Groundwater Assessment Report

Westside Districts and Western Supplemental Area

Kern and Kings Counties, California

Prepared for:

Westside Water Quality Coalition
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Prepared by:

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Project FR1216043A

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Mr. Joseph D. Hughes
Klein, DeNatale, Goldner, Cooper, Rosenlieb & Kimball, LLC
4550 California Avenue, Second Floor
Bakersfield, California 93389-1172

Subject: **Groundwater Assessment Report**
Westside Districts and Western Supplemental Area
Kern and Kings Counties, California

Dear Mr. Hughes:

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), has prepared the enclosed Groundwater Assessment Report (GAR) on behalf of Klein, DeNatale, Goldner, Cooper, Rosenlieb & Kimball, LLP and your client, the Westside Water Quality Coalition (Coalition). The Coalition is acting as a Third Party Coalition pursuant to General Waste Discharge Requirements, Order No. R5-2013-0120 (General Order) that was issued by the California Regional Water Quality Control Board (RWQCB, 2013).

The GAR comprises a study area that includes the original Coalition (Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District), including the Western Supplemental Area, pursuant to provisions of the General Order. This GAR presents the available background information on hydrogeology and groundwater quality below the Study Area as well as a summary of agricultural irrigation practices. Background information was obtained from a variety of public and private sources and has been interpreted using a geographical information system to identify areas that might be more vulnerable to groundwater degradation from agricultural practices.

Amec Foster Wheeler has evaluated recent irrigated agricultural methods, depth to first encountered groundwater, and analytical data that might indicate an impact on groundwater quality from irrigated agriculture. High vulnerability areas are identified for first encountered groundwater based on evidence of an existing agricultural impact to first encountered groundwater, except in areas where groundwater salinity renders the groundwater unsuitable for drinking water without expensive desalination treatment.

We certify under penalty of law that this document and all attachments were prepared under our direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the persons who manage the system, or those persons directly for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate and complete. We are aware that there are penalties for submitting false information, including the possibility of fine and imprisonment.

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Amec Foster Wheeler is pleased to be of service to Klein, DeNatale, Goldner, Cooper, Rosenlieb & Kimball, LLP and your client, the Coalition. If you have questions about this report, please call either of the undersigned.

Sincerely yours,
Amec Foster Wheeler Environment & Infrastructure, Inc.

Gary L. Kramer, PG
Senior Associate Hydrogeologist

Timothy G. Souther
Principal Environmental Scientist

Enclosure

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amec foster wheeler

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Kern and Kings Counties, California

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This report was prepared by the staff of Amec Foster Wheeler Environment & Infrastructure, Inc., under the supervision of the Geologist whose seal and signature appear hereon.

The findings, recommendations, specifications, or professional opinions presented in this report were prepared in accordance with generally accepted professional geologic practice and within the scope of the project. No other warranty, express or implied, is provided.

PROFESSIONAL GEOLOGIST
Gary L. Kramer
No. 7308
STATE OF CALIFORNIA

Gary L. Kramer, PG
Senior Associate Geologist

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Kern and Kings Counties, California

EXECUTIVE SUMMARY

The Westside Water Quality Coalition (Coalition) is acting as a Third Party Coalition pursuant to General Waste Discharge Requirements, Order No. R5-2013-0120 (General Order) that was issued by the California Regional Water Quality Control Board (RWQCB, 2013).

On behalf of the Coalition, Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), has prepared this Groundwater Assessment Report for the original Coalition (Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District), including the Western Supplemental Area (collectively the Study Area, as shown on Figure 1), pursuant to provisions of the General Order. This Groundwater Assessment Report presents the available background information on hydrogeology and groundwater quality below the Study Area as well as a summary of agricultural irrigation practices. Background information was obtained from a variety of public and private sources and has been interpreted using a geographical information system to identify areas that might be more vulnerable to groundwater degradation from agricultural practices.

Amec Foster Wheeler has evaluated recent irrigated agricultural methods, depth to first encountered groundwater, and analytical data that might indicate an impact on groundwater quality from irrigated agriculture. High vulnerability areas are identified for first encountered groundwater based on evidence of an existing agricultural impact to first encountered groundwater, except in areas where groundwater salinity renders the groundwater unsuitable for drinking water without expensive desalination treatment.

GROUNDWATER ASSESSMENT REPORT
Westside Districts and Western Supplemental Area
Kern and Kings Counties, California

1.0 INTRODUCTION

The Westside Water Quality Coalition (Coalition) is acting as a Third Party Coalition pursuant to General Waste Discharge Requirements, Order No. R5-2013-0120 (General Order) that was issued by the California Regional Water Quality Control Board (RWQCB) (Appendix A; RWQCB, 2013). The Coalition originally included the areas of Belridge Water Storage District (BWSD), Berrenda Mesa Water District (BMWD), Dudley Ridge Water District (DRWD), and Lost Hills Water District (LHWD). Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), has separately prepared a Groundwater Assessment Report (GAR) for the northern part of the Coalition's jurisdiction that includes Kettleman Plain and Sunflower Valley. As a condition of acceptance for the Coalition, the RWQCB (2014) also included the Western Supplemental Area (WSA) (Figure 1) as part of the Coalition's jurisdiction. The Coalition has requested that Amec Foster Wheeler prepare a GAR for the Districts and WSA (collectively the Study Area), pursuant to provisions of the General Order. Amec Foster Wheeler has prepared this GAR for the Study Area to address the Coalition's request.

The General Order indicates the purpose of the GAR is to provide the foundational information necessary for design of the Management Practices Evaluation Program, the Groundwater Quality Trend Monitoring Program, and the Groundwater Quality Management Plan.
To accomplish this purpose, the GAR must:

- assess all available, applicable, and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation;
- establish priorities for implementation of monitoring and studies within high vulnerability areas;
- provide a basis for establishing work plans to assess groundwater quality trends;
- provide a basis for establishing work plans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and
- provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

This GAR presents the available background information on hydrogeology and groundwater quality below the Study Area as well as a summary of agricultural irrigation practices. Background information was obtained from a variety of public and private sources and has been interpreted using a geographical information system to identify areas that might be vulnerable to groundwater degradation from agricultural practices. Amec Foster Wheeler has evaluated water quality criteria that would be applicable for municipal supply (MUN), agricultural supply (AGR), and industrial service supply (IND). That summary is provided in Appendix B, and the water quality criteria summarized in Table 1 are used to evaluate groundwater usability in the remainder of this report.

2.0 STUDY AREA

The following subsections are summaries of relevant information pertaining to each of the Districts and WSA.

2.1 BELRIDGE WATER STORAGE DISTRICT

The BWSD encompasses 93,000 acres of land in western Kern County (Figure 1). BWSD slopes from the Antelope Hills and Belridge Oil Field on the west to the California Aqueduct in the valley floor on the east. The BWSD has a contract for 121,508 acre-feet per year of irrigation water from the State Water Project (SWP) to about 52,000 acres of developed agricultural land between Highway 33 on the west and the Kern River Floodway on the east and California Highway 46 and the community of Lost Hills on the north (BWSD, 2012). This allocation of SWP water amounts to about 2.3 acre-feet per acre annually. Although 0.02 percent (%) of the acreage is classified as developed (USDA, 2015), no established communities are present within the BWSD. Oil field operations are present along the west side of California Highway 46 and immediately south of Lost Hills. A food processing plant along Highway 46 is also within the BWSD. In water short years, BWSD purchases supplemental water and recovers previously banked supplies from groundwater banking projects on the Kern Fan.

BWSD's *Agricultural Water Management Plan* (2012) indicates:

> "The land serviced by BWSD does not have a subsurface drainage water problem. There are no on-farm subsurface tile drains. On-farm tail water (surface) drainage within the District is also minimal due to the use of pressurized irrigation systems. In the cases where on-farm tail water is generated, the water users typically contain it within the property. So, there are no drainage discharges from the District."

> "Groundwater quality has not been monitored on a consistent basis in BWSD. The limited data and historical use indicate that the groundwater is saline. Total

dissolved solids (TDS) concentrations have ranged from 500 to over 6,000 mg/L. The groundwater quality of most wells in the District is not generally considered suitable for most agricultural applications unless it is blended with better quality water. By comparison, TDS concentrations in SWP water provided to BWSD generally ranges from 150 to 500 mg/L. In portions of BWSD, the groundwater also contains high boron and sulfate concentrations, which further reduces its suitability for agricultural purposes. Until recently, use of groundwater as a supplemental water supply was thought to be uneconomical. However, because recent reliability studies from DWR indicate reliable supplies on the SWP around 67% of Table A amounts, and given the tolerance of some crops, namely pistachios, to higher concentrations of salts in irrigation water, some landowners have blended a limited amount of groundwater with surface water to supplement their supplies. However, the viability of these sources as long-term supplies is still in question."

"BWSD participates in groundwater banking projects outside of the District boundaries just southwest of the City of Bakersfield."

BWSD's plan also summarizes the predominant crops grown by percentage:

Crop	**Acreage Percentage**
Almonds	54.4%
Pistachios	30.7%

These crops are permanent orchards with water-efficient irrigation systems.

2.2 BERRENDA MESA WATER DISTRICT

BMWD encompasses 55,440 acres of land in the upper Antelope Plain (Figure 1). BMWD extends north and west of BWSD and is bordered by California Highway 46 on the south, the Coastal Aqueduct along the north, and Lost Hills Oil Field on the west. BMWD has a contract for 92,600 acre-feet per year of irrigation water from the SWP to 49,000 acres of developed agricultural land (BMWD, 2013). This SWP allocation amounts to about 1.9 acre-feet per acre annually. Approximately 0.7% of the BMWD is classified as developed land (USDA, 2015), which includes the community of Blackwells Corner. A food processing plant is located within the BMWD along Highway 33. Groundwater beneath the BMWD is of poor mineral quality and is not used for potable water supply. BMWD participates in water banking projects, located immediately adjacent the Kern River, to develop water supplies that can be available during dry years. In water short years, BMWD purchases supplemental water.

BMWD's *Agricultural Water Management Plan* (BMWD, 2012) indicates:

"The land serviced by BMWD does not have a subsurface drainage water problem. There are no on-farm subsurface tile drains. On-farm tail water (surface) drainage within the District's service is also minimal due to the use of pressurized irrigation systems. In the cases where on-farm tail water is generated, the water users typically contain it within the property, as stated in the District's Operating Rules and Regulations."

"Groundwater aquifers in the BMWD area are considered to be unconfined or semi-confined. Shallow groundwater is naturally recharged by infiltration from runoff in intermittent stream channels and natural depressions which has a significant impact on quality. However, this is a minor, local effect that does not affect the deeper aquifer in the Tulare/alluvium formation as significantly as recharge from the adjacent Temblor Range which is comprised of mainly of tilted and folded marine sediments. Groundwater quality in the deeper aquifer (Tulare Formation) beneath the District is by nature of poorer quality, because of its recharge source (Temblor Range). Because of its limited lateral and vertical extent, poor quality and relatively low permeability, neither the shallow nor deeper aquifers provide an adequate groundwater supply to irrigate lands extensively in the District."

"Groundwater quality has not been monitored on a consistent basis in BMWD because historically this water has not been considered a reliable water supply. The limited data and historical use indicate that the groundwater is saline. Total dissolved solids (TDS) concentrations have ranged from 500 to over 6,000 mg/L. The groundwater quality of most wells in the District is not generally considered suitable for most agricultural applications unless it is blended with better quality water. By comparison, TDS concentrations in SWP water provided to BMWD generally ranges from 150 to 500 mg/L. In portions of BMWD, the groundwater also contains high boron and sulfate concentrations, which further reduces its suitability for agricultural purposes. Until recently, use of groundwater as a supplemental water supply was thought to be uneconomical. However, because recent reliability studies from DWR indicate reliable supplies on the SWP around 67% of Table A amounts, and given the tolerance of some crops, namely pistachios and some cotton varieties, to higher concentrations of salts, two landowners have blended a limited amount of groundwater with surface water to supplement their supplies. However, the viability of these sources as long-term supplies is still in question, as the quality has been declining."

"No groundwater recharge resources within the District are supported by the District's water supplies. However, the District participates in the Pioneer and the Berrenda Mesa banking projects. In addition one landowner participates in the Kern Water Bank Authority (all outside of the District on the Kern River alluvial fan)."

BMWD's plan also summarizes the predominant crops grown by percentage:

Crop	**Acreage Percentage**
Pistachios	50.4%
Almonds	29.5%

These crops are permanent orchards with water-efficient irrigation systems.

2.3 DUDLEY RIDGE WATER DISTRICT

DRWD encompasses 37,600 acres of land extending north of the border of Kings and Kern counties on the south, the California Aqueduct on the west, Tulare Lake Bed on the east, and a narrow strip of land on either side of Interstate Highway 5 north to (but not including) Kettleman City (Figure 1). DRWD has a contract for 50,343 acre-feet per year of SWP water that is currently used on 17,000 acres of developed agricultural land. This allocation of SWP water amounts to about 2.9 acre-feet per acre annually. Although 2.7% of DRWD is classified as developed land (USDA, 2015), DRWD does not include established communities. The northern border of DRWD abuts the community of Kettleman City. Groundwater from the DRWD is of poor mineral quality and is not used for potable water supply; DRWD indicates that one well (Section 17, 23S/20E) is used for toilets and sinks (bottled water used for drinking). DRWD participates in the water banking projects, located immediately adjacent to the Kern River, to develop water supplies that can be available during dry years. In water short years, DRWD can purchase supplemental water.

DRWD's *Agricultural Water Management Plan* (DRWD, 2012) indicated:

> "The District does not own or operate any subsurface drainage facilities. Shallow groundwater conditions experienced prior to the late 1980's have long since been alleviated by extensive landowner conversions to low-volume irrigation systems. Landowners are required by the District to maintain applied water on their lands—privately operated tail water/spill recovery systems are in place to accomplish this element of water management."

> "Although the District lies within the boundaries of what is defined as the Tulare Lake groundwater basin, it is categorized by DWR in Bulletin 118 as having "groundwater unavailable and/or unusable". Most wells in the area have been abandoned due to poor yield and poor water quality…the District has developed or participated in groundwater banking projects located elsewhere in the state to increase the dry year reliability of its water supply."

DRWD's plan also summarizes the predominant crops grown by percentage:

Crop	Acreage Percentage
Pistachios	43.9%
Almonds	28.3%
Pomegranates	14.7%

These crops are permanent orchards with water-efficient irrigation systems.

2.4 LOST HILLS WATER DISTRICT

LHWD encompasses 72,183 acres of land and extends east of BMWD to the Kern National Wildlife Refuge (Refuge), south to the community of Lost Hills, and north to the border of Kings and Kern counties (Figure 1). LHWD supplies 119,110 acre-feet per year of SWP water to about 56,000 acres of developed agricultural land (LHWD, 2012a). This allocation of SWP water amounts to about 2.2 acre-feet per acre annually. Approximately 0.6% of LHWD is classified as developed, which includes the community of Lost Hills (see subsection 2.5).
A food processing plant is located within LHWD along King Road. Devils Den Oil Field borders LHWD along the northwest and Lost Hills Oil Field borders along the south of LHWD. Oil field operators extract oil and re-inject associated brine into exempted aquifers for disposal or use in water or steam flood enhanced petroleum recovery operations. Groundwater from the LHWD is of poor mineral quality and is not used for potable water supply. In water short years, LHWD purchases supplemental water.

