance was prepared to represent baseline conditions in the Project area for the 3 typical years. Water balance components were derived from information presented in the previous sections of this report.

Water balances are the summation of flow into (inflow) and flows from (outflow) a defined area. There are two different types of water balances, a basin balance and a body balance. A basin balance contains all components of inflow and outflow for a specified area and contains many items that may not necessarily affect groundwater. Basin balances are more complex than a groundwater body balance.

A groundwater body balance only accounts for inflow or outflow components that directly affect the groundwater body and are easier to construct and simpler to interpret. For this study, a groundwater body balance was chosen for its simplicity. **Figure 27** shows a schematic of the water balance components for the Project area. The shallow and deep aquifers were grouped together due to the lack of evidence that the C-clay is acting as a barrier to groundwater flow and separating these aquifers. For purposes of discussion, the shallow and deep aquifers hereafter are described as the “main aquifer.” The water balance is split into the perched aquifer and the unconfined aquifer, and inflows and outflows from each aquifer were assigned.

As shown on the diagram the Main Drain Canal is considered to be a component of both inflow and outflow from the perched aquifer. The conditions which govern whether it creates outflow or inflow are based on groundwater levels and canal flows. Both of these conditions may vary along the canal.

Figure 27 Water Budget Diagram



Water balances for this analysis were developed using readily available data. It is common that water balances contain some well-quantified components and some poorly-quantified components. Components with poorer quantification are typically back-solved as being the component that is not known. A certainty index (CI) was assigned to each component in the water balance to identify well-quantified and poorly-quantified components. The CI is expressed as a percent and the value contained in the balance could vary by plus or minus this percent of the value contained in the balance. Major components with high CI's should be investigated in the future to better quantify these components and the higher quality data should be incorporated into the balances as this additional information becomes available.

The water balance contains many calculated values which are being expressed with an implied accuracy to the single digit. However, in reality the accuracy of these values are at best to the nearest hundred. Discussions within the text round the values from the tables to the hundreds.

Attachment B, **Table B-1** provides the baseline water balance for the Project area. The baseline water balance shows inflow and outflow from the perched aquifer. Inflow to the perched aquifer include deep percolation of applied water and precipitation, subsurface inflow, seepage from the East Side and West Side canals, and the Main Drain Canal The total inflow to the perched aquifer, based on the typical years, ranges from about 19,200 to 29,200 AFY. The lowest inflow was in 2013, a dry year when surface water deliveries were about 50 percent of those in 2008 or 2011. In all years, three-quarters of this inflow

was the result of District canal seepage. Outflows include groundwater discharges to surface water (Main Drain Canal); subsurface outflows; leakance to the main aquifer; and evaporation. The subsurface components of outflow from the perched aquifer are relatively well-quantified and are small volumes. The greatest uncertainties occur in the estimate of leakance to the underlying aquifers and discharges of groundwater to the Main Drain Canal, both represent some of the largest values in the perched aquifer balance.

The main aquifer water balance includes two inflows and four outflows. Groundwater contours from 2011 and 2013 **(Figures 11 and 12)** were used to estimate the direction of inflows and outflows from the main aquifer. Inflows to the main aquifer include subsurface inflow from the north and west and leakance from the perched aquifer. The total inflow to the main aquifer ranges from about 16,600 to 18,100 AFY. Outflows from the main aquifer are subsurface outflow to the east, south and through the E-clay and from groundwater pumping. Groundwater pumping is for the most part the largest component of outflow. Subsurface outflow to the south at times can surpass groundwater pumping, especially during drought years when pumping south of the Project area increases. Outflows in normal and dry years exceed inflows but during wet years the inflows are greater than outflows. The greatest uncertainty occurs in the estimate of leakance from the overlying perched aquifer and represents one of the largest values.

The results of the water balance are produced in AFY. These values were converted to change in groundwater levels using the storage coefficient of 3,000 AF per foot of storage. **Figures 28 and 29** shows the results of the long-term projection of the water balance for the perched and main aquifers in comparison to the groundwater level measurements. The results show the water balance has the capability of reasonably simulating groundwater conditions.

Figure 28 Groundwater Level Comparison to Baseline Water Balance – Perched Aquifer

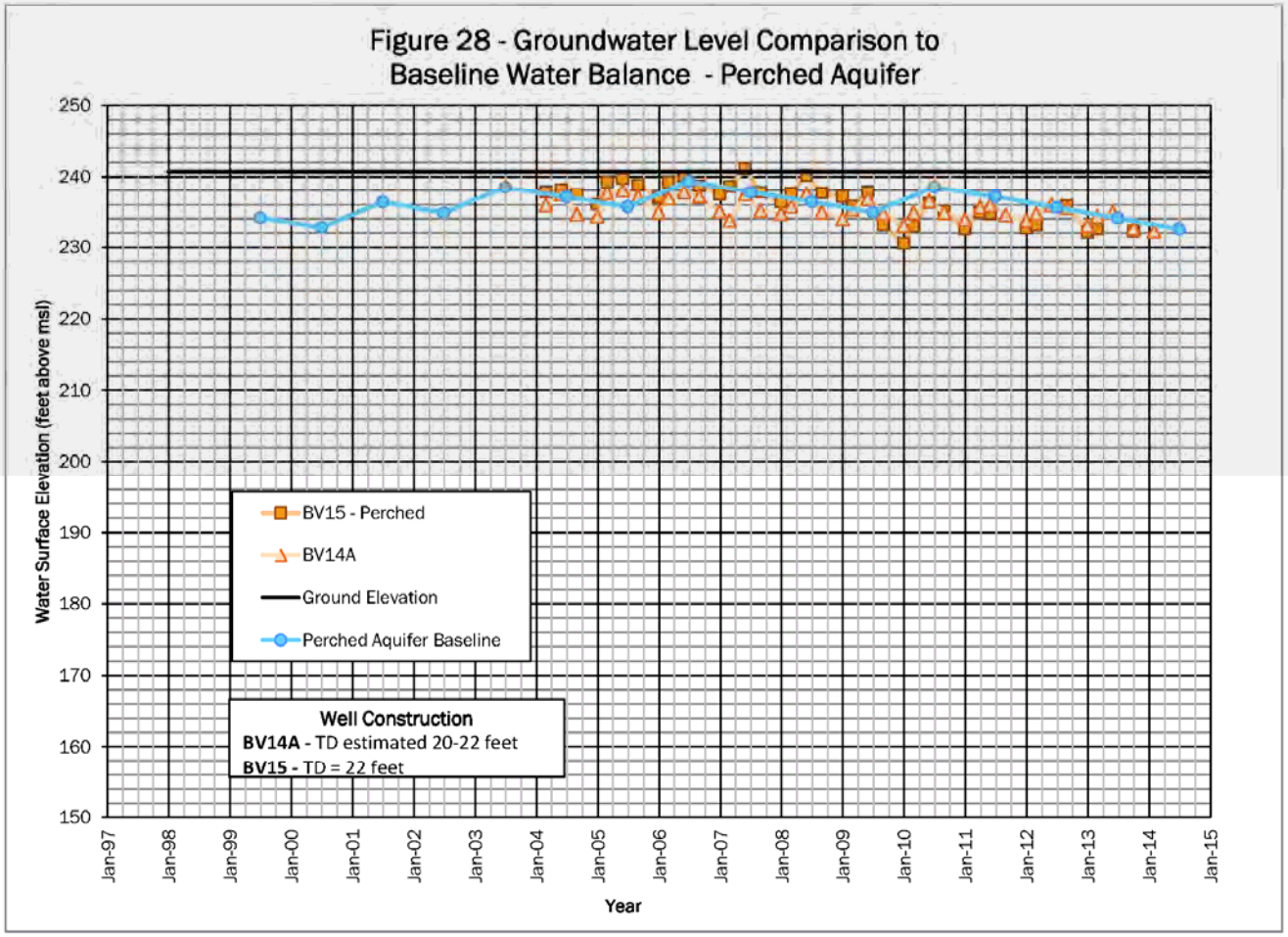
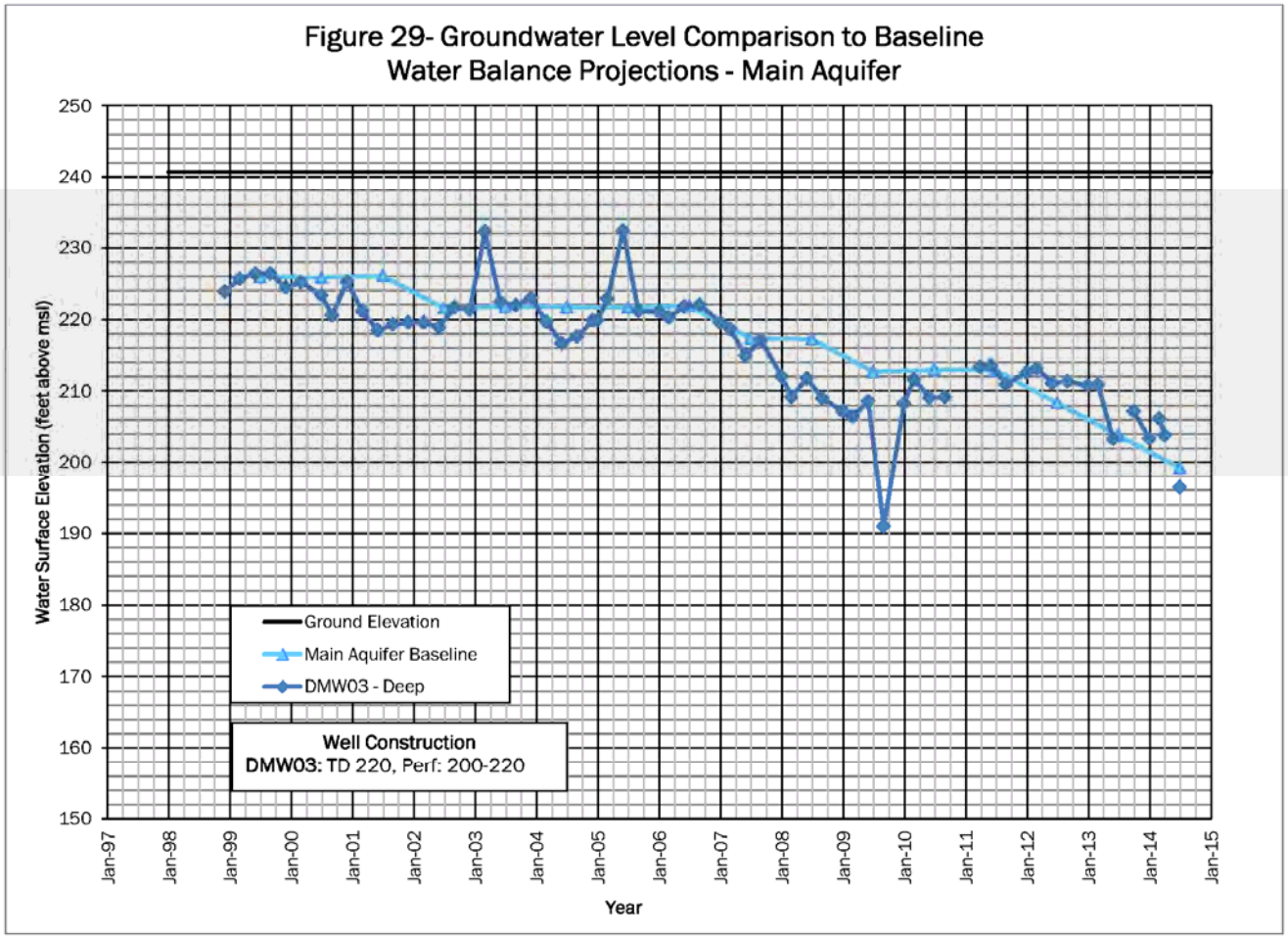