LHWD's *Agricultural Water Management Plan* (LHWD, 2012b) indicates:

> "The District does not own or operate any surface water drainage facilities (on-farm tail water return systems are owned and operated by the landowners). The District also does not own any on-farm subsurface drainage systems. The District does own a subsurface drain water evaporation pond system, which was acquired from the landowners who built the system. This system includes the evaporation ponds and associated land, and the discharge sumps, pumps and piping.
>
> "The District primarily supplies agricultural water to growers within its boundaries with a small amount of industrial water delivered annually to agricultural processing facilities and oil production customers. The District supplies no municipal water. The industrial water supplied makes up about one percent of the District's normal annual water deliveries."
>
> "There are three groundwater zones within the District: "perched" or shallow, "unconfined" and "confined". Shallow groundwater is found above a clay layer called the "A" clay, which is about 40 feet below the ground surface. This shallow groundwater is generally of such poor quality that it is unacceptable for irrigation use. Observation wells located within the shallow groundwater area have shown TDS (total dissolved solids) levels ranging from 5,000 to near 100,000 parts per million (ppm). The unconfined aquifer lies on top of a thick, nearly impervious clay layer called the Corcoran Clay. The Corcoran Clay lies 600 to 700 feet below the ground surface. The water quality of the unconfined aquifer as measured by KCWA generally ranges from 500 to over 5,000 ppm TDS within the eastern part of the District. The confined aquifer is found below the Corcoran Clay. This water is generally of better quality than the unconfined aquifer water and is the best chance to obtain useable groundwater within the District. The water quality of the confined aquifer as measured by KCWA generally ranges from 500 to 3,000 ppm TDS within the eastern part of the District."

> "No groundwater recharge resources within the District are supported by the District's water supplies. However, the District participates in the Pioneer and the Berrenda Mesa banking projects. In addition one landowner participates in the Kern Water Bank Authority (all outside of the District on the Kern River alluvial fan)."

LHHD's plan also summarizes the predominant crops grown by percentage:

Crop	**Acreage Percentage**
Pistachios	42.9%
Pomegranates	30.3%
Almonds	23.0%

These crops are permanent orchards with water-efficient irrigation systems.

2.5 WESTERN SUPPLEMENTAL AREA

The WSA includes about 150,000 acres of land west of the Districts to the crest of the coast range mountains. The WSA includes about 100,000 acres of land within Kern County. However, the western Kern County border only approximates the crest of the coast range, and the WSA also includes about 50,000 acres of land in eastern San Luis Obispo County. The WSA includes mountains of the Temblor Range that have been used primarily for oil field operations and cattle grazing. Occasionally, dry land farming has been conducted in isolated areas. No communities are located within the WSA. The *Kern County Integrated Regional Water Management Plan* prepared by Kennedy/Jenks Consultants did not identify any groundwater basins within the WSA (Kennedy/Jenks, 2011). Similarly, the *Integrated Regional Water Management Plan* recently prepared by San Luis Obispo County Water Resources Division did not identify any groundwater basins within the WSA (SLOCWRD, 2014).

3.0 STUDY AREA ENVIRONMENT

The Study Area is located along the western edge of Kern and Kings Counties within the Tulare Lake Basin, as regulated by the RWQCB (Figure 1). As described previously, the Study Area includes the communities of Lost Hills and Blackwells Corner, as well as Beer Nose Oil Field, Belridge Oil Field, Blackwells Corner Oil Field, Cal Canal Oil Field, Lost Hills Oil Field, and portions of other oil fields. Kettleman City is located just north and just outside of DRWD. The Temblor range borders the Districts on the west, and the valley floor of Tulare Lake Basin borders the Study Area on the east. The California Aqueduct and Interstate 5 traverse through the Study Area from the northwest (Kettleman City) to the southeast toward the City of Buttonwillow.

3.1 GEOLOGY

The Study Area is within the southwestern portion of the San Joaquin Valley. Regional geology in the southwestern San Joaquin Valley is characterized by a long history of structural deformation associated with tectonic movement along the continental borderland, including the prominent and still active San Andreas Fault. Uplift of the Sierra Nevada east of the valley, later uplift of the Temblor Range on west side, and formation of the deep structural trough beneath the valley floor, have resulted in the accumulation of more than 20,000 feet of marine and terrestrial sediments of Cretaceous to Holocene age throughout the basin (Maher et al., 1975).

3.1.1 Surface Soils

Surface soils for the Study Area are described in soil surveys (USDA, 1986 and 1988). For northwestern Kern County (BWSD, BMWD, and LHWD), soils transition from well-drained alluvial fans and plains on the east to somewhat poorly drained basin clays and silt loams on the west. For the western Kings County (DRWD), soils transition from well drained alluvial fans on the west to saline-alkaline basin loams or clay loams on the east.

The Study Area is covered by the *Soil Survey of Kern County Northwestern Part* (NRCS, 1988) and the *Soil Survey of Kings County* (NRCS, 1986). Near-surface soils within the Kern County part of the Study Area include the following soil series:

Series	pH (s.u.)	Salinity (mmhos/cm)	Limitations
Buttonwillow	7.9-8.4	<4	Drainage, Salinity
Kimberlina	6.6-8.4	<2-8	Fertility, Alkalinity
Lethent	>7.8-9.0	4-16	Saline-Alkali
Lokern	6.6-9.0	<2-16	Saline-Alkali, Drainage
Milham	7.4-8.4	<2-<8	Fertility
Nahrub	>7.4->7.8	4-16	Saline-Alkali, Drainage
Panoche	7.4-8.4	<2-16	Saline-Alkali, Drainage
Twisselman	7.9-9.0	<2->16	Saline-Alkali, Drainage
Yribarren	7.9-8.4	<2-<8	Saline-Alkali

Near-surface soils within the Kings County part of the Study Area (DRWD) include the following soil series:

Series	pH (s.u.)	Salinity (mmhos/cm)	Limitations
Garces	6.6-9.0	2-8	Saline-Alkali
Lethent	<7.8-9.0	4-16	Saline-Alkali
Panoche	7.4-8.4	<2-16	Saline-Alkali, Drainage
Wasco	6.1-8.4	<2	None
Westhaven	7.4-9.0	<2-8	Saline-Alkali

These data show that most of soil series within the Study Area are naturally saline-alkaline and those conditions limit the range of crops that can be grown productivity.

Near-surface soils within the Kings County part of the Study Area (DRWD) include the following soil series:

Series	pH (s.u.)	Salinity (mmhos/cm)	Limitations
Amramburu	6.6-8.4	0-2	Slope-Erosion
Balcom	7.9-8.4	0-2	Slope-Erosion
Naciemento	7.9-8.4	0-2	Slope-Erosion
Reward	7.9-8.4	0-2	Slope-Erosion
Temblor	7.9-8.4	0-2	Slope-Erosion

These soils are typically shallow and steep and contain rock fragments that limit their utility for irrigated agriculture. The distribution of these primary soil series are shown on Figure 2.

3.1.2 Regional Stratigraphy

The stratigraphy of the southwestern San Joaquin Valley comprises marine sedimentary rocks from the Jurassic/Cretaceous through Tertiary Periods and unconsolidated non-marine sediments from Late Tertiary and Quaternary Periods (Figure 3).

The oldest marine sediments are exposed in the Temblor Range from north of Highway 41 south to Highway 58. Younger marine formations are exposed to the east, approaching the valley floor. The stratigraphic relationships of these formations are complex, owing to the significant structural deformation present on the west side of the valley.

The continental Tulare Formation overlies various marine formations along the west side of the valley. In many areas, the Tulare Formation is overlain by younger alluvium. In areas where the Tulare Formation is absent, the younger alluvium directly overlies older marine sediments.

The Tulare Formation and overlying alluvium consist of coarse-grained facies east of the Temblor Range associated with alluvial fan deposition from the upland of the Temblor Range. West of the Kettleman and Lost Hills areas, these coarse-grained alluvial facies become interbedded with fine-grained facies associated with lacustrian, fluvial, deltaic, and marshland deposits from the pre-historic and historic Tulare Lake and Goose Lake, as well as the Kern River flood plain situated between them (Croft, 1972; Page, 1983). The Tulare Formation and overlying alluvial sediments comprise the major aquifers beneath the San Joaquin Valley.

3.1.3 Regional Structural Geology

The topography and geology of the southwestern San Joaquin Valley has been shaped by the regional tectonic environment and subsequent erosion. The dominant structure in the region is the San Andreas Fault. The regional stress field developed by slip along the irregular fault trace of the San Andreas has resulted in ancillary faulting within the Temblor Range paralleling the San Andreas. Furthermore, regional compressional forces along this margin have resulted in the uplift and formation of highly folded and faulted marine sediments in the Temblor Range and the development of a series of en-echelon anticlines and synclines east of the Temblor Range that either plunge to the southeast or are doubly-plunging toward the northwest and southeast (Figure 3).

Several anticlines and synclines that have been exposed in the vicinity of the Districts include:

1. the Kettleman Hills anticline west of DRWD, northwest of LHWD, and northeast of BMWD;

2. the Pyramid Hills anticline and syncline north of BMWD;

3. the Lost Hills anticline bisects portions of the southeastern portion of the LHWD and is east of BMWD and north of BWSD;

4. highly folded Monterey Shale of the Shale Hills lies adjacent to the western boundary of BMWD;

5. the North Antelope Hills anticline is situated west of the BWSD;

6. the North Belridge anticline is located within the BWSD;

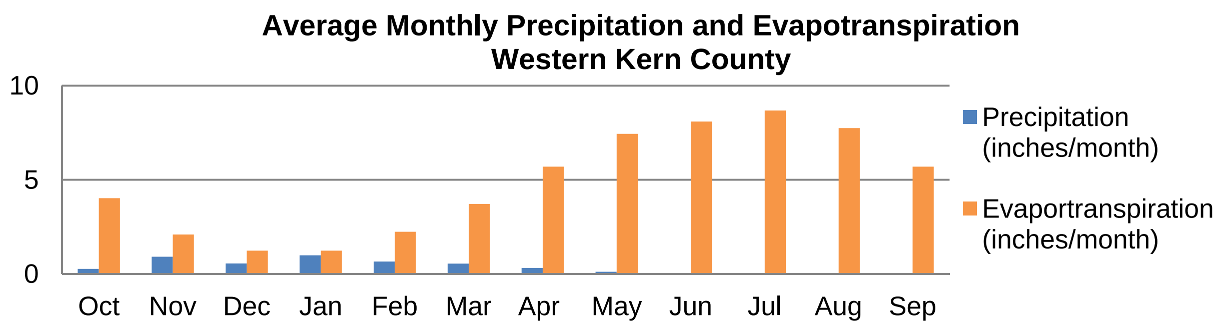
7. the McDonald anticline is situated west of the BWSD; and

8. the northern extension of the Elk Hills anticline lies west of the southwestern portion of the BWSD (Dibblee, 1973; Graham et al., 1999).

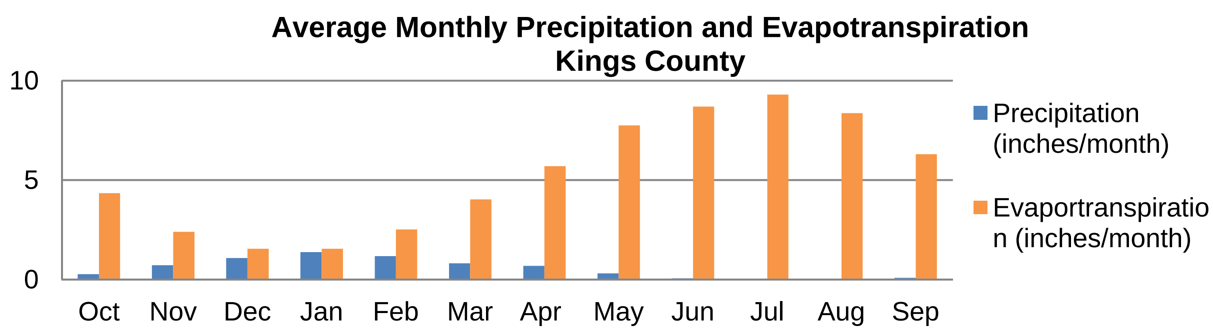
Post-Pliocene deposition of marine and terrestrial sediments occurred under the active tectonic environment of the San Andreas Fault and associated developing anticline and synclines in the region. Deposition and erosion associated with an active tectonic environment over time results in the incremental deformation of these sediments as the duration and magnitude of deformations progresses over time. This has implications on the occurrence and flow of groundwater in aquifers that have developed in the Tulare Formation, older alluvium, and alluvial sediments adjacent to the Temblor Range. Anticline, syncline, and fault structures have also contributed to the localization of oil and gas resources in the region.

3.2 CLIMATE

Climate in the Study Area is characterized as an inland Mediterranean climate with hot and dry summers and cool winters. The average annual precipitation at Blackwells Corner is 4.5 inches (WCRC, 2013) and the average annual reference evapotranspiration for western Kern County is 58 inches (CIMIS, 2009). The following chart is a comparison of the average monthly precipitation/evapotranspiration for the western Kern County area:



Western Kings County climate is similarly dry; the average annual precipitation at Kettleman City station is 6.6 inches (WCRC, 2013) and the average annual reference evapotranspiration for Kings County is 62 inches (CIMIS, 2009). The following chart is a comparison of the average monthly precipitation/evapotranspiration for the Kings County area:



These dry climatic conditions have resulted in desiccation of soils before irrigation development occurred within the Study Area; these soil characteristics restrict deep percolation of irrigation water.

3.3 SURFACE WATER

The Study Area is within the South Valley Floor Hydrologic Unit (specifically HA 558.60 and HA 557.30) (RWQCB, 2005). Ephemeral stream beds occur in the upper reaches of the hydrologic areas (WSA) and drain to the east into the Districts. Runoff in these streams is not controlled and typically percolates prior to reaching the valley floor. The 100-year, 24-hour storm event for this area ranges from 3 to 3.5 inches (NOAA, 2013).

Irrigation canals and drainage facilities are the main surface water features within the Study Area. Besides these features, the dominant surface water features in the area of BWSD, BMWD, DRWD, and LHWD are the California Aqueduct, its Coastal Aqueduct intertie, and the Refuge. Other surface water features in the area include the Tulare Lake Bed, Goose Lake, and Kern/Buena Vista Lake.

The designated beneficial uses of surface water in South Valley Floor Hydrologic Unit are agriculture (AGR); industrial (IND); process water supply (PRO); non-contact water recreation (REC-2); warm freshwater habitat (WARM); wildlife habitat (WILD); rare, threatened, or endangered species (RARE); and groundwater recharge (GWR) (RWQCB, 2005). The uplands (above the Districts) consist of 11 relatively small watersheds of 9 to 104 square miles that produce little runoff ranging from 100 to 2,700 acre-feet per year (USGS, 1983). For example, U.S. Geological Survey (USGS) maintained a stream flow gage in Bitterwater Creek, upstream of Lost Hills (USGS Station 11197370) for 17 years (1962 through 1978). The maximum annual flow in Bitterwater Creek was reported at 0 cubic feet per second for 7 of those 17 years.