Figure 29 Groundwater Level Comparison to Baseline Water Balance – Main Aquifer



5.2 Baseline Salt Balance

The baseline salt (TDS) balance was developed similar to the baseline water balance. The salt balance is a summation of salts into and out from the perched and main aquifers. The baseline water balance provides the volumes. The salinity concentrations of each component of the water balance was assigned from values provided in **Table 8** and estimates for unavailable data such as the salinity of deep percolation of applied water.

The salt concentration of each inflow and outflow component was estimated by converting TDS to tons of salt per AF (1 ton per acre-foot = 735 mg/L). To be able to compare these results to measured concentrations in the aquifers for calibration purposes, the calculated change in tons of salt were then added back to the total tons of salt in the aquifers within the Project area and a revised estimate of the salt concentration in the water was calculated.

Attachment B, **Table B-2** shows salt balance elements. The salt balance was calibrated using estimated TDS values taken from the piezometers and deep monitoring wells used for the water balance. As shown on **Figures 21 through 25** the water being used to forecast the potential effects have some of the worst quality in the Project area and therefore are providing a worst case scenario. The percent increases projected in this analysis could be used to project the water quality that may occur at other monitoring wells in the Project area.

The concentration of salts leaking into the main aquifer from the perched aquifer was obtained by averaging the concentration of salt concentrations in the subsurface outflow areas. This same average concentration was used for the salt concentration when evaporation occurred.

The water balance projects some groundwater was evaporated through the soils in 2008 and 2011 as a result of shallow perched water. The salts from evaporation are then flushed back into the perched aquifer by deep percolation of precipitation and applied water. In 2013, with groundwater levels declining, the amount of evaporation through the soils decreased. Also, a significant amounts of salt were imported with the surface water, of which most was retained in the soils and leached to the perched aquifer. Therefore, a balance was obtained by increasing the salinity of the deep percolation of precipitation and applied water to account for the flushing of the salts.

The concentration of salt in the imported surface water was based on a weighted average as the sources and volumes of water varied each year.

Salt concentrations (TDS) in the Main Drain Canal have been reported to range from 220 to 1,370 mg/L. No measurements were available for 2008 so the values from 2011 were used for 2008. Average concentrations salt concentration for each year, where avaialable were for each year.

Figures 30 and 31 show the salt balance projections versus measured salt concentrations in the perched and main aquifers. The graphs show there are significant swings in the groundwater concentrations that could not be entirely matched, but the general trend in the data was captured. The results show the salt balance has the capability of reasonably simulating groundwater conditions.

Figure 30 Salinity Comparison to Baseline Salt Balance – Perched Aquifer

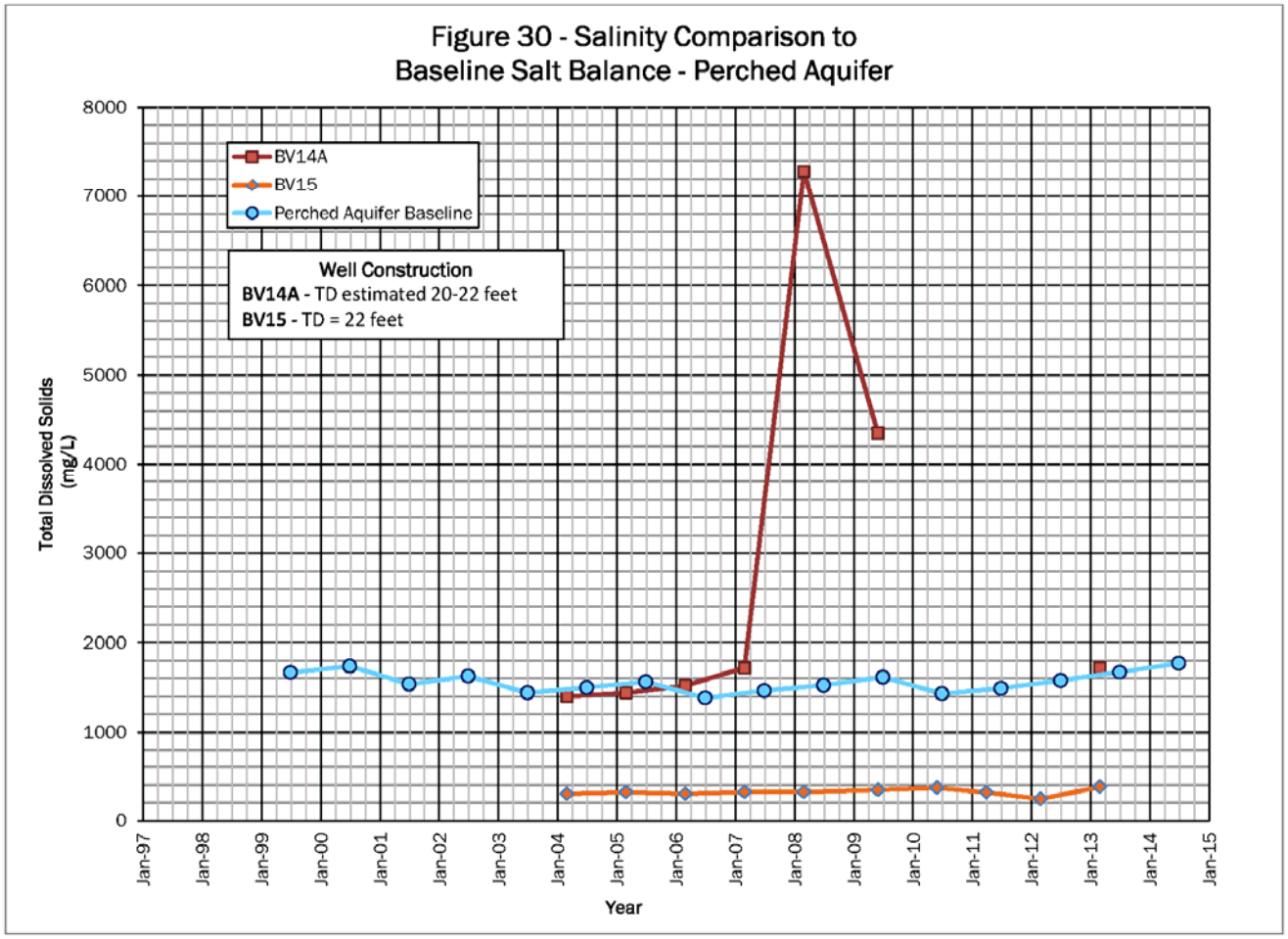
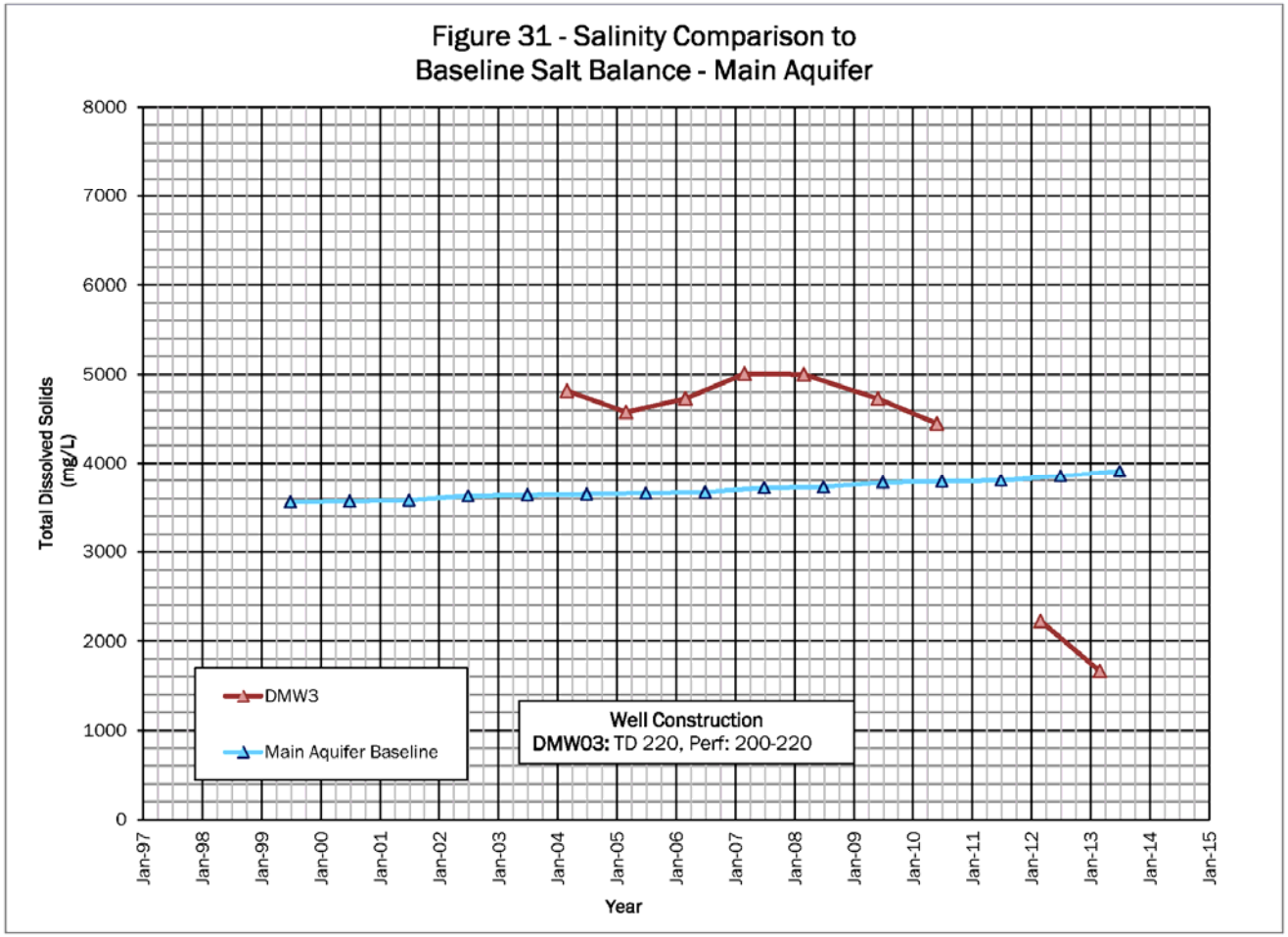


Figure 31 Salinity Comparison to Baseline Salt Balance – Main Aquifer



6 Assessment of Project Effects

About 63 miles of the East Side and West Side canals will no longer be used to for delivery of surface water to growers. As such the canals will no longer recharge high quality surface water to the perched water zone. BVWSD has estimated the amount of seepage loses to be about 15,400 AFY (**Table 5)**.

The effects of this Project on groundwater within the Project and surrounding areas will be reduction of groundwater recharge with low salinity due to the conversion of the West Side and East Side canals to a pipeline along the Main Drain Canal. The baseline water and salt balances were used to assess the potential impacts of these changes into the future.

The baseline water balance results for 1999 through 2011 were repeated to simulate and forecast conditions for 2015 through 2027. The last 3 years of the baseline period were not projected as these climatic conditions would not be expected to be repeated for another 40 years.

6.1 Approach

The baseline water balance was modified and then used to assess the changes in groundwater levels as a result of the addition of the Project. Changes to the baseline water balance include:

- The inflow to the perched aquifer from seepage from the East Side and West Side canals was reduced to zero.
- With the reduction of recharge groundwater levels in the perched aquifer would be below levels where the capillary fringe could evaporate water. Therefore, the evaporation was reduced to zero for all years.
- Seepage from the Main Drain Canal will continue.
- Groundwater discharges to the Main Drain Canal will not continue as the groundwater levels will be lower.
- To account for variable groundwater levels in the perched water aquifer affecting the amount of leakance to the main aquifer, the leakance was allowed to vary throughout the years. The assumption was made that the A-clay or the bottom of the perched aquifer was located about 30 feet below ground surface. There was an average of about 23 feet of saturated interval and there was about 9,000 AFY of

vertical leakance. This amount of leakance was used to calculate a rate of 400 AFY of leakance per foot of saturated thickness.

- Groundwater recharge along the West Side Canal was included in the water balance only in wet years.

- Groundwater pumping may change during the forecasted period, but the forecast uses pumping as reported in 2013.

The modified baseline water balance with the Project assumed conditions above are provided in **Attachment B, Table B-3**.

6.2 Project Effects on Groundwater Levels

The results of the water balance analysis estimate the Project's effects on groundwater levels for the perched and main aquifers. Results were compared to the forecasted baseline conditions on **Figures 28 and 29**. **Figures 32 and 33** show the forecasted Project groundwater level conditions in comparison to the baseline conditions. **Table 9** summarizes the projected effects.

If the proposed Project is not constructed groundwater levels in the perched aquifer will rise by about 2 feet from 2014 through 2027. If the proposed Project is constructed, groundwater levels in the perched aquifer will be unaffected. The last year of the forecasted period projects that groundwater levels may rise back to the baseline conditions but this is likely due to the analyses period ending in a wet year. The reason that the potential effect is small is due to the reduction of seepage from the canals (inflow) being offset by reduction in outflow due to groundwater discharges to the Main Drain Canal being eliminated with lower groundwater levels and the reduction of evaporation through the soils.

Repeating the baseline conditions for the main aquifer forecasts that groundwater levels in the aquifer will decline by about 13 feet from 2014 through 2027. Because groundwater levels are being forecasted to decline in the perched aquifer through much of the period with the Project there will be a decline in leakance from the perched aquifer to the main aquifers. This results in groundwater levels in the main aquifer being about 2 feet lower than baseline conditions.

Figure 32 Project and Cumulative Groundwater Level Comparison to Baseline Salt Balance - Perched Aquifer