The quality of water in upland streams and springs was characterized (USGS, 1959) as follows:

Surface Waters	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**
USGS - Streams[1]	590-3,100	540-3,200	0.4-0.9
USGS - Springs[2]	542-16,100	362-10,900	0.0-14
MUN	1,600	1,000	5
AGR-Irrigation	*3,000*	*2,000*	*15*
AGR-Livestock	*8,000*	*5,000*	*5*
AGR-Poultry	*5,000*	*na*[3]	*5*

1. Polonio, Bitterwater, Media Agua, and Carneros Creeks.
2. Mize and Carneros Springs and Unnamed Springs.
3. na = not available.

Surface waters in the Study Area do not support MUN or AGR beneficial uses based on limited and unreliable flow, as well as fair-to-poor mineral quality water.

The quality of imported surface water from the SWP is summarized from the California Department of Water Resources' (DWR) database (DWR, 2013b). The following data are the average concentration of water from Kettleman Check 21 between 2008 and April 2013:

State Water Project	EC (µmhos/cm)	TDS (mg/L)	Chloride (mg/L)	Boron (mg/L)
DWR - Check 21	449	252	71	0.17
MUN	*1,600*	*1,000*	*500*	*5*
AGR-Irrigation	*3,000*	*2,000*	*na*[1]	*15*
AGR-Livestock	*8,000*	*5,000*	*na*	*5*
AGR-Poultry	*5,000*	*na*	*na*	*5*

1. na = not available.

These data show that imported surface water from the SWP is of good mineral quality, suitable for all forms of AGR supply and potentially suitable for MUN with treatment (filtration and disinfection) to meet drinking water standards.

The Southern San Joaquin Valley Water Quality Coalition has been monitoring a surface water station at the Main Drain Canal at Highway 46 (558MDCH46) since 2004 (SWRCB, 2013). Salt concentrations in water samples from the Main Drain Canal have ranged as follows:

Main Drain Canal	EC (µmhos/cm)	TDS (mg/L)	Arsenic (µg/L)	Chloride (mg/L)	Boron (mg/L)
DWR - Check 21	259-3,960	140-2,410	2-30	40.9	0.12-2.58
MUN	*1,600*	*1,000*	*10*	*500*	*5*
AGR-Irrigation	*3,000*	*2,000*	*100*	*na*[1]	*15*
AGR-Livestock	*8,000*	*5,000*	*200*	*na*	*5*
AGR-Poultry	*5,000*	*na*	*200*	*na*	*5*

1. na = not available.

These data show that water in the Main Drain Canal is of fair-to-poor mineral quality. This variability in water quality renders that water unsuitable for MUN and unusable for AGR-Irrigation unless blended with high quality irrigation water, although it may be suitable for AGR-Livestock or AGR-Poultry.

3.4 HYDROGEOLOGY

Groundwater beneath the Study Area occurs under perched, unconfined, and confined conditions (Figure 4). Areas of shallow perched groundwater appear to correspond to the presence of a shallow clay layer (designated the A-clay) beneath the BWSD, DRWD and LHWD. The perched aquifer consists of Pleistocene-Holocene fluvial and flood basin sediments comprised predominately of silts and clay interbedded with sand layers (Hilton et al., 1963; Croft, 1972). These sediments overlie the A-clay and grade laterally into younger alluvium to the west. The areal extent of perched aquifers appears centered on an axis along the Kern River Flood Channel between Goose Lake and Tulare Lake beds and lie east of the California Aqueduct (DWR, 2008). The lateral extents of the A-clay are poorly constrained. The A-clay reportedly has been encountered under LHWD at depths of 30 to 60 feet (P&P, 2007).

Unconfined aquifers exist in alluvial sediments of Antelope Valley east of the Lost Hills Anticline and below the perched groundwater in the upper Tulare Formation. The unconfined aquifer consists predominately of coarser alluvial sediments flanking the Temblor Range that grade laterally eastward into finer grained fluvial, marsh, deltaic, and lucustrian deposits between Goose Lake and Tulare Lake. In areas where fluvial deposits become highly interbedded and bifurcated, semi-confined groundwater conditions may be encountered in the upper Tulare Formation. The base of the unconfined aquifer is defined by the presence of the Corcoran Clay (E-clay), where it is present. In areas where the E-clay is absent, the unconfined aquifer extends to the top of the marine formations.

The modified E-clay described in Page (1986) forms the major regional aquitard that separates the upper unconfined aquifer from the lower confined aquifer in the southwestern San Joaquin Valley. Within BWSD and LHWD, it has been encountered in wells east of the California Aqueduct (Page, 1986). The E-clay is also known to underlie DRWD and portions of LHWD east of the Lost Hills Anticline, but appears absent west of this structure beneath the Antelope Plain (P&P, 2007) and BMWD. The presence of the E-clay beneath BWSD west of the California Aqueduct is poorly constrained. The depth at which the E-clay is encountered varies due to structural deformation associated with the presence of anticline and syncline structures along the west side of the valley. It is encountered as shallow as 100 feet along the east limb of Lost Hills (P&P, 2007) to as deep as 900 feet near the southwest edge of Tulare Lake bed (Page, 1986). The thickness of the E-clay ranges from 8 feet south of Lost Hills to 205 feet near the southwest edge of the Tulare Lake bed (Page, 1986).

Groundwater below the E-clay is encountered in confined conditions. The Tulare Formation below the E-clay consists of unconsolidated interbedded sand, silt, and clay. The nature of these sediments ranges from coarser alluvial fan deposits near the Temblor Range to fine grained lucustrian, fluvial, and marsh deposits eastward toward the axis of the valley trough (Croft, 1972).

3.4.1 Groundwater Occurrence

The DWR indicates that perched groundwater occurs below the eastern Districts (DWR, 2008). Perched water in portions of the BWSD, DRWD, and LHWD ranges in depth from 5 to 20 feet (Appendix C). DWR does not identify perched groundwater in the BMWD, although it may be present in some areas.

The DWR does not characterize the occurrence of semi-confined or confined groundwater within the Study Area due to lack of current data. However, the Kern County Water Agency (KCWA) indicates the depth to groundwater in the Districts (except BMWD and DRWD) in

2001 was between 50 and 100 feet with a general gradient to the east. KCWA performed a groundwater study between 1970 and 1974 (KCWA, 1974) within the Districts; at that time, groundwater gradients in the unconfined aquifer showed an east-northeast trend, except around the Lost Hills anticline, which appeared to act as a hydraulic barrier. In the immediate vicinity of the anticline, groundwater level data indicate that groundwater flows radially away from the axis of the anticline (Appendix C).

3.4.2 Tulare Lake Basin Plan Designation

The Study Area is within Detailed Analysis Units (DAUs) designed by the *Water Quality Control Plan for the Tulare Lake Basin* (*Tulare Lake Basin Plan*; RWQCB, 2005):

> BWSD, BMWD, LHWD and WSA in DAU 259
> DRWD in DAU 246

The designated beneficial uses of groundwater in DAU 259 and DAU 246 are MUN, AGR, and IND (RWQCB, 2005). Groundwater in the Study Area occurs as perched (unconfined), semi-confined, and confined groundwater.

Amec Foster Wheeler has evaluated water quality criteria that would be applicable for MUN, AGR, and IND. That summary is provided in Appendix B, and the water quality criteria summarized in Table 1 are used to evaluate groundwater usability in the remainder of this report.

3.5 BIOLOGY

Kern County Planning Department is in the process of developing a conservation management plan for the valley floor to the western edge of Kern County. The draft *Kern County Valley Floor Habitat Conservation Plan* (VFHCP; Garcia and Associates, 2006) includes the areas of BWSD, BMWD, and LHWD. The draft VFHCP describes the area as follows:

> "The San Joaquin Valley included a variety of ecological communities, including woodlands, freshwater marshes and grasslands prior to the establishment of the present land use patterns. In upland areas, several distinct dryland communities of grasses and shrubs developed along rainfall and edaphic gradients, forming a mosaic of vegetation types. Today, agricultural development dominates the flat lands in the center of the valley. Undisturbed open space is largely restricted to the sloping margins of the valley, including many areas, where oil development also occurs.
>
> "The extent of wetlands in the San Joaquin Valley has decreased since the 1800s. For example, lakes and wetlands in the Kern River delta area have been converted to other uses since the 1880s when the human population began to increase (Cole 1945). Today there is little standing water on the valley floor and most lands are committed to

> agriculture. The Kern River channel, flowing west of Bakersfield toward Interstate Highway 5, is undeveloped and dry for most of the year.
>
> "Loss of native plant and animal species accompanied habitat conversion. The Tulare subbasin, along with the Carrizo Plain, Cuyama Valley and the surrounding foothills, once contained over six million acres of native grasslands, shrublands, woodlands and riparian habitat. Today, more than 90 percent of the native habitats of the valley floor have been converted to human uses. More importantly, many of the remaining undeveloped parcels are scattered and largely isolated throughout the region."

In the VFHCP, the environment of the Study Area is described as Valley Saltbrush Scrub:

> "This vegetation type is also dominated by chenopod shrubs, but it differs from valley sink scrub in that the shrubs are typically less alkali-tolerant and support an herbaceous annual understory, typically dominated by non-native annual grasses which greatly increase susceptibility of this vegetation type to fire. Saltbush scrub formerly covered extensive areas of the San Joaquin Valley, especially around the Kern River delta and lower foothills surrounding the Tulare subbasin, however this vegetation type has been reduced by agricultural production, and other human-caused disturbances."

Wetlands occur within the Refuge and the Goose Lake wetlands. The 11,249-acre-Refuge is located just west of the LHWD and includes approximately 5,000 to 6,500 acres of seasonal wetlands, irrigated moist soil units, and riparian habitat. Upland areas of the Refuge total about 3,600 acres of grassland, alkali playa, and valley sink scrub habitats. Water supply for the Refuge is provided by the SWP. The *Water Management Plan* for the Refuge (USBR, 2011) indicates:

> "Groundwater has elevated levels of boron, arsenic and sodium. The depth to ground water makes the pumping very expensive. All wells are inactive with deteriorated casings and only four of the wells have pumps. These wells would only be used in a short-term emergency and only if money were available to pay the pumping costs."

Goose Lake is a privately held, ephemeral wetland that is habitat for threatened or endangered species. Goose Lake is located between Wasco and Lost Hills in western Kern County, but not within any of the Study Area. The United States Bureau of Reclamation (USBR) is attempting to organize a management plan at Goose Lake for species protection. The USBR indicates that the wetland contains native alkali grassland and native alkali scrub habitat. Goose Lake is reportedly maintained by surface waters from a variety of sources (USBR, 2012).

Two ecological preserves have been established in the vicinity of the Study Area: the Lokern Preserve and the Semitropic Ridge Ecological preserve. Both preserves are managed by the Center of Natural Lands Management (CNLM).

Just south of the BWSD, the Lokern Preserve has been established by industry-government partnership. The preserve is 3,900 scattered acres consisting of native habitat for threatened/endangered species including the Kern mallow, San Joaquin kit fox, giant kangaroo rat, San Joaquin antelope squirrel, and blunt-nosed leopard lizard. Much of the preserve is comprised of valley saltbush scrub. In areas of heavy clay soils east of the California Aqueduct, saltbush scrub grades into valley sink scrub and Iodine bush. Since most of these species are desert-adapted, the CNLM emphasizes maintenance of relatively sparse herbaceous cover (CNLM, 2013).

Just west of LHWD and south of the Refuge, the Semitropic Ridge Ecological Preserve is 3,700 scattered acres that were established as a wildflower preserve and habitat for threatened/endangered species, including the San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin antelope squirrel. The major vegetative associations at this preserve include valley saltbush scrub and valley sink scrub. As with the Lokern Preserve, most of these species are desert-adapted, and special emphasis is placed on maintaining a relatively sparse herbaceous cover (CNLM, 2013).

In addition, the Chico Martinez ACEC has been established to include the southern edge of the WSA. The Chico Martinez ACEC is 7,217 acres of private and federal land, identified principally for its important cultural, paleontological, and geological resources, in addition to habitat for special status animal and plant species. The lower slopes and less rugged terrain of the area provides habitat for the federally endangered blunt nosed-leopard lizard and San Joaquin kit fox and the state-listed San Joaquin antelope squirrel (USBLM, 2014).

3.6 Economic Geology

Within the Tulare Lake Basin, mineral resources are mined to produce aggregates, precious metals, petroleum, and natural gas. Within LHWD, H.M. Holloway, Inc., operated an open-pit gypsum mine located on Holloway Road. For this report, we focus on production of oil and gas within the Study Area.

Oil and gas recovery operations occur immediately adjacent to each of the Districts or historically within portions of the Study Area. Designated oil fields include North Antelope Hills, Antelope Hills, McDonald Anticline, Carneros Creek, Chico Martinez, Cymric, Monument Junction, North Belridge, and South Belridge Oil Fields east the BWSD; Deer Nose, Welcome

Valley, Shale Point Gas, and Blackwells Corner Oil Fields adjacent BMWD; Lost Hills Oil Field between BMWD and LHWD and within portions of BWSD and LHWD; and Kettleman Middle Dome west of DRWD. Oil field operations extract various grades of petroleum, natural gas, and associated produced water (brine). The brine is currently re-injected into oil producing zones for use in water- or steam-flood enhanced petroleum recovery operations or into designated exempt aquifers for disposal, in accordance with regulations of the California Division of Oil, Gas, and Geothermal Resources (CDOGGR). Previous oil field operations included evaporation/percolation ponds for disposal of brine and surface discharge into drainage channels.

Formations that produce oil and gas generally do not produce usable groundwater as a drinking water source because of dissolved petroleum and salts in the water. For example, the reported total dissolved solids (TDS) in brine produced in the North Belridge Oil Field ranges from 21,400 to 42,000 milligrams per liter (mg/L). Current production zones range from 1,000 to more than 15,000 feet in depth. However, some of the early oil and gas production was much shallower; the average depth of production from the shallow Tulare Formation wells in Lost Hills Oil Field and South Belridge Oil Field were 200 and 400 feet in depth, respectively (CDOGGR, 1998). Brine water quality in the Tulare Formation is reported as:

Tulare Formation Water	**TDS (mg/L)**
Belridge North Oil Field	21,400
Belridge South Oil Field	13,900
Cymric Oil Field	4,844 – 17,000
Dudley Ridge Gas Field (Abandoned)	6,412
Lost Hills Oil Field	15,500
MUN	*1,000*
AGR-Irrigation	*2,000*
AGR-Livestock	*5,000*
AGR-Poultry	*na*[1]

1. na = not available, milligrams per liter (mg/L).

The last producing gas well in Dudley Ridge Gas Field was abandoned in 1965. The California State Water Resources Control Board (SWRCB) authorized exempted aquifers for reinjection of brine water back into the oil producing zones (CDOGGR, 1981). Until recently, the RWQCB regulated percolation pond discharges of produced brine water in westside oil fields; these produced water ponds have been closed. These discharges have reportedly affected the mineral quality of shallow groundwater below and downgradient within the Study Area (RWQCB, 2005 and 2006).

4.0 LAND USE

The United States Department of Agriculture (USDA) annually publishes a geomap of land uses within the United States (USDA, 2015) interpreted from satellite photography and geospatial interpretation. For the Study Area, the most recently published map for land uses in 2013. The USDA map for the Study Area indicates the following approximate acreages:

Category	Descriptions	Acreage Percentage
Grazing	Pasture/Grassland	46.1%
Open Space	Barren/Shrub land/Fallow/Developed Open Space	31.2%
Agriculture	Orchards/Vineyards/Row and Field Crops	18.0%
Urban	Low/Med/High Density Development	4.7%

Based on the above estimates, less than 20% of the acreage is in agricultural production. Based on the above, we have summarized agricultural, petroleum, mining, municipal, and open space land uses for the Study Area.