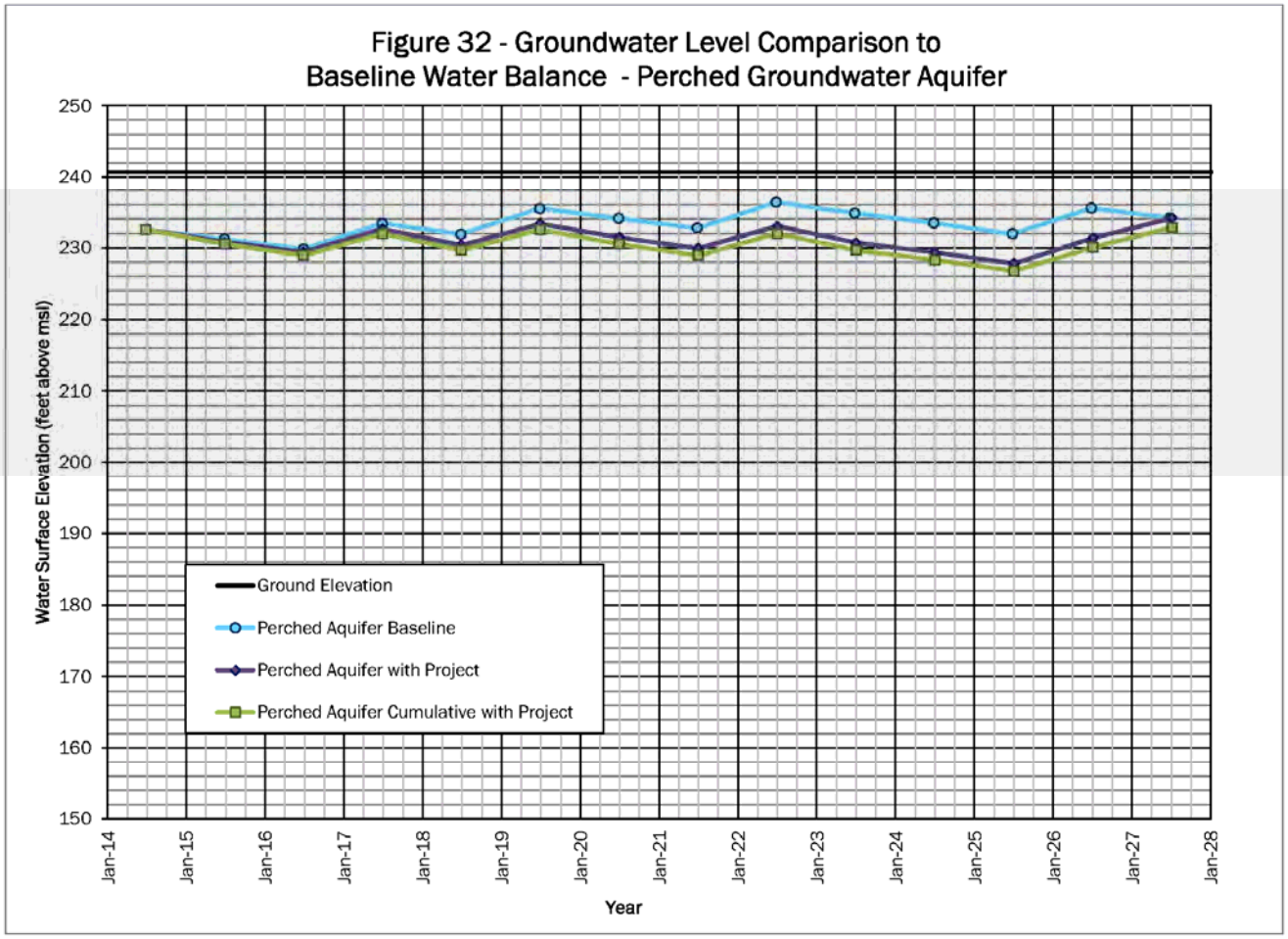


Figure 33 Project and Cumulative Groundwater Level Comparison to Baseline Salt Balance – Main Aquifer

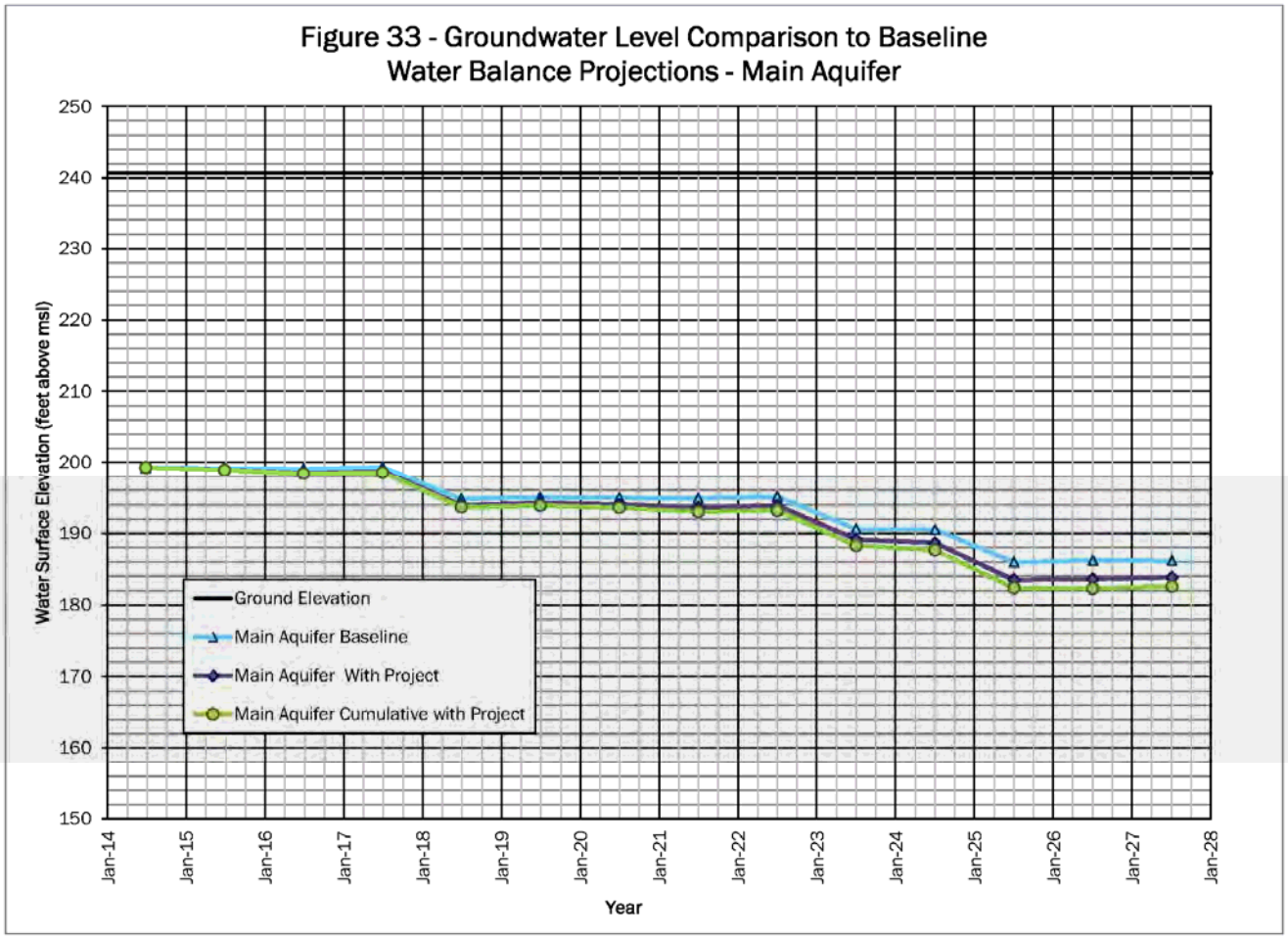


Table 9 Project Effects – Groundwater Levels

Analysis	Groundwater Level (in feet msl)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	232.5	234.2	1.6
With Project	232.5	234.2	1.6
Main Aquifer			
Baseline	199.3	186.1	-13.1
With Project	199.3	183.8	-15.4

6.3 Project Effects on Groundwater Quality

The baseline salt balance was used to assess the changes in water quality with the Project. The salt balance was modified after the initial runs as it was showing that the TDS in the perched aquifer was going to increase to about 7,000 mg/L yet using the baseline salt balance only allowed leakance of perched water to the main aquifer of about 1,900 mg/L. Therefore, the concentration of salts in the water that leaks between the two aquifers was increased to an average of 3,500 mg/L to better forecast water quality effects. The salt balance calculations are provided in **Attachment B, Table B-4.** The results of the analyses are shown on **Figures 34 and 35**. **Table 10** summarizes the projected effects.

The baseline forecast for the main aquifer shows that TDS concentrations in the aquifer would be expected to decline by 110 mg/L between 2014 and 2027. The results of the analyses with the Project for the perched aquifer shows the salinity will gradually increase by 1,635 mg/L or an increase of 1,745 mg/L above baseline conditions. The increase is due to the decrease in recharge of low TDS water and the elimination of salts being exported due to groundwater discharge to the Main Drain Canal.

The baseline forecasted conditions in the main aquifer are showing the salinity is expected to rise by 252 mg/L between 2014 and 2027. The salinity with the Project is showing the TDS is expected to increase by 422 mg/L, an increase of 170 mg/L above baseline conditions. The increase is predominately due to the increased salinity in the leakance from the perched aquifer.

Figure 34 Project and Cumulative Salinity Comparison to Baseline Salt Balance - Perched Aquifer

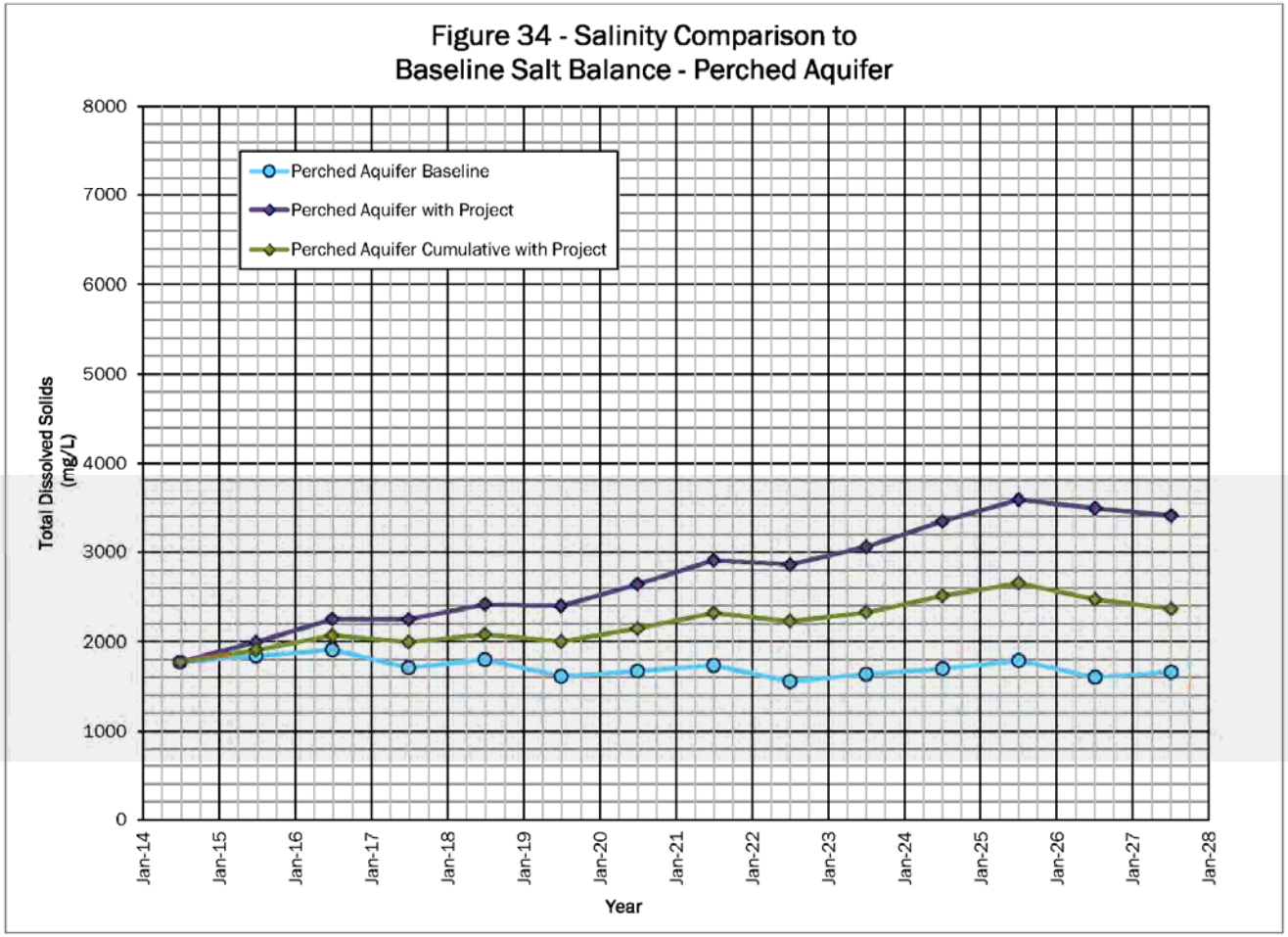


Figure 35 Project and Cumulative Salinity Comparison to Baseline Salt Balance – Main Aquifer

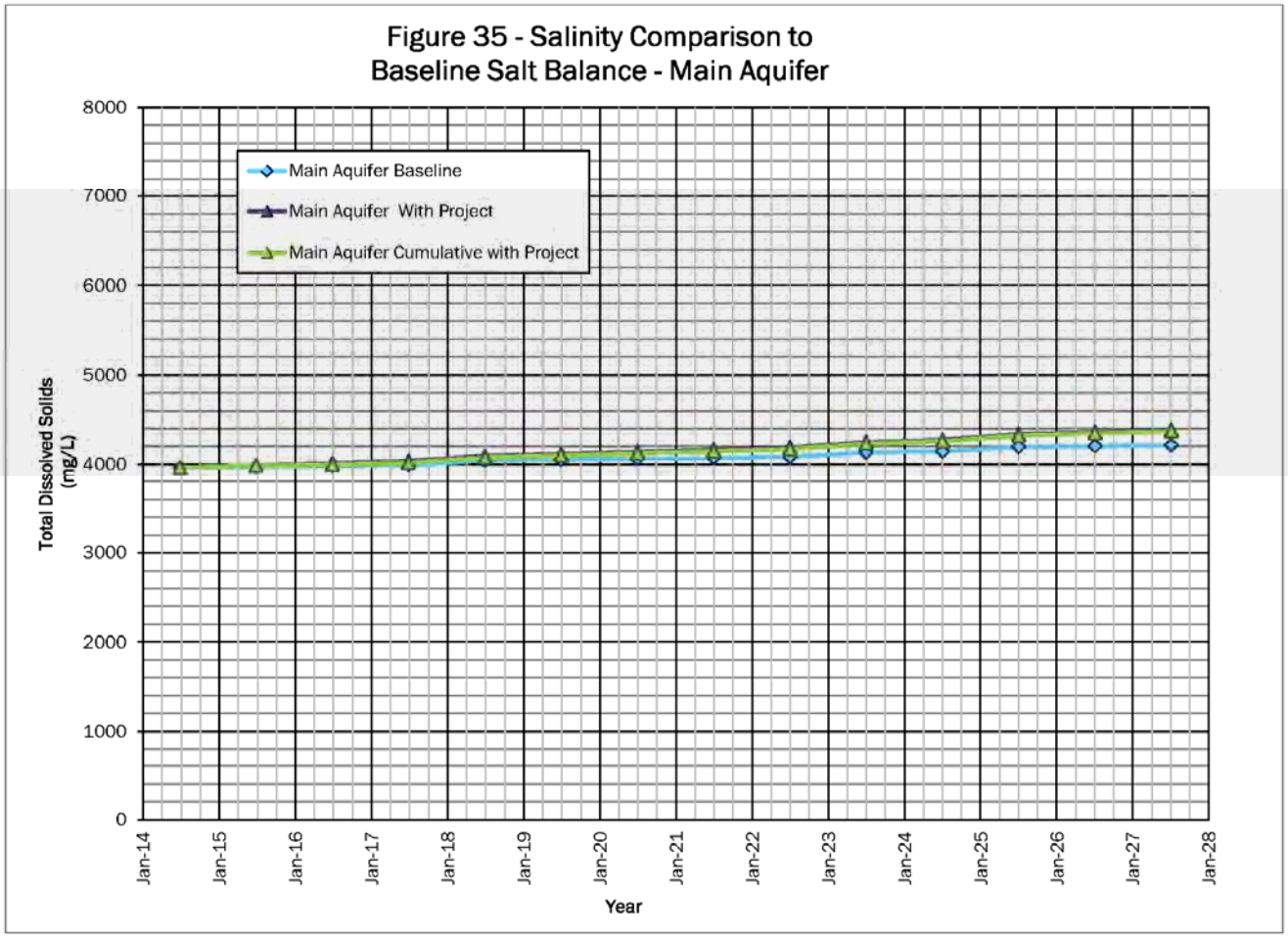


Table 10 Project Effects – Salt Concentrations

Analysis	Salt Concentrations (mg/L)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	1,772	1,662	-110
With Project	1,772	3,407	1,635
Main Aquifer			
Baseline	3,965	4,217	252
With Project	3,965	4,387	422

6.4 Project Effects on Subsidence

Dewatering of saturated clayey sediments can results in inelastic subsidence, especially if they have not previously been dewatered. The perched aquifer is overlain by clayey soils. Existing groundwater levels in 2013 are beneath these soils prior to the Project. Therefore, lowering of the perched aquifer would have a low potential to create subsidence.

The A-clay is about 20 to 50 feet thick and is estimated to be about 20 to 30 feet below ground surface. A reduction of groundwater levels by about 4 feet in the main aquifer would not lower groundwater levels beneath the bottom of the A-clay and therefore the potential to create subsidence with the Project is low.

6.5 Summary of Project Impacts

Groundwater levels in the perched aquifer are projected to rise by about 2 feet using the baseline conditions from 2014 to 2027. The groundwater levels with the Project will rise be at a similar level in 2027 as the baseline conditions.

The main aquifer beneath the Project area contains over 400 feet of saturated sediments. The decline in water levels of 2 feet in this aquifer would only be a change of about 0.5 percent.

Subsurface outflow in the main aquifer to the east, towards the main Kern County groundwater basin and SWSD, was projected to average about 3,400 AFY under baseline conditions. With the decline in groundwater levels by about 2 feet, the outflow would decrease about 20 AFY. This represents about a 0.5 percent decrease in outflow. SWSD performed in-lieu recharge operations in 2011 of 338,000 AF and 146,000 AF in 2013 and therefore the reduction of 20 AFY is a very small percentage of the overall recharge.

The most notable change will be the changes in water quality in the perched aquifer which supplies some water to the Tulare Lake and main Kern County groundwater subbasins. The salinity is forecasted to increase from about 1,800 mg/L to about 3,400 mg/L.

The increase in salinity in the main aquifer with the Project will be about 170 mg/L above the baseline conditions and it appears to be a long term trend. This represents a change of about 4 percent.

7 Assessment of Cumulative Effects

Other projects in the area could affect the groundwater conditions beneath the Project area and result in cumulative impacts. Foreseeable projects and changes were identified. The effects of land use changes, climate change, and a proposed project within the northern portion of the BSA were evaluated using the groundwater and salt balances to assess the cumulative effects on the groundwater. The cumulative analyses include the changes due to implementation of the Project and these foreseeable projects.