4.1 AGRICULTURE

Agricultural operations within the Study Area include irrigated agriculture, dry farmed agriculture, and pasture and grazing land. In 2013, about 46% of the acreage was used for grazing and about 15% of the acreage was fallow. Irrigated agriculture estimated at about 17%, or about 52,000 acres, and dry farmed was about 1%, or about 3,000 acres. The USDA database does not indicate which agricultural uses include irrigation. For purposes of this summary, we assumed that crops of winter wheat and barley are dry farmed. The distribution of agricultural land use by crop type is shown on Figure 5.

4.2 PETROLEUM

Petroleum production (oil and gas) would be identified by USGS as developed open space, barren, or shrubland and occupied about 20% of the acreage in the Study Area in 2013. Those oil fields include:

- Antelope Hills Oil Field
- Antelope Hills, North, Oil Field
- Antelope Plains Gas Field
- Blackwells Corner Oil Field
- Belridge North, Oil Field
- Belridge South Oil Field
- Beer Nose Oil Field
- Cal Canal Oil Field
- Carneros Creek Oil Field
- Chico Martinez Oil Field
- Cymric Oil Field
- Lost Hills Oil Field
- Lost Hills, North, Oil Field
- McDonald Anticline Oil Field
- Monument Valley Oil Field
- Shale Flats Gas Field
- Shale Point Gas Field
- Welcome Valley Oil Field

According to CDOGGR (1998), the gas fields have been abandoned and the oil fields continue production of oil and gas. Oil field administrative boundaries within the Study Area are shown on Figure 6.

4.3 MINING

The USGS maintains a database of *Mineral Resources On-Line Spatial Data* (USGS, 2015) that includes information on current and previous mining activities in the United States. Within the Study Area for this report, the database identifies borrow pits, sand and gravel quarries, and gypsum mines. The database identifies one former borrow pit in the vicinity of Lost Hills and one former sand and gravel quarry in the vicinity of Blackwells Corner that provided construction materials. The database identifies more than ten former gypsum mines scattered within the Study Area, including six along the western flank of the Lost Hills anticline.
In addition, the database lists other former mining operations without identification of the commodity.

4.4 MUNICIPALITIES

The only communities within the Study Area are Lost Hills and Blackwells Corner (Figure 7). These two communities are provided municipal water supply by the Lost Hills Utility District (LHUD) that imports groundwater from outside the Study Area, about 10 miles east of City of Lost Hills. Lost Hills is identified as a Disadvantaged Community (PolicyLink, 2013). LHUD water demand was reportedly 423 acre-feet in 2005 and was projected to grow to 661 acre-feet in 2030 (Kennedy/Jenks, 2011).

BMWD includes the small community of Blackwells Corner at the intersection of Highway 46 and Highway 33. Groundwater is imported by the LHUD for potable supply in Blackwells Corner; LHUD imports water from 13 miles further east and beyond the borders of any of the Districts.

The Kettleman City Community Services District (KCCSD) is located north of DRWD and outside of the Study Area. KCCSD currently supplies 315 acre-feet per year of municipal water to the community through two active wells located north of DRWD. For planned development, KCCSD is anticipated to need up to 2,116 acre-feet per year (KCPD, 2009). The groundwater supplies exceeded the drinking water standard for arsenic (CDPH, 2012). Kettleman City has recently acquired funds for a water treatment facility and has assigned water credits of up to 900 acre-feet per year from the SWP (KCPD, 2009).

For the community of Lost Hills, LHUD imports groundwater from 10 miles east of LHWD for potable water supply. Prior to distribution, the imported water is treated for arsenic removal.

LHUD provides water to commercial facilities at the intersection of Highway 46 and Interstate Highway 5, to the community of Lost Hills and to the community of Blackwells Corner. Municipal water demand by LHUD was projected to increase from 462 acre-feet per year in 2010 to 661 acre-feet per year in 2030 (Kennedy/Jenks, 2011).

The GeoTracker GAMA database identifies two public water systems within BWSD: Aera Energy LLC (Aera) and Clean Harbors Buttonwillow LLC (Clean Harbors) west of Buttonwillow. The Aera system consists of two wells located along Lerdo Highway about 1½ miles east of the eastern edge of BWSD that supplies water for industrial and domestic use. Clean Harbors system consists of two wells that are currently listed in the "DRINC" database (CDPH, 2015) as "inactive." The GeoTracker GAMA database also identifies one public water system in LHWD: La Cuesta Verde Ranches is listed in the DRINC database as "NP" or a "non-piped source of water…transported to a facility via a sanitary tanker."

4.5 OPEN SPACE

Based on the USDA database, approximately 31% of the Study Area was open space in 2013. As described by USDA, open space can include barren land, shrub land, fallow crop land, forests, and wetlands. An additional 46% of the Study Area was identified as pasture or grassland, which would be suitable for livestock grazing. If grazing is included as part of open space, about 77% of the Study Area would be open space. One area of these open spaces has been designated an Area of Critical Environmental Concern (ACEC) (USBR, 2015):

> Chico Martinez ACEC (7,217 acres) in southern WSA: USBR intends to "Manage the Chico Martinez ACEC to protect significant exposures of important paleontologic resources, geologic rock type formations, and endangered species."

5.0 PREVIOUS GROUNDWATER STUDIES

Groundwater studies within the Study Area have been conducted and published occasionally for more than 100 years. Groundwater below the Study Area was originally described by Mendenhal in 1908 (USGS, 1908):

> "…there can be no doubt that beneath the broad, steeply sloping westside plains of Kern County, the water is too poor in quality to be usable, except possibly for stock…"

Amec Foster Wheeler has reviewed available reports and has developed a database of groundwater data based on published reports and governmental databases. Groundwater data from each of the following references were incorporated into a project database. For this report, we included published data within 5 miles of the perimeter of each of the Districts and up to the crest of the watershed divide bordering the west side of the WSA; the Study Area is shown on Figure 1. The following subsection summarizes the sources of those data and evaluates groundwater quality data within the Study Area. The data sources share some overlapping information and obviously duplicated data were identified to the extent feasible.

5.1 U.S. GEOLOGICAL SURVEY

In 1959, Wood and Davis reported on 1930 through 1955 water sample analytical data from 45 water supply wells within the Study Area (USGS, 1959). Water uses of the 45 wells were described as follows: 2 were listed as industrial, 3 were listed as domestic, 6 were listed as unused, 13 were listed as stock, and 21 were listed as irrigation. Groundwater samples were analyzed for salts and provided the following results:

Wells	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**	**Sulfate (mg/L)**
USGS 1930-1955	890-8,370	537-7,040	0.4 – 18	48-3,930
MUN	*1,600*	*1,000*	*5*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*

na = not available.

Between 1930 and 1955, groundwater below most of the Study Area exceeded the current water quality criteria for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry. Based on USGS listings of water use, the poor mineral quality of water marginally supported these uses until better-quality imported water became available from the SWP.

In 1963, Beard, et al., reported on the vertical characterization of groundwater quality for well clusters in perched groundwater areas (Beard, 1963). One of the well clusters was located near the Refuge (25S/21E-01N). The cluster consisted of four wells constructed with screened intervals between 10 to 20 feet below ground surface (bgs) (designated 1N15), 56 to 62 feet bgs (designated 1N57), 90 to 100 feet bgs (designated 1N95), and 189 to 199 feet bgs (designated 1N194). Each well was sampled in August 1990 for salinity and metals analyses. The data are summarized as follows:

Wells	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**	**Sulfate (mg/L)**	**Arsenic (µg/L)**
USGS-1N15	1,750	1,270	0.87	220	6
USGS-1N57	12,000	9,280	9.4	4,600	16
USGS-1N95	6,250	4,260	2.1	1,500	10
USGS-1N194	4,540	2.620	1.3	420	8
MUN	*1,600*	*1,000*	*5*	*500*	*10*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*100*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*	*200*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*200*

na = not available.

These data show that shallow groundwater (10 to 20 feet bgs) in the immediate vicinity of the Refuge exceeds the current water quality criteria for MUN. Deeper groundwater (56 to 199 feet bgs) exceeds the current water quality criteria for MUN and AGR-Irrigation. Shallow groundwater in the immediate area of the Refuge was of better mineral quality than deeper groundwater, possibly due to recharge of shallow groundwater with fresh water imported for the Refuge operations.

In 1995, Swain et al. (USGS, 1995), reported on the sampling and analysis of water from shallow wells around the Tulare Lake bed, including 15 perched water wells in eastern BWSD and LHWD:

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)	Arsenic (µg/L)
USGS Shallow	1,840-102,000	1,130-37,300	0.8-70	160-34,000	1-20
MUN	*1,600*	*1,000*	*5*	*500*	*10*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*100*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*	*200*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*200*

na = not available.

Based on these data, perched groundwater below eastern BWSD and LHWD exceeded the current water quality criteria for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry in isolated areas, except that it may be of marginal quality for AGR-Livestock and AGR-Poultry in isolated areas.

Groundwater data were obtained from the National Water Information System (NWIS; USGS, 2013) for hydrographic unit 18030012. NWIS well information included well location, total depth, and analytical data for select constituents. For this data set, 59 wells were listed within the Study Area that contained some general mineral data between 1930 and 1992. The samples had been analyzed for salts and other inorganics; the ranges of salt concentrations for groundwater in areas below the Study Area were:

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)	Chloride (mg/L)
USGS - NWIS	1,080-102,000	544-91,900	0.58-70	100-27,000	59 -44,000
MUN	*1,600*	*1,000*	*5*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*	*na*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*na*

na = not available.

The NWIS data show a wide range in salt concentrations in groundwater. The data indicate that groundwater below the Study Area exceeds the current water quality criteria for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry in most parts of the Study Area. The data also indicate that there are isolated areas of groundwater within the Study Area that may be marginal quality for MUN, AGR-Livestock, and AGR-Poultry.

5.2 CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prior to adoption of waste discharge requirements (WDRs) for oil field operations, the RWQCB contracted for a hydrogeologic assessment for selected oil fields in the Study Area.
The following subsections summarize that information for facilities within the Study Area.

5.2.1 Vicinity of Belridge Water Storage District

In the *Geologic and Waste Disposal Investigation, North and South Belridge Oil Fields* (DWR, 1957a), the DWR found two water supply wells in the general vicinity of these oil fields: an industrial supply well in the oil field and a livestock watering well. The range of salts concentrations for these wells and an associated DWR comment were reported as follows:

N&S Belridge Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
Stock Water Well	5,450	3,863	3.3	766	1,775
Industrial Well	4,730	2,848-2,950	0.4-7.6	830-870	462-464
MUN	*1,600*	*1,000*	*5*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*na*

na = not available.

"Although groundwater from these two wells is suitable for limited industrial uses or livestock watering, its use for irrigation or domestic purposes would be undesirable."

These data indicate that groundwater in the vicinity of North and South Belridge Oil Field and BWSD did not meet the water quality criteria for MUN and AGR-Irrigation. The data also show that groundwater provided by the stock watering wells was suitable for AGR-Livestock, but was of marginal quality for AGR-Poultry.

Buena Vista Water Storage District (BVWSD) is an irrigation water purveyor located just east and downgradient of BWSD. In a recent report for BVWSD, GEI Consultants, Inc. (GEI, 2014) reported on groundwater conditions. Shallowest groundwater occurs under a perched condition from the surface to about 30 feet in depth. The perched groundwater water is almost continuous across the area of BVWSD and extends west below BWSD. The depth to perched groundwater varied in 2013 from 4.2 to 15 feet and flow direction varied in 2008 from north to southeast.

The unconfined (designated "shallow") aquifer occurs below the perched zone to a depth of about 200 feet bgs where the C-clay is encountered. The deep aquifer occurs between 200 and 400 feet bgs where the E-clay is encountered. The deep aquifer is used within some areas of BVWSD for irrigation water supply. GEI Consultants, Inc., reports that water level data "show 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" but in the southern portions "groundwater levels in the deep aquifer are close to the ground surface and have similar levels as the perched aquifer" (GEI, 2014).

Below BVWSD, the salinity of perched and deep groundwater varies, as summarized from maps of 2012 TDS concentration contours (GEI, 2014), as follows:

BVWSD Groundwater	TDS (mg/L)
Perched Groundwater	1,000 – 10,000
Deep Groundwater	500 – 4,500
MUN	*1,000*
AGR-Irrigation	*2,000*
AGR-Livestock	*5,000*
AGR-Poultry	*na*

na = not available, milligrams per liter (mg/L).

The above data show that perched groundwater downgradient of BWSD is of poor mineral quality and unsuitable for MUN without expensive desalination treatment. Deep groundwater is some areas of BVWSD is of marginal quality for MUN, but usable for AGR-Irrigation, AGR-Livestock and AGR-Poultry.

5.2.2 Vicinity of Berrenda Mesa Water District

In the *Geologic and Waste Disposal Investigation, Blackwells Corner Oil Field* (DWR, 1957b) and *Geologic and Waste Disposal Investigation, Welcome Valley Oil Field* (DWR, 1957c), the DWR found nine irrigation water supply wells and one stock watering well. DWR found no other water supply wells immediately south or east of the Blackwells Corner Oil Field. For the wells found, the range of salt concentrations and a DWR comment were reported as follows:

Blackwells/Welcome Valley Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
Irrigation Wells	2,030-3,450	1,370-2,660	1.0-2.7	166-288	600-1,450
Stock Water Well	8,370-15,700	5,450-10,400	11-18	2,200-4,870	1,180-1,730
MUN	*1,600*	*1,000*	*5*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*na*

na = not available.

DWR found that "These concentrations are considered excessive for drinking water." These data show that groundwater in the vicinity of Blackwells Corner Oil Field, Welcome Valley Oil Field, and BMWD did not meet the water quality criteria for MUN and was of marginal quality for AGR-Irrigation, AGR-Livestock, and AGR-Poultry.

5.2.3 Vicinity of Dudley Ridge Water District

Prior to importing SWP supplied into DRWD, the DWR conducted a study to evaluate the *Feasibility of Serving the Dudley Ridge Water District from the State Water Project* (DWR, 1964). DWR found:

> At present the principal water supply for irrigation of land in the District is conveyed some 40 miles from sources located to the east outside the District. There are some producing water wells in the extreme northern portion of the District which provide a small portion of the present water supply. Most wells that have been drilled, however, have been abandoned due to poor yield and poor quality of ground water.

5.2.4 Vicinity of Lost Hills Water District

In the *Geologic and Waste Disposal Investigation, Lost Hills Oil Field* (DWR, 1956), the DWR found 12 water supply wells in the vicinity of Lost Hills Oil Field: 10 stock watering wells and 2 domestic wells. The ranges of general mineral concentrations for these wells were reported as follows:

Lost Hills Oil Field	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
Stock Water Wells	2,750-8,410	1,860-6,780	2.9-10	230-1,460	470-3,630
Domestic Wells	3,600-6,100	2,700	5.2	500-542	920-2,700
MUN	*1,600*	*1,000*	*5*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*na*

na = not available.

These analyses indicate that groundwater in the vicinity of the Lost Hills Oil Field is of poor mineral quality. Chloride and boron concentrations in the waters from all but well No. 26S/21E-12F are high enough to classify them poor-to-injurious for irrigation use.