7.1 Foreseeable Projects and Changes

Anticipated projects and changes that could affect the northern portion of the BSA include land use changes and climate change as discussed in the following sections.

7.1.1 *Land Use Changes*

As noted earlier, land use within both the BSA and the Maples Service Area is predominately agricultural. As neither service area encompasses or borders an urban or municipal area, there is little pressure to convert irrigated lands to urban uses.

Long-term changes in farmed acreage are likely to result from implementation of programs such as the Conservation Easement Water Acquisition and Management Project (CEWAMP). Under this program, Buena Vista is investigating acquiring and managing water service rights in the “Northern Area Lands” (i.e., BSA lands generally north of Lerdo Highway) that have already entered into, or that will soon enter into, conservation easement programs and that have transitioned away from full agricultural production.

The District anticipates about 2,815 acres of irrigated land will be transitioned into these conservation easements.

7.1.2 *Climate Change*

Annual precipitation typically ranges from 5 to 7 inches and averages 5.64 inches per year between 1940 to 2013 (BVWSD, 2014).

Several investigations were conducted by the USGS California Water Science Center (CAWSC) regarding hydrological effects of climate scenarios in the Sierra Nevada Mountain Range (USGS 2009; Water Resources Research, 2012). The Kern River and CVP water supplies are directly affected by the quantities of runoff and recharge in the Sierras. Each of these investigations predict that California’s climate will become warmer (+2 to +4° C) and drier (10-15%) during the mid- to late-21st century, relative to historical conditions. This will reduce precipitation in the area.

7.2 Approach

The Project water and salt balances, **Tables B-3 and B-4**, were modified to represent changes from the cumulative effects of land use changes and climate change. The modified balance was then used to assess the changes that might occur as a result of these foreseeable projects.

The water balance was adjusted to account for climate change by reducing the baseline deep percolation from precipitation by 15 percent. The amount of surface water deliveries was not lowered as many of the sources are from outside of the BVWSD area and may not be impacted.

The transition of 2,800 acres of irrigated land will reduce the current cultivated land from about 13,800 to 11,000 acres (BVWSD, 2014). This amounts to about a 20 percent reduction of agricultural land in the Project area. The amount of deep percolation from applied water in the water balance was reduced by this amount to account for this effect. The total amount of surface water was not reduced as it was assumed that this water would still be imported.

Attachment B, Tables B-5 and B-6 provides tables for the cumulative with project water and salt balances.

7.3 Cumulative Effects on Groundwater Levels

The results of analysis of the cumulative with Project effects on groundwater levels are shown on **Figures 32 and 33**. **Table 11** summarizes the effects of the cumulative with Project scenario on groundwater levels.

At the end of the Cumulative with Project forecast period groundwater levels are 1.4 feet lower than baseline conditions.

Because the reduced leakance of water from the perched aquifer, groundwater levels in the main aquifers, decline of about 3.6 feet below baseline conditions.

Table 11 Cumulative Effects – Groundwater Levels

Analysis	Groundwater Level (in Feet Msl)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	232.5	234.2	1.6
Cumulative with Project	232.5	232.8	0.3
Main Aquifer			
Baseline	199.3	186.1	-13.1
Cumulative with Project	199.3	182.6	-16.7

7.4 Cumulative Effects on Groundwater Quality

The results of analysis of the cumulative with Project effects on groundwater quality are shown on **Figures 34 and 35**. **Table 12** summarizes the effects of the cumulative with Project scenario on groundwater levels.

The analysis forecasts that salinity will be greater in the perched aquifer in the Project scenario than in the Cumulative with Project scenario. Salinity is forecast to be 1,040 mg/L less than the forecast under the Project scenario, and about 700 mg/L greater than the baseline forecast under the Cumulative with Project scenario. The cumulative water quality forecast is less than that projected with just the Project because cumulative effects reduce applied water to agricultural lands. The applied water percolates into the perched aquifer and carries salt back to the perched aquifer. This effect is also present in the amount of deep percolation from precipitation leaching salts from the soils. Therefore the reduction agricultural lands and climate change reduces the amount of water leaching salts into the perched aquifer and is the reason why the cumulative effects are less than the Project effects alone.

The forecasted changes in TDS in the main aquifer show the concentrations will gradually increase and be about 155 mg/L greater than the baseline forecast under the Cumulative with Project scenario.

Table 12 Cumulative Effects – Groundwater Quality

Analysis	Salt Concentrations (mg/L)		
	Start 2014	Finish 2027	Change
Perched Aquifer			
Baseline	1,772	1,662	-110
Cumulative with Project	1,772	2,367	594
Main Aquifer			
Baseline	3,965	4,217	252
Cumulative with Project	3,965	4,372	407

7.5 Cumulative Effects on Subsidence

Dewatering of saturated clayey sediments can results in inelastic subsidence, especially if they have not previously been dewatered. The perched aquifer is overlain by clayey soils. Existing groundwater levels in 2013 are beneath these soils prior to the cumulative projects. Therefore, lowering of the perched aquifer would have a low potential to create subsidence.

The A-clay is about 20 to 50 feet thick and is estimated to be about 20 to 30 feet below ground surface. A reduction of groundwater levels by about 4 feet in the main aquifer would not lower groundwater levels beneath the bottom of the A-clay and therefore the potential to create subsidence with the cumulative effects is low.

7.6 Summary of Cumulative Impacts

Decreasing the groundwater levels in the perched aquifer by 1.4 feet below the baseline conditions will be beneficial to growers within the Project area.

The lowering of the perched groundwater levels by about 1.4 feet more than baseline will affect the subsurface outflow from the area to the Tulare Lake groundwater subbasin. This reduction of groundwater levels will change the outflow to the Tulare Lake subbasin from the Project area from an average of about 10 to 9.4 AFY or a change of about 6 percent at the Project's northern boundary. The subsurface inflow to the Tulare Lake groundwater subbasin was estimated to be about 40 AFY. Therefore, the inflow to the subbasin from the perched aquifer would only be reduced to about 39.4 AFY or a change of about 1.5 percent. However, the amount of water in the Tulare Lake groundwater subbasin is about 12,100,000 AF and therefore a reduction by 0.6 AFY is a very small change to the total amount of groundwater in storage.

Additional subsurface outflow from the perched aquifer occurs to the northeast to a small perched water area that is overlain by farmland. About 6 AFY outflows through this area. Recuding groundwater levels by 1.4 would reduce the out flow to 5.4 AFY. The effects of reducing the outflow of water to this area would not be considered significant and again would be beneficial to growers.

The baseline subsurface outflow from the perched aquifer towards the east and the main Kern County groundwater basin was estimated to average about 4 AFY. The subsurface inflow to the main Kern County groundwater basin is similar to that at the Project boundary as most of inflow is from the Project area. Reduction of groundwater levels by 1.4 feet in the perched aquifer would result in about 0.2 AFY or a 5 percent reduction of subsurface inflow from the perched aquifer to the Kern County groundwater basin and the SWSD. However, SWSD performed in-lieu recharge operations in 2011 of 338,000 AF and 146,000 AF in 2013 and therefore the reduction of 0.2 AFY is a small percentage of the total available recharge.

The main aquifer beneath the Project area contains over 400 feet of saturated sediments. The decline in water levels in this aquifer would be about 4 feet below baseline conditions and would only be a change of less than 1 percent.

Subsurface outflow in the main aquifer to the east towards the main Kern County groundwater basin and SWSD was projected to average about 3,400 AFY under baseline conditions. With the decline in groundwater levels by about 4 feet, the outflow would

decrease about 34 AFY. This represents a 1 percent decrease in outflow. SWSD performed in-lieu recharge operations in 2011 of 338,000 AF and 146,000 AF in 2013 and therefore the reduction of 34 AFY is less than significant.

The most notable change will be the changes in water quality in the perched aquifer which supplies some water to the Tulare Lake and main Kern County groundwater basins. The salinity is forecasted to increase from about 1,700 mg/L to about 2,400 mg/L.

The increase in salinity in the main aquifer with the cumulative effects will be about 150 mg/L greater than baseline conditions. This represents a change of about 4 percent over the long-term.

7.7 Impact Evaluation

The potential effects of the Project and cumulative effects were evaluated against significance criteria and mitigation measures are proposed for those potential impacts that have potential significant impacts. Significance criteria from the Environmental Checklist Form, Appendix G of the CEQA Guidelines, were used to evaluate the significance of the potential impacts to groundwater.

Significance criteria relevant to potential groundwater impacts used were:

Will the project:

a) Violate any water quality standards or waste discharge requirements?

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)?

f) Will the project substantially degrade water quality?

Potential Groundwater Quantity Impacts: The project will lower the local groundwater levels. Shallow perched groundwater with elevated salinity has adversely impacted plant growth and crop yields in affected areas of the District. Lowering the water level in the perched aquifer is one of the goals of the project, because the perched aquifer has poor water quality which has a detrimental effect on agricultural production. The water balance described in this report shows that the Project with cumulative impact may potentially lower the perched aquifer by 1.4 feet below baseline conditions. This impact will not harm existing land uses and is not a significant impact requiring mitigation.