These data show that groundwater provided by the two domestic wells near Lost Hills Oil Field and LHWD did not meet the water quality criteria for MUN (for electrical conductivity [EC], TDS, boron, chloride, and sulfate). The data also show that groundwater provided by the stock watering wells exceeded the water quality criteria for AGR-Irrigation, AGR-Livestock, and AGR-Poultry in some of the wells.

The Water Data Library maintained by the DWR includes analytical results for surface and groundwater sources in California. Amec Foster Wheeler reviewed the DWR data and found no groundwater quality data within the Study Area.

In 1990, the RWQCB published the results of analyses for groundwater entering tile drains in the Tulare Lake Basin (RWQCB, 1990), including four in the vicinity of the Study Area. Groundwater samples were collected in 1988 and 1989 and analyzed for TDS and selected metals. For groundwater samples from the four tile drainage systems in the Study Area, the RWQCB reported the following concentration ranges:

Drainage System	**TDS (mg/L)**	**Boron (mg/L)**	**Arsenic (µg/L)**
Westlake Farms	16,000	9	120
Tulare Lake Drainage District	10,000-130,000	7.3-130	100-710
Lost Hills Water District	14,000-29,000	29-63	<5-<10
Carmel Ranch	9,200-13,000	10-19	360-560
Lost Hills Ranch	11,000-14,000	8.8-9	320-560
MUN	*1,600*	*5*	*10*
AGR-Irrigation	*2,000*	*15*	*100*
AGR-Livestock	*5,000*	*5*	*200*
AGR-Poultry	*na*	*5*	*200*

na = not available.

These data are compared to water quality objectives for MUN and AGR. The tile drainage samples did not met the water quality criteria for MUN for TDS and arsenic, with the exception of arsenic in the LHWD samples that did not contain detectable arsenic. The tile drainage samples also failed to meet the water quality criteria for AGR.

As part of the Agricultural Drainage Monitoring Program, the DWR has collected water samples from agricultural drains in the Tulare Lake Basin (DWR, 2013a). In 2012, DWR analyzed three samples of water from two tile drains in LHWD and reported the following concentration ranges:

Drainage System	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**	**Arsenic (µg/L)**
DWR 5467 and 6467	14,950-28,470	12,520-23,300	26.6-43.5	20-54
MUN	*1,600*	*1,000*	*5*	*10*
AGR-Irrigation	*3,000*	*2,000*	*15*	*100*
AGR-Livestock	*8,000*	*5,000*	*5*	*200*
AGR-Poultry	*5,000*	*na*	*5*	*200*

na = not available.

These DWR data are presented in this section for comparison with the 1988-1989 data published by the RWQCB. These 2012 drainage quality data are within the range of the detected concentrations for TDS and boron reported in the 1988-1989 samples. As such, the salinity of tile drainage water below LHWD appears to be consistent over time. The 2013 samples, however, included detected arsenic concentrations greater than the water quality criteria for MUN. None of the 2013 tile drainage samples met the water quality criteria for MUN or AGR.

Semitropic Water Storage District (SWSD) is downgradient (east) of LHWD. In its *Agricultural Water Management Plan*, SWSD (2013) found:

> In general, groundwater in the west has higher TDS content relative to the eastern part of the District. Groundwater of poor quality, typically a sodium chloride or sodium chloride-sulfate type with high concentrations of dissolved solids and chlorides, can be found extensively along the west side of the San Joaquin Valley.

SWSD's finding indicates that the shallow, poor quality water below the Study Area extends downgradient (east) into the western parts of SWSD.

5.2.5 Western Supplemental Area

DWR maintains limited groundwater data for the WSA in their Water Data Library (DWR, 2013b). Historical groundwater depth measurements (1962 through 1976) are maintained for one well in the central part of the WSA (27S19E28H002M), and groundwater quality data are maintained for two wells in the central part of the WSA (27S19E28F001M and 27S19E28H002M).

Wells	**EC (µmhos/cm)**	**Chloride (mg/L)**	**Sulfate (mg/L)**
Central WSA	2,570-8,250	972-1,130	3,025-3,310
MUN	*1,600*	*500*	*500*
AGR-Irrigation	*3,000*	*na*	*na*
AGR-Livestock	*8,000*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*na*

na = not available.

These data indicate that groundwater below the central part of the WSA is not suitable for MUN without expensive desalination treatment and is not suitable for AGR-Irrigation, AGR-Livestock, or AGR-Poultry without substantial dilution with imported potable water.

5.3 CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

The Water Quality Analysis Database maintained by the California Department of Public Health (CDPH) includes analytical results for public drinking water systems in California. The database does not include location information, except for the mailing address for the system operator. Since most of the groundwater information from this database is included in the SWRCB's GeoTracker GAMA database, data were not separately obtained from this CDPH database.

5.4 CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Groundwater data were obtained from two SWRCB's databases: GeoTracker and GeoTracker GAMA.

The GeoTracker database contains groundwater monitoring data from sites regulated by the RWQCB and cleanup sites regulated by the RWQCB and local Comprehensive Unified Program Agencies. GeoTracker well information included well location, well construction, and select analytical data.

The GeoTracker GAMA database contains groundwater data from a variety of sources, including the CDPH, California Department of Pesticide Regulation (CDPR), DWR, U.S. Environmental Protection Agency (EPA), and USGS. GeoTracker GAMA database well information includes approximate location, well construction, and select analytical data. The analytical data available included samples that had been analyzed for salts and many other constituents.

Data obtained from GeoTracker and GeoTracker GAMA were incorporated with data collected from RWQCB file review for individual sites so that a complete set of location, well construction, and analytical data for each site could be compiled.

5.5 CALIFORNIA DIVISION OF OIL, GAS AND GEOTHERMAL RESOURCES

CDOGGR maintains a database of oil and gas production wells, injection wells, disposal wells, and plugged wells within each oil field. This database does not currently include groundwater quality data; CDOGGR data on produced brine quality are summarized in Section 3.6.

5.6 CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

Amec Foster Wheeler requested access to review RWQCB files for groundwater quality data associated with WDRs and cleanup projects within the Study Area. Some of these data are not included in the databases maintained by the SWRCB (GeoTracker and GeoTracker GAMA). Amec Foster Wheeler reviewed 24 project files and recorded groundwater quality data from 43 well locations. The groundwater samples were analyzed for constituents of concern for the individual site and some included analysis for salts. The following subsections summarize the analytical results of salts and arsenic for selected facilities.

5.6.1 Vicinity of Belridge Water Storage District

In the vicinity of the BWSD, the RWQCB regulates Aera's South Belridge Oil Field Ponds, Clean Harbors' disposal facility, ExxonMobil's (Exxon) Hill Lease, and the McKittrick Waste Treatment Facility (MWTF) operated by Waste Management, Inc. (WMI).

Aera's former oil field ponds are located in the western part of BWSD along Highway 33. For shallow groundwater below and downgradient of their South Belridge facilities, Aera reported the following salt concentrations for May 2012 samples (AMEC, 2012b):

Wells	**EC (μmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**	**Sulfate (mg/L)**
Aera South Belridge	3,000-70,000	2,400-45,000	2.4-110	520-3,000
MUN	*1,600*	*1,000*	*5*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*

na = not available.

Clean Harbors is a hazardous waste disposal facility located along the southern edge of BWSD on Highway 58. For groundwater monitoring at the Buttonwillow Waste Facility, Clean Harbors has groundwater monitoring wells in three zones: upper perched zone (80 to 140 feet bgs), intermediate perched zone (185 to 201 feet bgs), and lower water table zone (260 to 290 feet bgs). Groundwater monitoring data reported the following salt concentrations for November 2012 samples (Cameron-Cole, 2013):

Clean Harbors Wells	**TDS (mg/L)**	**Boron (mg/L)**	**Chloride (mg/L)**	**Sulfate (mg/L)**
Upper Perched	1,390-3,980	4.7-11.8	185-2,400	559-2,110
Intermediate Perched	2,230-2,670	4.8-6.9	162-555	980-1,560
Lower Water Table	2,100-3,210	6.2-9.4	385-527	806-1,280
MUN	*1,000*	*5*	*500*	*500*
AGR-Irrigation	*2,000*	*15*	*na*	*na*
AGR-Livestock	*5,000*	*5*	*na*	*3,000*
AGR-Poultry	*na*	*5*	*na*	*na*

na = not available.

Exxon's Hill Lease is also located in western BWSD along Highway 33. For shallow groundwater below and downgradient of the Hill Lease, Exxon reported the following salt concentrations for October 2012 samples (Cardno ERI, 2013):

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)
Exxon Hill Lease	4,000-25,000	4,160-19,300	2.5-48.7	830-2,000
MUN	*1,600*	*1,000*	*5*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*

na = not available.

Based on these data, shallow groundwater below the BWSD is not suitable for MUN without expensive desalination treatment and is not suitable for AGR-Irrigation without significant dilution with imported water. Groundwater below BWSD is marginally suitable for AGR-Livestock and AGR-Poultry near the southern border of the District.

The RWQCB also regulates the MWTF operated by WMI; the MWTF is located just outside the southern edge of the Study Area. The *Tulare Lake Basin Plan* finds that groundwater and springs within ½ mile of the MWTF are found to have no beneficial uses and are included in the beneficial use exceptions.

5.6.2 Vicinity of Berrenda Mesa Water District

In the vicinity of BMWD, the RWQCB regulates the Lost Hills Sanitary Landfill (LHSL) operated by Kern County. The RWQCB also oversees cleanup of the Antelope Pump Station by Chevron Environmental Management Company (CEMC).

The LHSL is located along the eastern edge of BMWD and along the southwestern flank of the Lost Hills Anticline. For shallow groundwater below the LHSL, Kern County reported the following salt concentrations for October 2011 samples (KCWMD, 2012):

Wells	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
Lost Hills Landfill	3,400-4,300	620-1,200	1,400-1,500
MUN	*1,000*	*500*	*500*
AGR-Irrigation	*2,000*	*na*	*na*
AGR-Livestock	*5,000*	*na*	*3,000*
AGR-Poultry	*na*	*na*	*na*

na = not available.

Antelope Pump Station is located in the west-central portion of BMWD along Highway 46. For groundwater below the Antelope Pump Station, CEMC reported the following salt concentrations in March 2012 samples from shallow groundwater monitoring wells (Stantec, 2012):

Wells	EC (µmhos/cm)
Antelope Pump Station	1,175-2,416
MUN	*1,600*
AGR-Irrigation	*3,000*
AGR-Livestock	*8,000*
AGR-Poultry	*5,000*

About 4 miles from the eastern border of BMWD, the RWQCB regulates the Horizon Nut Company, LLC, which operates a pistachio processing plant with a discharge of process waste water to land (RWQCB, 2013a). The plant is located along Highway 33 near the intersection of Highway 46. The RWQCB found "Groundwater in the vicinity of the Plant is saline and generally of poor quality, which is characteristic of the west side of the San Joaquin Valley." The RWQCB reported the following salt concentrations for shallow groundwater in the vicinity of the plant:

Wells	EC (µmhos/cm)	TDS (mg/L)	Sulfate (mg/L)
Horizon Nut	2,295-4,730	1,590-3,660	680-1,800
MUN	*1,600*	*1,000*	*500*
AGR-Irrigation	*3,000*	*2,000*	*na*
AGR-Livestock	*8,000*	*5,000*	*3,000*
AGR-Poultry	*5,000*	*na*	*na*

na = not available.

Based on these data, shallow groundwater below the BMWD is not suitable for MUN without expensive desalination treatment, but may be suitable for AGR-Irrigation, AGR-Livestock, and AGR-Poultry in the eastern uplands near Antelope Pump Station.

5.6.3 Vicinity of Dudley Ridge Water District

In the vicinity of DRWD, the RWQCB regulates the Westlake Farms Biosolids Composting Facility (WFB) operated by the County Sanitation Districts of Los Angeles County (LACSD) and Westlake Farms, Inc. (Westlake), drainage basins.

The WFB is located just outside the east border of DRWD and about 5 miles southeast of Kettleman City. Amec Foster Wheeler installed 14 shallow groundwater monitoring wells and conducted routine monitoring for 5 years to develop concentration limits and to characterize background concentrations of salts prior to development of the WFB (AMEC, 2010a).
The range of salt concentrations was:

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)
LACSD-Biosolids	6,670-26,500	5,920-26,800	2.4-20.2	2,930-11,600
MUN	*1,600*	*1,000*	*5*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*

na = not available.

Westlake's south basins are also located just outside the east border of DRWD and about 4 miles southeast of Kettleman City. Westlake conducts groundwater monitoring from four shallow groundwater monitoring wells. For the monitoring round in August 2011, the range of salt concentrations was (AMEC, 2012c):

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)
Westlake Farms	40,000-52,000	36,000-58,000	12-41	9,900-12,000
MUN	*1,600*	*1,000*	*5*	*500*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*na*	*5*	*na*

na = not available.

These data for the WFB and Westlake south basins show that groundwater along the eastern border to DRWD exceeds the water quality criteria for MUN and all forms of AGR. The most recent of the WFB and Westlake data are included in the study database.

The RWQCB regulates the Kettleman Hills Facility (KHF) operated by WMI; the KHF is along the northwestern edge of the Study Area. Groundwater below the KHF is naturally of poor mineral quality like the remainder of the Study Area (AMEC, 2012a):

Wells	EC (µmhos/cm)	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
WMI - KHF	2,622-20,393	1,700-19,000	79-3,000	800-12,000
MUN	*1,600*	*1,000*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*na*	*na*

na = not available.

Based on these data, shallow groundwater below the DRWD is not suitable for MUN without expensive desalination treatment and is not suitable for AGR-Irrigation, AGR-Livestock, and AGR-Poultry without substantial dilution with imported potable water.

However, KHF is located on the southwestern portion of the North Dome of the Kettleman Hills and is geologically isolated from groundwater within the Study Area. The sandstone beds beneath KHF dip toward the southwest, away from the Study Area. Groundwater within the sandstones cannot move eastward from the site toward the San Joaquin Valley (AMEC, 2010b). Based on these conditions, the RWQCB resolved in 1989 that groundwater contained in the sandstones within ½ mile of the KHF is not a municipal or domestic supply (RWQCB, 1989). The *Tulare Lake Basin Plan* acknowledges these findings as "beneficial use exceptions." Since KHF groundwater is geologically isolated from the Study Area, Amec Foster Wheeler has not included groundwater data below the KHF in this study.

5.6.4 Vicinity of Lost Hills Water District

The RWQCB regulates the closed oil field ponds previously operated by Chevron USA, and the irrigation drainage ponds operated by the LHWD in the vicinity of LHWD.

Chevron's closed oil filed ponds are located along the eastern border of Lost Hills Oil Field just north of Highway 46. For groundwater below and downgradient of the former oil field ponds in Lost Hills Oil Field, Chevron reports the following salt concentrations for November 2012 samples (AMEC, 2013):

Wells	**EC (µmhos/cm)**	**TDS (mg/L)**	**Chloride (mg/L)**	**Sulfate (mg/L)**
Chevron - Lost Hills	4,600-30,000	4,100-30,000	880-7,900	1,500-23,000
MUN	*1,600*	*1,000*	*500*	*500*
AGR-Irrigation	*3,000*	*2,000*	*na*	*na*
AGR-Livestock	*8,000*	*5,000*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*na*	*na*

na = not available.

These data indicate that groundwater along the western side of LHWD is not suitable for MUN without expensive desalination treatment and is not suitable for AGR-Irrigation, AGR-Livestock, or AGR-Poultry without substantial dilution with imported potable water.

Along eastern border of LHWD, the District operates evaporation basins for disposal of agricultural subsurface drainage water. These evaporation ponds are located just east of Interstate 5 and south of Twisselman Road. For groundwater below the evaporation ponds, LHWD reports the following range of salt concentrations in 2009/2010 samples from shallow and deep monitoring wells (P&P, 2011):

Wells	EC (µmhos/cm)	Chloride (mg/L)	Sulfate (mg/L)
LHWD-Shallow	13,000-171,000	na	na
LHWD-Deep	2,500-50,600	980-23,000	500-20,000
MUN	*1,600*	*500*	*500*
AGR-Irrigation	*3,000*	*na*	*na*
AGR-Livestock	*8,000*	*na*	*3,000*
AGR-Poultry	*5,000*	*na*	*na*

na = not available.

These data indicate that shallow and deep groundwater along the eastern side of the LHWD is not suitable for MUN without expensive desalination treatment and is not suitable for AGR-Irrigation, AGR-Livestock, or AGR-Poultry without substantial dilution with imported potable water.

5.6.5 Western Supplemental Area

Amec Foster Wheeler was unable to find groundwater information/data for RWQCB-regulated sites within the WSA.

5.7 KERN COUNTY WATER AGENCY

Groundwater quality data were requested from the KCWA for the Study Area. The KCWA provided groundwater level and water quality data for 66 wells in the Study Area except for DRWD, which is located in Kings County. Most of the data consisted of EC data with a few boron and sulfate data points. The data set includes groundwater level data from 1957 to 2013 and water quality data from 1948 to 2013. A summary of the following salts concentration data for these samples are summarized as follows:

KCWA	EC (µmhos/cm)	Boron (mg/L)	Sulfate (mg/L)
Groundwater	370-55,600	0.48-14	130-3,600
MUN	*1,600*	*5*	*500*
AGR-Irrigation	*3,000*	*15*	*na*
AGR-Livestock	*8,000*	*5*	*3,000*
AGR-Poultry	*5,000*	*5*	*na*

na = not available.

These data indicate that groundwater in areas below portions of the Study Area contains high EC concentrations that exceed the current water quality criteria for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry west of DRWD, within the western portion of LHWD, and in portions of BWSD. The western portion of BMWD has EC concentrations that meet the water quality criteria for AGR-Irrigation. EC concentrations would also meet water quality criteria for AGR-poultry and AGR-Livestock in the central portion of BMWD and in the northwest area of BWSD. These data also indicate that there are isolated areas of groundwater in the northwest quadrant of the Study Area that may be marginal quality for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry.

5.8 San Luis Obispo County

The far western part of the WSA includes a portion of San Luis Obispo County (SLO County) within the Carrizo Plain Groundwater Basin and a portion of the Cholame Valley Groundwater Basin, as designated by SLO County in their *San Luis Obispo County Master Water Report* (SLO County, 2012). For Carrizo Plain Basin, SLO County summarized groundwater information only for the base of Carrizo Plain, but not for the uplands area within the WSA. For the Cholame Valley Basin, SLO County reports:

> There are some small public water systems in the San Luis Obispo County portion of the basin. All other pumping is for residential and agricultural purposes by overlying users. No information is available describing basin yield. Very limited groundwater quality information has been published or described. Water quality data from non-specific sites indicate generally high concentrations of TDS, chlorides, sulfates, and boron. Constraints on water availability in this basin include physical limitations and water quality.

Within Cholame Valley Basin, SLO County reports only 26 acres of irrigated agriculture, specifically citrus. Citrus was not grown within the WSA at that time.

5.9 Others

Starrh & Starrh Cotton Growers (Sanden, 2012) provided analytical data for a new irrigation well and several other irrigation wells in southern BWSD. The results for salts in the September 2010 samples from the new well in NE¼09-T28S/R22E are:

Wells	EC (µmhos/cm)	TDS (mg/L)	Boron (mg/L)	Sulfate (mg/L)	Arsenic (µg/L)
Starrh & Starrh	3,100	2,300	7.1	1,000	16
MUN	*1,600*	*1,000*	*5*	*500*	*10*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*100*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*	*200*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*200*

na = not available.

This groundwater is not suitable for MUN without expensive desalination treatment. This groundwater is also not suitable for AGR-Irrigation, AGR-Livestock, or AGR-Poultry without substantial dilution with imported potable water.

Aera operates the Spicer City water system just east of BWSD and outside of the Study Area. The system consists of two wells, a pipeline, booster pumps, and a chlorination system that supplies water for IND and MUN operations in Belridge Oil Field. The system also supplies MUN for Missouri Triangle, Belridge School, and for office/housing facilities operated by Paramount Farming Company on Lerdo Highway and on Lost Hills Road. Aera provided some recent (2008 and 2015) analytical results for this water supply:

Wells	**EC (µmhos/cm)**	**TDS (mg/L)**	**Sulfate (mg/L)**	**Arsenic (µg/L)**
Spicer City	2,080-2,530	1,300-1,700	200-310	5.6
MUN	*1,600*	*1,000*	*500*	*10*
AGR-Irrigation	*3,000*	*2,000*	*na*	*100*
AGR-Livestock	*8,000*	*5,000*	*3,000*	*200*
AGR-Poultry	*5,000*	*na*	*na*	*200*

na = not available.

Although this groundwater is used for MUN, it exceeds the corresponding drinking water quality criteria for EC and TDS. This water is usable for AGR-Irrigation, AGR-Livestock, AGR-Poultry and IND.

DRWD (1976) provided analytical results for EC concentrations in water samples collected from four wells located in the district between April 1968 and April 1971:

Wells	**EC (µmhos/cm)**
T22S/R19E/18P2	1,130
T23S/R23E/11D1	13,300
T24S/R19E/2R2	7,050
T24S/R19E/25E1	24,300
MUN	*1,600*
AGR-Irrigation	*3,000*
AGR-Livestock	*8,000*
AGR-Poultry	*5,000*

na = not available.

The northern-most well (T22S/R19E/18P2, near Kettleman City) is marginally suitable for MUN; groundwater from this well could be used for all AGR uses. However, groundwater from the remaining wells in central and southern DRWD (T23S/R23E/11D1, T24S/R19E/2R2, and T24S/R19E/25E1) are not suitable for MUN, AGR-Irrigation, or AGR-Poultry. Groundwater from T24S/R19E/2R2 may be marginally usable for AGR-Livestock.

Provost & Pritchard Consulting Group (P&P) prepared an *Initial Groundwater Study, Vicinity of Service Area 6* (P&P, 2007) on behalf of LHWD. Area 6 of LHWD includes most of the District east of I-5 highway. P&P found that groundwater occurs as a perched zone (above the A-clay), an unconfined zone (above the Corcoran Clay), confined zone (below the Corcoran Clay), and the deep saline aquifer (below about 600 feet bgs). “The A-clay underlies most of

Service Area 3…and does cause perched groundwater conditions." P&P summarized groundwater quality for the perched zone as follows:

LHWD Area 6	**TDS (mg/L)**
Perched Zone	1,955-32,227
Unconfined Zone	2.433-5,480
Confined Zone	392-3,000
MUN	*1,000*
AGR-Irrigation	*2,000*
AGR-Livestock	*5,000*
AGR-Poultry	*na*

na = not available.

Based on these data, first encountered perched groundwater and the unconfined zone below Service Area 6 are not suitable for MUN without expensive desalination treatment. The perched and unconfined zones are also unsuitable for AGR-Irrigation but may be suitable for AGR-Livestock or AGR-Poultry with substantial dilution with imported potable water.

The Central Valley Salinity Alternatives for Long-Term Sustainability (CVSalts) recently published the *Initial Conceptual Model, Final Report* (Walker, et al., 2013) as a precursor for salt and nutrient management planning in the San Joaquin Valley. Walker, et al. (2013) looked at readily available groundwater quality data for hydrologic basins, including the Western Kern County and Southern Pleasant Valley Basin (Initial Analysis Zone 19 or IAZ 19) that encompasses the Study Area for this report. Walker, et al. (2013) summarized the following statistical analysis of TDS data for shallow groundwater in IAZ 19, as follows:

Wells	**TDS (mg/L)**
IAZ 19 - 29th Percentile	3,075
IAZ 19 – Median	11,300
IAZ 19 – 79th Percentile	14,500
MUN	*1,000*
AGR-Irrigation	*2,000*
AGR-Livestock	*8,000*
AGR-Poultry	*5,000*

The IAZ 19 data indicate that shallow groundwater within the Study Area exceeds the current water quality criteria for MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry in most parts of the Study Area. The data also indicate that there are isolated areas of shallow groundwater within IAZ 19 that may be marginal quality for AGR-Livestock and AGR-Poultry.

6.0 GROUNDWATER SAMPLING/ANALYSIS PROGRAM

To support this study, the Coalition arranged for sampling and analysis of groundwater from operable wells within the Study Area. At the time, the agricultural wells were in use that included blending with CVP water.

On May 9, 2013, and prior to sampling the wells, Amec Foster Wheeler and a representative of the Coalition conducted a reconnaissance of 16 wells in BWSD, 6 wells in BMWD, and 5 wells in LHWD. All except two of the wells were used for AGR-Irrigation producing from the semi-confined aquifer. One well in the far western extent of BMWD (Berrenda Mesa 1) was used for domestic water supply, after desalination treatment with a point-of-use (under-sink) system. One well in southeastern LHWD was used for wildlife habitat upkeep adjacent the LHWD drainage ponds. During this reconnaissance, Amec Foster Wheeler collected geospatial position (GPS) information locating each well, worked out well operating parameters, and identified well construction/use information that was readily apparent at the well sites. Groundwater level measurements were taken in four of the wells, where accessible. Five of the wells were operating at the time for irrigation with blended aqueduct water. Based on the reconnaissance, the Coalition elected to sample all the wells, except those that had no attached drive motor and required tractor equipped power take-off to operate or were having pump components serviced. The well reconnaissance information is summarized in Table 2 for those wells in which samples were collected. After the reconnaissance, the Coalition identified one well in BWSD and one well in DRWD that were added to the sampling program (Table 2). Dudley Ridge 1 was used for limited domestic use (toilets and sinks – bottled water supplied for drinking).

Amec Foster Wheeler prepared a sampling and analysis plan prior to mobilizing to the field, subcontracted for laboratory analytical services, and obtained sampling equipment. Amec Foster Wheeler subcontracted with BSK Laboratories, Inc. (BSK), of Fresno California, a California-certified laboratory, for the analytical services and obtained laboratory-prepared sample containers. Amec Foster Wheeler used a bladder pump and Teflon lined polyethylene tubing for sampling accessible wells that were not equipped with operable pumps.

6.1 FIELD METHODS

On May 21, 2013, Amec Foster Wheeler mobilized to collect groundwater samples from 11 area water supply wells. Amec Foster Wheeler collected groundwater samples from six wells with operable pumps and from two wells (Belridge 1 and Belridge 3) without operable pumps. These two wells were sampled with a portable bladder pump system. Amec Foster

Wheeler also collected groundwater samples from two additional wells, one in BWSD and one in LHWD, on May 30, 2013. A total of 21 wells were sampled as part of this study.

Groundwater monitoring equipment was cleaned prior to each use. Sounder measurements were recorded to the nearest 0.01 foot. Amec Foster Wheeler attempted to take depth-to-groundwater measurements (top of the casing to first encountered groundwater) using a portable electric sounder before collecting groundwater samples.

For wells with operable pumps, Amec Foster Wheeler purged the wells and opened the spigot nearest the well. The well was purged for a minimum of 5 minutes and until field parameters (pH, EC, and temperature) had stabilized. Purge water was discharged to the irrigation system or placed as directed by the well owner. Groundwater samples were collected in sample containers provided by the laboratory from the spigot nearest the well. The samples were immediately sealed, labeled, and placed into iced coolers for transport to the laboratory using chain-of-custody procedures.

For wells without operable pumps (wells Belridge 1 and Belridge 3), Amec Foster Wheeler purged and sampled the wells using a bladder pump fitted with a Teflon™ bladder and Teflon-lined tubing. These wells were purged using compressed nitrogen in accordance with the low-flow sampling methodology.

6.2 LABORATORY METHODS

The groundwater samples were analyzed for salts by BSK using the following analytical methods:

Constituent	Method
Electrical Conductance	EPA 120.1
pH	EPA 150.1
Total Dissolved Solids	EPA 160
Dissolved Metals[1]	EPA 200.7 and 7470A (mercury)
Inorganics[2]	EPA 300.0 and EPA 310.1
Total Kjeldahl Nitrogen	EPA 351.2
Nitrite	EPA 353.2
Gross Alpha	EPA 900.0

1. Dissolved Metals includes aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, copper, iron, lead, manganese, magnesium, mercury, nickel, potassium, selenium, sodium, silica, thallium, vanadium, and zinc.
2. Inorganics includes chloride, fluoride, nitrate, sulfate, bicarbonate, carbonate, hydroxide, and alkalinity.

Samples intended for dissolved metals analysis were filtered (0.45 micron filter) in the laboratory prior to analysis. In addition to the above analyses, Amec Foster Wheeler requested that the laboratory calculate sodium adsorption ratio, exchangeable sodium percentage, total cations, total anions, cation/anion balance, and Langelier saturation index. A copy of the analytical reports is provided in Appendix D, and the results are summarized in Tables 3, 4, and 5 (inorganics, metals, and other constituents, respectively).

Upon receipt of the analytical results, Amec Foster Wheeler reviewed the results for quality assurance purposes. The laboratory indicated that quality assurance results were within acceptable limits. In addition, Amec Foster Wheeler collected a duplicate sample from one well (Belridge 1) for laboratory analysis and calculated the cation/anion balance. The analytical results for the primary and duplicate sample from this well (Belridge 1) were comparable (relative percent difference within ±10%, except for selenium at -17%). The cation/anion balances were calculated from results for major cations/anions for each sample; cation/anion balances were within ±5%. Based on these quality assurance results, the analytical results for the 2013 groundwater samples should be usable for groundwater characterization.

6.3 RESULTS

The analytical results for the supply wells in each district that were sampled as part of this study are summarized in Tables 4, 5, and 6. The results for salts (Table 4) and metals (Table 5) include the following:

Wells	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**	**Sulfate (mg/L)**	**Arsenic (µg/L)**
BWSD (10 Wells)	2,900-21,000	1,800-18,000	3.3-47	510-2,200	2-33
BMWD (6 Wells)	1,800-3,200	1,300-2,600	1.6-6.7	450-1,200	<2-22
DRWD (1 Well)	4,500	3,000	1.2	1,200	14
LHWD (4 Wells)	2,700-5,800	2,000-4,000	0.8-3.3	470-1.300	<2-10
MUN	*1,600*	*1,000*	*5*	*500*	*10*
AGR-Irrigation	*3,000*	*2,000*	*15*	*na*	*100*
AGR-Livestock	*8,000*	*5,000*	*5*	*3,000*	*200*
AGR-Poultry	*5,000*	*na*	*5*	*na*	*200*

na = not available.