The project will also lower the local groundwater table of the main aquifer. This is not anticipated to reduce the production rate of nearby wells or cause the aquifer to fail to

support existing planned uses. BVWSD will continue to monitor groundwater levels in the main aquifer to confirm that no significant impact is occurring.

There will be a very slight decrease in water flow off-site, feeding other aquifers downstream **(Table 13)**. This change will not result in reduced production rate of wells or cause the downstream aquifers to fail to support existing planned uses and is therefore less than significant.

Potential Groundwater Quality Impacts: The project will increase salinity in the perched and unconfined aquifers and may substantially degrade water quality. Therefore, this impact is potentially significant. However, water quality in the perched aquifer is already poor. The proposed Project with cumulative effects will result in a decline in the water level in the perched aquifer, resulting in less impact to agriculture and other users from the high-saline water.

The TDS in the main aquifer already limits the direct use of the groundwater on most crops. The proposed project with cumulative effects will increase salinity by a small percentage over baseline conditions **(Table 13)**. However the impact is long-term and is considered potentially significant.

Table 13 Impact Assessment Summary

Impact	Change from baseline		Percent change		Level of significance
	With Project	**Cumulative with Project**	**With Project**	**Cumulative with Project**	
Decline groundwater level in perched aquifer (in comparison to baseline)	0 Feet	1.4 Feet	0	6%	No impact, decline in groundwater levels in cumulative scenario is considered beneficial
Decline in groundwater level in main aquifer (in comparison to baseline)	2.3 Feet	3.6 Feet	0.6%	<1%	Less than significant
Decline in subsurface outflow from perched aquifer to Tulare Lake groundwater basin	0 AFY	0.6 AFY	0%	6%	Less than significant. Total was supply in Tulare Lake groundwater subbasin is 12,100,000 AF
Decline in subsurface outflow from perched aquifer to northeast	0	0.6 AFY	0%	10%	Less than significant. Land overlain by farmland, so decline in water level is beneficial to agricultural production
Subsurface outflow from perched aquifer to main Kern County groundwater basin	0 AFY	0.2 AFY	0% of outflow to from perched aquifer, but a tiny fraction of total	5% of outflow from perched aquifer, but a tiny fraction of total	Less than significant. Total recharge in SWSD ranges from 146,000 AFY to 338,000 AFY

Impact	Change from baseline		Percent change		Level of significance
	With Project	**Cumulative with Project**	**With Project**	**Cumulative with Project**	
and SWSD			recharge	recharge	
Decline in subsurface outflow from main aquifer to main Kern County groundwater basin and SWSD	20 AFY	34 AFY	<1%	1%	Less than significant
Increase in TDS in perched aquifer (compared to baseline)	1,745 mg/L	700 mg/L	192%	133%	Potentially significant
Increase in TDS in main aquifer	170 mg/L	155 mg/L	4%	4%	Potentially significant. Change in TDS is small, but long term

7.8 Mitigation Program

In order to address potentially significant impacts, BVWSD will adopt a mitigation program to lower impacts to a level of non-significance.

Mitigation Measure GW -1: construct a new set of nested or clustered monitoring wells, with screens placed opposite the perched, shallow and deep aquifers to confirm the changes in water quality and water levels these different aquifers.

Mitigation Measure GW -2: If monitoring of the main aquifer (as described in Mitigation Measure GW-1) detects that the water level is declining to a degree that potential impacts to water users may occur, then water conserved by construction of the Northern Area Project will be used to periodically provide additional groundwater recharge to the main aquifer. This recharge will be conducted where the A-clay is not present, as necessary to compensate for the loss of groundwater recharge from the perched aquifer. (Note: this impact is not anticipated based on the analysis in this report, but this mitigation measure is incorporated to address an unexpected outcome.)

Mitigation Measure GW-3: The Brackish Groundwater Remediation Project (BGRP) will be implemented to lower water levels in the perched aquifer and control salinity in both the perched and main aquifer.

The BGRP is designed to remediate brackish groundwater within the BSA by recovering groundwater from two aquifer zones. In the northern Buttonwillow Service Area, the BGRP consists of construction and operating strategically-located shallow and medium depth brackish groundwater recovery wells and collection and conveyance pipelines. The project will pump low quality water from the aquifer and blend it with higher quality water delivered to the Project area through the Northern Area Pipeline, making this water available for agricultural uses. The BGRP will lower and control the salinity in the perched aquifer and the main aquifer.

7.9 Impacts After Implementation of Mitigation Program

The potentially significant impact to water quality will be lowered to a level of less than significant with the implementation of the mitigation program, specifically mitigation measure GW-1 (monitoring of water levels and water quality) and GW-3 (implementation of the Brackish Groundwater Remediation Program).

8 References

Buena Vista Water Storage District (BVWSD). 2014. Agricultural Water Management Plan.

Buena Vista Water Storage District (BVWSD). 2014. Northern Area Pipeline Project, 2014 WaterSMART Grant Application FOA No. R14AS00021.

California Department of Water Resources (DWR). 2004. California's Groundwater. Bulletin 118 – Update 2003.

California Geologic Survey, 1991. California Geologic Data Map Series – Map No. 2 – Geologic Map of California.

Croft, M.G. and Gordon, G.V. 1968. Geology, Hydrology, and Quality of Water in the Hanford-Visalia Area, San Joaquin Valley, California. USGS Open-File Report 68-67.

Croft. 1972. Subsurface Geology of the Late Tertiary and Quaternary Water-bearing Deposits of the Southern Part of the San Joaquin Valley, California. Geological Water-Supply Paper 1999-H.

Dale R.H., French J.J., and Gordon G.V. 1966. Ground-Water Geology and Hydrology of the Kern River Alluvial-Fan Area, California.

Johnson. 1967. Specific Yield- Compilation of Specific Yields for Various Materials. Geological Survey Water-Supply Paper 1662-D.

Luhdorff and Scalmamni Consulting Engineers. 2014. Land Subsidence from Groundwater Use in California.

Pacific Geotechnical Associates. 1991. Study of the Regional Geologic Structure related to Ground Water Aquifers in the Southern San Joaquin Valley Groundwater Basin, Kern County, California (Phase 1A and Phase 1B).

Page R. W. 1986. Geology of the Fresh Ground-Water Basin of the Central Valley, California with Texture Maps and Sections. Professional Paper 1401-C.

Provost and Pritchard. 2013. Groundwater Management Plan, Buena Vista Water Storage District.

Rector, Michael R. 1983. Westside Groundwater Study, Kern County, California.

Todd. 1980. Groundwater Hydrology.

URS March, 2010. Hydrogeologic Data Acquisition Report, Groundwater Monitoring and Process-Water Well-Field Development Project.

Wood, P.R. and Dale R. H. 1964. Geology and Ground-water Features of the Edison-Maricopa area, Kern County, California. USGS Water Supply Paper 1656.

Woodring, W.P., Stewart, R., and Richards, R.W. 1940. Geology of the Kettleman Hills oilfield, California: U.S. Geol. Survey Prof. Paper 195.

Appendix B: Indian Trust Asset Compliance Memo

Cordova, Daniel <dcordova@usbr.gov>

Re: ITA Request for BVWSD

1 message

STEVENSON, RICHARD <rstevenson@usbr.gov> Tue, May 5, 2015 at 9:17 AM
To: "Cordova, Daniel" <dcordova@usbr.gov>

Dan,

I have examined the project description for CEC 15-06-MP, Buena Vista Water Storage District pipeline and have determined that the closest Indian Trust Asset is over 50 miles distant. This project does not have the potential to impact Indian Trust Assets.

Richard Stevenson
Deputy Regional Resources Manager

On Fri, May 1, 2015 at 1:25 PM, Cordova, Daniel <dcordova@usbr.gov> wrote:

> Richard,
>
> I've been told that I am now delivering this to the correct person. Please see ITA request form attached.
>
> Dan
>
> Dan Cordova
> Natural Resources Specialist
> Bureau of Reclamation, Mid-Pacific Region
> Division of Environmental Affairs
> Environmental Compliance and Conservation Branch (MP-152)
> 2800 Cottage Way
> Sacramento, CA 95825
> 916-978-5483
>
> On Fri, May 1, 2015 at 1:20 PM, Cordova, Daniel <dcordova@usbr.gov> wrote:
>
> > Richard,
> >
> > I sent this to Patricia before finding out they now go to you.
> >
> > Thanks,
> >
> > Dan
> >
> > ---------- Forwarded message ----------
> > From: **Cordova, Daniel** <dcordova@usbr.gov>
> > Date: Fri, May 1, 2015 at 1:15 PM
> > Subject: ITA Request for BVWSD
> > To: privera@usbr.gov
> > Cc: kseabrook@usbr.gov, marywilliams@usbr.gov
> >
> > Request attached.