These data show that groundwater from supply wells within the Study Area does not meet water quality criteria for MUN due to elevated salts (EC, TDS, and sulfate) and metals (boron and, in some areas, arsenic, selenium, and gross alpha particles). All 21 of the samples exceeded the State of California Secondary Maximum Contaminant Levels (MCLs, Sections 64444 through 64449, Title 22, California Code of Regulations [CCR]) for EC and TDS in drinking water. Eight of the 21 groundwater samples exceeded the EPA's Drinking Water

Health Advisory (DWHA) for boron (6,500 to 47,000 micrograms per liter [µg/L] compared to the DWHA of 5,000 µg/L). For the other salts (Table 4), all 21 of the groundwater samples exceeded the DWHA for sodium (220 to 3,600 mg/L compared to the DWHA of 20 mg/L). For the metals in addition to arsenic (see Table 5), 2 of the 21 groundwater samples also exceeded the MCL for selenium (95 and 250 µg/L compared to the MCL of 50 µg/L), and 6 of the 21 water samples exceeded the MCL for alpha particle activity (17.7 to 479 pCi/L compared to the MCL of 15 pCi/L). These data indicate that groundwater below the Study Area is not suitable as a source of MUN without expensive desalination treatment. The presence of detectable gross alpha activity also shows that groundwater below parts of the Study Area contains naturally occurring radioactive materials.

Elevated salt concentrations typically correlate with elevated water hardness. Water hardness is not directly linked to impairment of human health. However, hard water requires more soap and synthetic detergents for home laundry and washing and contributes to scaling in household piping and water heaters. Hardness is caused by compounds of calcium and magnesium and by a variety of other metals. General guidelines for classification of waters are: 0 to 60 mg/L as calcium carbonate is classified as soft, 61 to 120 mg/L as moderately hard, 121 to 180 mg/L as hard, and more than 180 mg/L as very hard. Most water utilities try to provide water that is not in the very hard category because of the unpleasant effects such as scaling in equipment and the need for more soap and synthetic detergents. In addition, many homeowners in hard-water areas use water softeners to further reduce hardness by substituting sodium for calcium and magnesium (USGS, 2013). As such, elevated water hardness has economic effects for MUN, if not treated. The range of water hardness results for 2013 groundwater samples are summarized in Table 5 and as follows:

Supply Wells	**Hardness (mg/L)**
BWSD (10 Wells)	510-5,600
BMWD (6 Wells)	470-890
DRWD (1 Well)	960
LHWD (4 Wells)	790-1,200
MUN	*180 (Very Hard)*

> “Most water utilities try to provide water that is not in the very hard category because of the unpleasant effects such as scaling in equipment and the need for more soap and synthetic detergents. In addition, many homeowners in hard-water areas use water softeners to further reduce hardness by substituting sodium for calcium and magnesium.” (USGS, 2013)

Groundwater below the Study Area would be classified as *very hard* and would typically require softening or desalination treatment for MUN use.

The 2013 data show that groundwater from producing wells within the Study Area does not meet the water quality criteria for AGR-Irrigation due to elevated concentrations of salts (EC and TDS, Table 4). Sixteen of the 21 groundwater samples equaled or exceeded the AGR-Irrigation water quality criteria for TDS and/or EC (3,000 micromhos per centimeter [µmhos/cm] and 2,000 mg/L, respectively from FAO, 1994). These data indicate that groundwater below the Study Area is not suitable as a source for AGR-Irrigation without substantial dilution with imported aqueduct water, except for salt tolerant crops in certain isolated areas (primarily BMWD).

Groundwater within the Study Area is marginally suitable to unsuitable in some parts of the Study Area for AGR-Livestock and AGR-Poultry based on elevated salts (EC) and a metal (boron). Eight of 21 groundwater samples exceeded the AGR-Poultry water quality criteria for EC (5,000 µmhos/cm from FAO, 1994) and 8 of 21 groundwater samples exceeded the AGR-Livestock water quality criteria for boron (5,000 µg/L from FAO, 1994). Groundwater in some parts of the Study Area may be suitable as a source for AGR-Livestock and AGR-Poultry, without treatment or dilution with imported aqueduct water. Hardness is not known to have limitations for AGR-Livestock or AGR-Poultry.

7.0 WATER QUALITY DATABASE AND GEOGRAPHIC INFORMATION SYSTEM

Amec Foster Wheeler compiled a database of geological, water quality, and groundwater level data for the Study Area from available federal, state, and local agency data sources. These sources include: KCWA, DWR, SWRCB, CDPH (Drinking Water Branch), CDPR, California Department of Conservation (Division of Oil and Gas), USBR, USGS, EPA, and information made available from the Districts.

Data that were available electronically were parsed and imported into the database. Data from paper sources were manually entered into the database. Well locations identified from non-digital maps were digitized using ESRI ArcGIS Geographic Information System (GIS) software and imported into the database. Each data point was assigned a unique source identification. Spatial information including coordinate data (northing and easting) and elevation (if available) were imported into the database so that it could be integrated with ArcGIS. Analytical and groundwater level data were assigned unique sample identification based on the source identification and date and time the sample or groundwater level was taken or measured. A total of 1,716 well locations were imported into the database. Of these, 1,102 locations had available analytical data and 565 locations contained groundwater level data.

Geologic data obtained from USGS and DWR were imported into ArcGIS geodatabase. Electronically available data in the form of ESRI compatible shape files contained geology features (Graham et at., 1999; Faunt et al., 2010) and soil texture data (Faunt et al., 2010) that were directly imported into the geodatabase. Paper copies of geologic maps containing data within the Study Area were digitized into the geodatabase.

The database was intergraded with ESRI's ArcGIS software so that well locations and analytical data could be evaluated using GIS to parse and display the data on maps in relation to cultural and geologic features. ArcGIS was used to query the analytical data to generate concentration maps for TDS, EC, boron, chloride, and sulfate.

7.1 U.S. GEOLOGICAL SURVEY TEXTURE MODEL DATA

The USGS compiled a proprietary database of 150,000 DWR well driller logs for the entire San Joaquin/Sacramento Valley in support of their Central Valley Hydrogeologic Model (Faunt et al., 2010). A subset of 8,497 *good* quality logs was used to interpret soil texture data in depth intervals of 50 feet from ground surface to a depth of 2,275 feet bgs. The texture data represents the percent of *coarse grained* fraction within the 50 foot logged interval. In regards to soil textures, the USGS defines coarse grained as sediments consisting of sand, gravel pebbles, boulders, cobbles, or conglomerates. Fine grained units are sediments consisting of clay, silt, mud, loam, or lime (Faunt et al., 2010).

The texture data within the Study Area consist of a grid of 932 points with a uniform cell spacing of approximately 5,250 feet. The average range of percent coarse-grained soils within the Study Area is from 32 to 45%. This range is equivalent to sandy lean clay/silt type Unified Soil Classification System soils. Table 6 summarizes the average percent coarse for the upper 30 soil texture depth intervals from surface to 1,450 feet bgs within the model domain. These data show that on average for each depth interval that soil textures within the Study Area are generally fine grained.

Amec Foster Wheeler prepared soil texture maps with contours showing percent coarse-grained soils for the first 30 depth intervals from surface to 1,450 feet bgs. The soil textures and contours were prepared using ArcGIS spatial analysis kriging tools. These maps are provided in Appendix E. Cross sections A to A' and B to B' (Figure 4) were also prepared using the ArcGIS kriging tools.

7.2 WELL AQUIFER ZONE DESIGNATIONS

Each well was assigned to one of four aquifer zones based on available well construction information (Figure 8). Wells with no available construction data are designated as unassigned. The four zones are: (1) perched aquifer zone located along the west side of the Study Area, (2) unconfined zone consisting of sediments above the Corcoran Clay where present, (3) regional unconfined zone west of the lateral extent of the Corcoran Clay, and (4) confined zone in areas underlying the areal extent of the Corcoran Clay.

The following criteria were applied to assigning wells to aquifer zones. Wells located west of the California Aqueduct with screened intervals or total depths less than 60 feet deep were assigned to the perched zone. Wells located with the areal extent of the Corcoran Clay with screened intervals or total depths above the top of the Corcoran Clay were assigned to unconfined zone. Wells screened below the base of the Corcoran Clay were assigned to the confined zone. Wells with total depths below the Corcoran Clay with unknown screened intervals were also assigned to the confined zone. Wells located west of the area extent of the E-clay with screened intervals or with total depths within the Tulare Formation were assigned to the regional unconfined zone. Wells with screened zones through the perched, unconfined, or confined zones were designated multi-zone wells.

7.3 GROUNDWATER LEVEL DATA

The database contains 565 well locations that contained water data. Of these, 58 are perched zone wells, 111 are unconfined wells, 71 are regional unconfined wells, and 6 are confined zone wells. The remaining 319 wells are not assigned to an aquifer zone because they have no available well construction data.

Groundwater level measurement data for most wells were collected as a single event or on an infrequent basis. Groundwater level data were scattered with respect to location and frequency of collection. Facilities that have monitoring systems required by WDRs have groundwater level data available on a quarterly or semiannual basis for recent years. Even so, these facilities are generally remotely located with respect to one another. The highest concentration of groundwater level data occurs between 1970 and 1974 and was associated with KCWA *Westside Groundwater Study* (KCWA, 1974). A potentiometric surface map for groundwater was not prepared because of the scattered nature of the groundwater level data with respect to location and temporal distribution of these data. Depth to groundwater within the Study Area is shown on Figure 9.

7.4 GROUNDWATER QUALITY DATA

The groundwater quality database consists of 1,102 well locations that contain water quality data. Of these, 66 are perched zone wells, 287 are unconfined wells, 171 are regional unconfined wells, and 50 are confined zone wells (Figure 5). The remaining 528 wells are not assigned to an aquifer zone due to lacking well construction data.

Agricultural irrigation may affect the quality of first encountered groundwater below the Study Area, which includes perched groundwater below BWSD, DRWD, and LHWD and unconfined groundwater below BMWD. Agricultural irrigation is unlikely to affect confined groundwater below the Study Area. For purposes of this study, Amec Foster Wheeler has defined first encountered groundwater to include the lateral extent of the perched zone, the adjacent unconfined aquifer zone, and the regional unconfined aquifer west of the lateral extent of the Corcoran Clay (Figure 5).

Groundwater quality parameters TDS, EC, boron, chloride, and sulfate were plotted on Figures 10 through 15. Groundwater quality data are discussed in the following subsections.

7.4.1 Total Dissolved Soils

TDS groundwater quality data are shown on Figure 10 for all aquifer zones. This map gives an overview of TDS in groundwater within the Study Area for all available data. The color-coded wells are keyed to ranges of TDS concentrations associated with the following beneficial use designations:

0 to 1,000 mg/L = MUN, AGR-Irrigation, and AGR-Livestock
1,001 to 2,000 mg/L = AGR-Irrigation and AGR-Livestock
2,001 to 5,000 mg/L = AGR-Livestock
>5,000 mg/L = no MUN, AGR-Irrigation, or AGR-Livestock beneficial use

Figure 10 shows that groundwater beneath the Study Area varies in TDS concentrations, even in wells in close proximity. However, groundwater from relatively few wells is reported to meet the MUN designation (<1,000 mg/L TDS or <1,600 µmhos/cm EC). Lower salinity concentrations suitable for AGR-Irrigation are apparent in BMWD. Most groundwater from wells within BWSD and LHWD is not suitable for MUN or AGR-Irrigation.

TDS concentrations for wells producing first encountered groundwater are shown on Figure 10. The distribution of TDS shown on Figure 10 shows that first encountered groundwater within the Study Area does not meet water quality criteria for MUN designation due to elevated TDS except in the extreme northern portion of DRWD. AGR-Irrigation is not suitable in most parts of the Study Area, except the western portion of BMWD, along the extreme western portion of LHWD and BWSD, and the extreme northern tip of DRWD. Some areas within the Study Area may be suitable for AGR-Livestock, whereas others areas are not because of TDS in excess of 5,000 mg/L. Based on these TDS data, the concentration of total salts in first encountered groundwater below the Study Area is incompatible with MUN use without expensive desalination treatment, except possibly at the northern end of DRWD near Kettleman City. Concentrations of total salts in first encountered groundwater below BWSD, DRWD, and LHWD are incompatible with AGR-Irrigation without significant dilution with fresh water. Concentrations of total salts in first encountered groundwater below the eastern third of BMWD are marginally suitable for AGR-Irrigation, depending upon the location of the well.

7.4.2 Electrical Conductivity

EC data for first encountered groundwater are shown on Figure 11. The color-coded wells are keyed to ranges of EC concentrations associated with the following beneficial use designations:

0 to 1,600 µmhos/cm = MUN, AGR-Irrigation, AGR-Poultry, and AGR-Livestock
1,601 to 3,000 µmhos/cm = AGR-Irrigation, AGR-Poultry, and AGR-Livestock
3,001 to 5,000 µmhos/cm = AGR-poultry and AGR-Livestock
5,001 to 8,000 µmhos/cm – AGR-livestock
>8,000 µmhos/cm = no MUN, AGR-Irrigation, AGR-Poultry, or AGR-Livestock beneficial use

The distribution of EC concentrations shown on Figure 11 shows that first encountered groundwater within the Study Area does not meet water quality criteria for MUN designation due to elevated salts except in the extreme northern portion of DRWD. AGR-Irrigation is not suitable in most areas of the district except the western portion of BMWD, along the extreme western portion of LHWD and in isolated pockets in the extreme southeast corner of BWSD. Some parts of the Study Area may be suitable for AGR-poultry (EC 3,001 to 5,000 µmhos/cm) and AGR-Livestock (EC 5,001 to 8,000 µmhos/cm) whereas other areas are not because of EC in excess of 8,000 mg/L.

7.4.3 Boron

Boron data for first encountered groundwater are shown on Figure 12. The color-coded wells are keyed to ranges of boron concentrations associated with the following beneficial use designations:

0 to 5 mg/L = MUN, AGR-Irrigation, AGR-Livestock, and AGR-Poultry
5.01 to 15 mg/L = AGR-Irrigation
>15 mg/L = no MUN, AGR-Irrigation, AGR-Livestock, or AGR-Poultry beneficial use

The distribution of boron shown on Figure 12 shows that groundwater within the Study Area meets water quality criteria for MUN designation for boron in BMWD, the western portion of LHWD, in isolated pockets in BWSD, and in the extreme north of DRWD. Boron concentrations in which groundwater are not suitable for MUN or AGR-Irrigation appear to be associated with areas of perched groundwater along the central and eastern portions of LHWD and within the east central and southern portions of BWSD. Isolated pockets of high boron appear to be associated with oil field operations in BWSD.

7.4.4 Chloride

Chloride data for first encountered groundwater are shown on Figure 13. The color-coded wells are keyed to ranges of chloride concentrations associated with MUN beneficial use designations:

0 to 500 mg/L = MUN
>500 mg/L = no MUN use

The distribution of chloride concentrations on Figure 13 shows that groundwater within the Study Area meets water quality criteria for MUN designation for chloride in the western portions of BMWD and LHWD and the extreme northern portion of DRWD. There are also some pockets of groundwater within BWSD that would meet the MUN criteria for chloride. These are, however, interspersed among areas of poor groundwater quality. Groundwater quality east of DRWD is very poor with respect to chloride and it would not meet the MUN criteria. Chloride concentrations in groundwater that is not suitable for MUN occur along the east central portion of LHWD, the central portion of BMWD, and along the west central portion of BWSD.