Thank you,

Dan

Dan Cordova
Natural Resources Specialist
Bureau of Reclamation, Mid-Pacific Region
Division of Environmental Affairs
Environmental Compliance and Conservation Branch (MP-152)
2800 Cottage Way
Sacramento, CA 95825
916-978-5483

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Richard M. Stevenson
Deputy Regional Resources Manager
2800 Cottage Way, MP-400
Sacramento, CA 95825-1898
(916) 978-5264
(916) 396-3380 iPhone
rstevenson@usbr.gov

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1309K

Appendix C: Cultural Resource Compliance Memo

CULTURAL RESOURCE COMPLIANCE
Mid-Pacific Region
Division of Environmental Affairs
Cultural Resources Branch

MP-153 Tracking Number: 14-MPRO-228

Project Name: Buena Vista Water Storage District (BVWSD) Pipeline Project

NEPA Document: EA 15-06-MP

MP 153 Cultural Resources Reviewer: Amy J. Barnes

Date: June 25, 2015

This proposed undertaking by Reclamation is to award a WaterSMART Water Use Efficiency Grant to the BVWSD to construct approximately 10 miles of pipeline in the northern portion of their service area. This is the type of action that has the potential to cause effects to historic properties pursuant to 36 CFR §800.3 of the Section 106 implementing regulations. As a result of this determination, Reclamation implemented the steps in the Section 106 process as outlined at §800.3 to §800.6.

BVWSD proposes to construct a new gravity flow pipeline that will begin at the existing Semitropic 120-inch-diameter pipeline and terminate 8 miles south at Lerdo Highway. Two lateral pipeline sections will be constructed east and west, approximately 1 mile and 0.25-mile long, respectively, from the 8-mile-long portion of new pipeline. The new pipeline will be located primarily within the right-of-way for the Main Drain Canal and other BVWSD facilities. The new pipeline will measure between 21 and 63 inches in diameter and installed in a trench measuring a maximum of approximately 18 feet wide and 12 feet deep. Two existing pumping stations on the Main Drain Canal will be retrofitted to pump water into the new pipeline. Two areas will be used for staging equipment and materials. The area of potential effects (APE) includes a 50-foot-wide linear corridor that is 10 miles long (60.6 acres), two staging areas (4.4 and 6.4 acres), and two 1-acre pump station work areas, for a collective total of 73.4 acres. It is located in Sections 9, 16, 21, 22, 28, 29, and 32 in T. 27 S., R. 22 E. and Sections 4, 5, and 9 in T. 28 S., R. 22 E., Mount Diablo B.M., as depicted on the Lokern and Semitropic 7.5' U.S. Geological Survey topographic quadrangle maps (Figures 2-5, enclosed). The vertical extent of the project area will be approximately 12 feet deep, primarily in the Main Drain Canal right-of-way. The project area is characterized by agricultural fields and orchards, field roads, and water conveyance facilities as well as main transportation routes, including Main Drain Road, Lerdo Highway, and Interstate 5.

The historic property identification efforts included a cultural resources survey by ASM Affiliates to assist in the identification of historic properties. Three cultural resources were identified within the APE for this undertaking: Main Drain Canal, 17 Extension Canal, and the L Canal, which are part of the Kern River Flood Canal District. Twelve isolated artifacts were also documented during the survey within the constructed earthen berm the Main Drain Canal. Based on the historic context developed by ASM Affiliates for the development of irrigated agriculture in the local area and recorded the segments of the Main Drain Canal, the 17 Extension Canal, and the L Canal within the APE, Reclamation is treating the Kern River Flood Canal District as eligible for inclusion in the National Register. We consider it eligible under Criterion A for local contributions to the history of early settlement, reclamation, and agriculture in Kern County, as described in "Theme 1: Development of Irrigated Agriculture in the San Joaquin Valley, 1852-1964." The system still exists for the original purpose for which it was constructed, in a very similar agricultural setting as during the time of its original construction and development, and along nearly the same alignments as its original construction. The physical features of the Kern River Flood Canal District, taken together, convey the property's historic character. The canal segments have retained

STATE OF CALIFORNIA – THE NATURAL RESOURCES AGENCY EDMUND G. BROWN, JR., *Governor*

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June 24, 2015

In reply refer to: BUR_2015_0526_001

Ms. Anastasia T. Leigh
Regional Environmental Officer
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

Re: National Historic Preservation Act (NHPA) Section 106 Consultation for the Proposed Buena Vista Water Storage District (BVWSD) Pipeline Project, Kern County, California (14-MPRO-228)

Dear Ms. Leigh:

Thank you for your letter dated May 19, 2015, requesting my review and comment with regard to the proposed Buena Vista Water Storage District (BVWSD) Pipeline Project in Kern County, California. The Bureau of Reclamation (Reclamation) is consulting with me pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations found at 36 CFR Part 800 (as amended 8-05-04). Along with your consultation letter, you also provided the following document:

- *Phase I Survey/Class III Inventory, BVWSD Northern Pipeline Project, Kern County, CA* (ASM Affiliates, March 2015).

Reclamation proposes to award a WaterSMART Water Use Efficiency Grant to the BVWSD to construct approximately 10 miles of pipeline in the northern portion of their service area. The proposed undertaking includes construction of a new gravity flow pipeline that will begin at the existing semitropic 120-inch-diameter pipeline and will terminate 8 miles south at Lerdo Highway. Two lateral pipeline sections will be constructed east and west, approximately 1 mile and 0.25-mile long, respectively, from the 8-mile-long portion of new pipeline. The new pipeline will be located primarily within the right-of-way for the Main Drain Canal and other BVWSD facilities. The new pipeline will measure between 21 and 63 inches in diameter and will be installed in a trench measuring a maximum of approximately 18 feet wide and 12 feet deep. Two existing pumping stations on the Main Drain Canal will be retrofitted to pump water into the new pipeline. In addition, two areas will be used for construction staging activities.

Reclamation has determined that the area of potential effects (APE) for this undertaking consists of a 50-foot-wide linear corridor that is 10 miles long (60.6 acres), two staging areas (4.4 and 6.4 acres), and two 1-acre pump station work areas, for a total APE of 73.4 acres.

The cultural resources identification effort included a records search and cultural resources survey performed by ASM Affiliates (Consultant), and Native American consultation initiated by Reclamation. A records search completed on June 24, 2014, indicated that no previously recorded cultural resources had been identified within the APE. Archaeological and architectural historical pedestrian surveys conducted between July and October 2014, identified three historic built environment resources and 12 prehistoric isolates within the APE: CA-KER-9374H (The Main Drain Canal); P-15-016988 (the 17 Extension Canal); P-15-017001 (the L Canal), and BVWSD-ISO-1 through BVWSD-ISO-12. All three built environment properties have been identified as contributing elements to the Kern River Flood Canal District. The 12 prehistoric isolates were found to be not eligible for inclusion on the NRHP. For the purpose of this undertaking, Reclamation is proposing to treat the Main Drain Canal, the 17 Extension Canal, and the L Canal as contributing elements to the Kern River Flood Control District, which will be considered eligible under Criterion A for its contributions to the history of early settlement, reclamation, and agriculture in Kern County.

The Native American Heritage Commission (NAHC) was contacted by the consultant on June 25, 2014 to request a search of the Sacred Lands File for known sacred sites in the project area and to request a list of Native American organizations and individuals who may have knowledge of cultural resources within the APE. NAHC records indicated that no previously identified sacred lands or areas of cultural importance are located within the APE. Likewise, Native American coordination initiated by Reclamation on March 12, 2015 did not result in the identification of potential historic properties within the APE.

Reclamation applied the criteria of adverse effect to the current undertaking and found that the proposed activities would result in no significant alterations to the historic characteristics that make the Main Drain Canal, 17 Extension Canal, and the L Canal eligible for the National Register as contributing elements to the Kern River Flood Canal District. Reclamation found that the proposed actions of installing a new pipeline and retrofitting modern pump stations on the Main Drain Canal will not alter any historic physical characteristics of the canal or its berm. Upon completion, the Main Drain Canal, 17 Extension Canal, and the L Canal rights of way and embankments will be re-contoured to their pre-construction form. Since there will be no alterations to the Main Drain Canal, 17 Extension Canal, and the L Canal, Reclamation holds that the Kern River Flood Canal District will also be unaffected by the proposed undertaking.

Reclamation is requesting my review and comment on the delineation of the APE and their efforts to identify historic properties. Additionally, Reclamation is requesting my concurrence with their finding of no adverse effect to historic properties. After reviewing your submission I have the following comments:

- Pursuant to 36 CFR 800.4(a)(1), I have no objections to the APE as defined.

- Reclamation has proposed to presume, for the purpose of this undertaking only, that the Main Drain Canal, the 17 Extension Canal, and the L Canal are contributing elements to the Kern River Flood Control District, which will be considered eligible under Criterion A for its contributions to the history of early settlement, reclamation, and agriculture in Kern County. I concur.

- Pursuant to 36 CFR 800.4(b), I find that the COE has made a reasonable and good faith effort to identify historic properties within the area of potential effects.

- Pursuant to 36 CFR 800.5(c)(1), **I concur with your finding of "no adverse effect to historic properties" for this undertaking.**

Thank you for seeking my comments and considering historic properties as part of your project planning. Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. If you have any questions, please contact Patrick Riordan of my staff at (916) 445-7017 or Patrick.Riordan@parks.ca.gov or Ed Carroll at (916) 445-7006 or Ed.Carroll@parks.ca.gov.

Sincerely,

Carol Roland-Nawi, Ph.D.

Carol Roland-Nawi, PhD
State Historic Preservation Officer