7.4.5 Nitrate

Nitrate data for first encountered groundwater are show on Figure 14. The color-coded wells are keyed to ranges of nitrate concentrations associated with MUN beneficial use designations:

0 to 45 mg/L = MUN
>45 mg/L = no MUN use

The distribution of nitrate concentrations on Figure 14 shows that groundwater within the Study Area meets water quality criteria for MUN designation for nitrate in most areas. There are area of groundwater within LHWD, DRWD, and BWSD that would meet the MUN criteria for nitrate. These are, however, interspersed among areas of poor groundwater quality (Figures 10 and 11). Groundwater quality in the southern portion of BWSD is very poor with respect to nitrate and it would not meet the MUN criteria. Nitrate concentrations in groundwater that is not suitable for MUN occur in several scattered pockets in eastern LHWD, three pockets in western portion of the BMWD, and at the northern edge of DRWD.

7.4.6 Sulfate

Sulfate data for first encountered groundwater are shown on Figure 15. The color-coded wells are keyed to ranges of sulfate concentrations associated with the following beneficial use designations:

0 to 500 mg/L = MUN and AGR-Livestock
501 to 3,000 mg/L = AGR-Livestock
>3,000 mg/L = no MUN or AGR-Livestock beneficial use

The distribution of sulfate concentrations shown on Figure 15 shows that most groundwater within the Study Area does not meet water quality criteria for MUN designation because of elevated Sulfate. There are isolated wells within the extreme eastern portion of LHWD, the west side of BWSD, and the extreme northern portion of DRWD that produce groundwater with sulfate concentrations low enough meet the MUN designation criteria. Most wells in BWSD would be limited to AGR-livestock designation with the exception of very poor water quality in perched groundwater in the east central portion of LHWD and east of DRWD, which contains sulfate in excess of 3,000 mg/L.

7.4.7 Pesticides

CDPH (now part of the SWRCB) has required monitoring of pesticide residues in California municipal water supplies for many years. Much of these data are summarized in the SWRCB's GeoTracker GAMA database. Amec Foster Wheeler found pesticide analytical results for two wells in the Study Area for samples collected in 1987 through 2006. The samples were collected from two wells in southern BWSD (Clean Harbors) and a water system in central LHWD (La Cuesta Verde Ranches). These samples were analyzed for a variety of chlorinated pesticides and volatile organic compounds; none were detected. The Clean Harbors wells are identified on CDPH's DRINC database as "inactive." The database identified the La Cuesta Verde Ranches facility as "NP" or a "non-piped source of water…transported to a facility via a sanitary tanker."

The CDPR has monitored California well water for pesticide residues for more than 25 years. In 1982, CDPR collected water samples from one well in BWSD and one well in LHWD and arranged for selected pesticide analyses (carbofuran, 1,2-dibromochloropropane [DBCP], ethylene dibromide, and simazine); none were detected. The CDPR did not find detected pesticides in these well water samples collected within the Study Area.

In 2008, the USGS published the results of a study of *Nitrate and Pesticides in Groundwater in the Eastern San Joaquin Valley* (USGS, 2008b). Although the USGS Study Area did not include the Northern Supplemental Area of the Coalition, it identifies the pesticides most likely to be detected in groundwater. USGS found that the most frequently detected pesticides were atrazine, simazine, diuron, 1,2,3-trichloropropane (TCP), and DBCP. Also in 2008, the USGS published the results of a similar study for the central part of Kern County (not including this Study Area) (USGS, 2008a). For central Kern County, USGS found that the most frequently detected pesticides were atrazine, simazine, 1,2-dichloropropane (DCP).

Amec Foster Wheeler has reviewed the GeoTracker GAMA database for analytical data on atrazine, simazine, diuron, TCP, DBCP, and DCP for groundwater within the Study Area. The following table summarizes the results of that review:

Pesticide	Wells with Data	Wells with Detections
Atrazine	24	1 (E)
Simazine	30	1 (E)
Diuron	15	0
TCP	21	0
DBCP	31	0
DCP	25	1

E = estimated value at or below analytical detection level

This review indicated that the available data for the Study Area did not typically include detections of pesticides commonly detected in groundwater. Two of the reported detections (atrazine and simazine) were at or near the analytical detection level; well below concentrations of potential health concern in drinking water. DCP was detected in one sample at a concentration of 0.3 µg/L, well below the MCL for DCP in drinking water (5.0 µg/L).

Amec Foster Wheeler also reviewed DWR's agricultural drainage database for analytical data on atrazine, simazine, diuron, TCP, DBCP, and DCP in perched groundwater within BWSD and LHWD. DWR sampled one tile drain (LNW5467) in LHWD for pesticides consisting of 12 samples collected between 2006 and 2012. Drainage water samples were not analyzed for TCP, DBCP, or DCP.

Pesticide	LNW5467 Samples	Samples with Detections
Atrazine	12	2
Simazine	12	2
Diuron	12	3

The maximum detected concentrations of atrazine, simazine, and diuron were 0.09, 0.05, and 0.34 µg/L, respectively. These detected concentrations were well below the corresponding MCLs for atrazine and simazine (1.0 and 4.0 µg/L, respectively); an MCL has not been established for diuron. The most recent samples (2011) from LNW5467 did not contain detectable atrazine, simazine, or diuron.

Based on the above data, pesticides were infrequently detected in groundwater samples from the Study Area and the detections were at concentrations well below corresponding MCLs.

8.0 BENEFICIAL USE CHARACTERIZATION

Pursuant to Section 13050 of the California Water Code, a basin plan is to consist of all of the following:

(1) Beneficial uses to be protected.
(2) Water quality objectives.
(3) A program of implementation needed for achieving water quality objectives.

The RWQCB originally adopted the *Tulare Lake Basin Plan* in 1975 based on the directive of Section 13050 of the California Water Code. The *Tulare Lake Basin Plan* established beneficial uses of surface water and groundwater and specified water quality objectives to protect those beneficial uses. Pursuant to *Policy with Respect to Maintaining High Quality of Waters in California* (SWRCB, 1968) and other SWRCB policies, groundwater in the Tulare Lake Basin was designated to have the following beneficial uses: MUN, AGR, and IND.

In WDRs issued to individual facilities within the vicinity of the Study Area, the RWQCB has found poor groundwater quality conditions and referenced the applicable MUN exceptions from the *Sources of Drinking Water* policy; for example, WDRs Order R5-2009-0018, for the Liberty Composting Facility:

> “27. Results of groundwater monitoring at the facility indicate that the groundwater has an electrical conductivity that ranges from 4,200 to 8,900 micromhos per centimeter and a TDS concentration that ranges from 3,660 to 8,850 mg/L. These concentrations exceed the California Recommended Secondary Drinking Water Standard for TDS of 500 mg/L contained in Title 22, CCR, Section 64449; and the USEPA Recommended Secondary Standard for TDS in drinking water of 500 mg/L.
>
> “28. Groundwater within one mile of the site is not suitable for use as a municipal and domestic water supply. TDS exceeds 3,000 mg/l and the water contains excessive amounts of chloride, sulfate, nitrate, arsenic, chromium, and lead. This water cannot be used for municipal or domestic supply without extensive treatment, which is not economical when excellent quality surface water (from the California Aqueduct) is available. It is therefore not expected to supply a public water system.”

Despite the above RWQCB finding and other similar findings for facilities within the Study Area (Appendix A), the RWQCB has yet to take action to appropriately designate beneficial uses of groundwater within the Districts area. The Coalition has advised the RWQCB of its intent to pursue a basin plan amendment to support appropriate designation of beneficial uses and adoption of appropriate water quality criteria for groundwater within a portion of the Study Area.

8.1 DESIGNATED BENEFICIAL USES OF GROUNDWATER AND WATER QUALITY CRITERIA

Beneficial uses of groundwater are established in the *Tulare Lake Basin Plan* for DAUs. The Districts are within the following DAUs:

> BWSD, BMWD, LHWD, and WSA in DAU 259
> DRWD in DAU 246

The designated beneficial uses of groundwater in DAU 259 and DAU 246 are MUN, AGR, and IND. For these beneficial uses, the *Tulare Lake Basin Plan* specified numeric water quality criteria for certain water quality parameters and provided narrative water quality for other parameters. In the *Tulare Lake Basin Plan*, the designated numeric water quality criteria for MUN are:

> "At a minimum, waters designated MUN shall not contain concentrations of chemical constituents in excess of maximum contaminant levels (MCLs)…or secondary Maximum Contaminant Levels (SMCLs)…"

The *Tulare Lake Basin Plan* did identify the following narrative water quality criteria for groundwater, including the following:

> "Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."
>
> "Ground waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses."

As a component of this GAR, Amec Foster Wheeler reviewed available references to define water quality criteria for the beneficial uses of MUN, AGR, and IND. We have limited this review primarily to salts. However, groundwater in portions of the Study Area also contains naturally elevated concentrations of the metal arsenic; as such, arsenic has been included in this review. The review summarizes information including: MCLs and SMCLs from Title 22 of the CCR DWHA published by the EPA (2003 and 2008) and *Water Quality for Agriculture* (FAO, 1994). A summary of that review is provided in Appendix B.

8.2 MUNICIPAL AND DOMESTIC SUPPLY

MUN uses of water exist within the area of the Coalition. The communities of Lost Hills and Blackwells Corner (in LHWD and BMWD, respectively) are provided municipal water supply by LHUD. LHUD and BMWD import municipal water from groundwater 13 miles to the east and outside the Study Area. KCCSD is located just north of DRWD and provides municipal water from groundwater extraction wells. Due to the poor mineral quality of groundwater, KCCSD is developing a project to connect to the California Aqueduct for water supply. Aera's Spicer City system includes two wells located east of the Study Area and a pipeline to Belridge Oil Field, food processing facilities, and Belridge school. Water from the Spicer City system is used for IND and limited MUN (landscape irrigation). Industrial facilities within the Study Area obtain drinking water from the SWP or from bottled water supplies.

Groundwater below the Study Area is of sufficiently poor mineral quality to severely impair MUN beneficial uses. Groundwater below the Study Area exceeds MCLs (or SMCLs) for EC, TDS, sulfate, and in some areas for arsenic or chloride. The *Tulare Lake Basin Plan* has designated beneficial uses of MUN, for the most part, do not currently exist and cannot be supported based on the poor mineral quality of groundwater. Groundwater will require expensive desalination treatment to be useful for current or future MUN uses. As such, groundwater and/or surface water is imported to the area for municipal supply.

8.3 AGRICULTURAL USES

AGR-Irrigation uses of groundwater exist within the Study Area, except that sources for irrigation water supply are almost exclusively imported surface water from the SWP. The poor mineral quality groundwater below the Study Area would have to be heavily diluted to be usable for AGR. Because of the required dilution and poor water production from test wells, irrigation with groundwater is currently a last resort for short term use when sufficient imported water is not available.

The Coalition reports that the only livestock/poultry activity that occurs is seasonal grazing by sheep tended by sheepherders. Three of the Districts (BWSD, BMWD, and LHWD) provide stock water for the sheep from the SWP. DRWD reports that "It's been several years since DRWD has had any stock watering occurring within the District." Within WSA, livestock grazing is more common.

Groundwater below the Study Area is of sufficiently poor mineral quality to severely impair AGR beneficial uses. Groundwater below most of the Study Area exceeds published water quality criteria for AGR-Irrigation (severe restrictions; FAO, 1994). The *Tulare Lake Basin Plan* has designated beneficial uses of AGR that, for the most part, do not currently exist and cannot be sustained based on the poor mineral quality of groundwater. Groundwater below the Study Area requires significant dilution to be usable for AGR-Irrigation. Some parts of the Study Area include groundwater that is marginally suitable for AGR-Livestock or AGR-Poultry uses.

8.4 INDUSTRIAL SERVICE SUPPLY

The Basin Plan defines IND as follows:

> "Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization."

IND uses of groundwater occur at mining operations and at oil field operations within the Study Area. Groundwater below the Study Area is used for some of these operations. An IND use of groundwater has been adopted for dust control of unpaved roads (oil field roads, for example) (SJVAPCD, 2004b). IND beneficial uses do not depend primarily on water quality and would not appear to be affected by the poor mineral quality of area groundwater.

Dust control is also an agricultural use of water that is not implicitly considered in the *Tulare Lake Basin Plan*. To control fugitive dust emissions from farming operations, the San Joaquin Valley Air Pollution Control District has adopted a rule requiring spray application dust palliative (water, other dust suppressants, or pavement) on unpaved roads (SJVAPCD, 2004a). Dust-control use of water on unpaved roads is not applied directly to irrigated land and its use does not depend primarily on water quality. For this report, we include water application for dust control on unpaved roads under IND beneficial uses.

8.5 EXISTING BENEFICIAL USES OF GROUNDWATER

The poor mineral quality of groundwater below the Study Area has been documented in many area groundwater studies conducted by federal, state, and local agencies and has been acknowledged in WDRs issued by the RWQCB for individual facilities in the vicinity of the Study Area. The poor mineral quality of groundwater has also severely limited beneficial uses of groundwater within the Study Area. Based on the poor mineral quality of groundwater within the Study Area, surface water is imported from the SWP into the Districts for AGR uses. As such, there are almost no remaining AGR-Irrigation or MUN uses of groundwater within the Districts. Some IND beneficial uses of water remain (principally water for water/steam flood in oil fields); such IND uses of water are not limited by poor water quality.

8.5.1 Municipal Supply

Water that does not exceed the MCLs is currently usable for MUN, with minimal treatment (principally disinfection). However, water that exceeds MCLs is not currently usable for MUN.

MUN supply for the Study Area is imported from the SWP, except for LHUD, which imports municipal supply from wells located in the valley floor about 13 miles to the east and outside of the Study Area. KCCSD is located just north of DRWD and is currently using groundwater for municipal supply; that groundwater exceeds the MCL for arsenic. KCCSD is pursuing a project, with funding from California Department of Health Services (CDHS), to treat water from the SWP for municipal supply.

The Coalition has advised Amec Foster Wheeler of two exceptions to the use of imported MUN supply. BMWD identifies one well (Section 17, 23S/20E) that produces water for domestic supply at the far western extent of BMWD. An expensive point-of-use (under-sink) water treatment system (ion exchange plus reverse osmosis [RO]) is used to treat drinking water for one residence. DRWD has identified one well (Section 17, 23S/20E) that is used for water supply in toilets and sinks (bottled water is used for drinking water). Pursuant to Section 64418, Title 22, CCR, point-of-use systems by community water suppliers "is limited to no longer than three years or until funding for the total cost of constructing a project for centralized treatment or access to an alternative source of water is available, whichever occurs first."

Domestic groundwater can be treated by a private well owner using a point-of-use system, without regulation as a public water system by the CDHS. CDHS does provide certifications for qualifying water treatment systems for treatment of bacteria, viruses, cysts, metals, radium, and organics. Except for nitrate, CDHS does not certify water treatment systems for salts. Kern County Environmental Health Division requires that new domestic wells be tested for selected potable water characteristics, including salts, prior to putting the well into service (KCEHD, 2013). Kings County Building Division can require groundwater testing prior to issuance of a well drilling permit or in areas of known water quality problems (KCBD, 2000).

8.5.2 Agricultural Supply

AGR irrigation supply for the Study Area is also imported from the SWP. Prior to delivery of aqueduct water to the Districts, the DWR prepared evaluations of the feasibility of providing water from the SWP to the Districts (DWR, 1963 and 1964). DWR's evaluation of existing surface and groundwater conditions in the Districts are provided in the following paragraphs.

> ***Belridge Water Storage District, Antelope Plain Water District, and Lost Hills Water District*** (Antelope Plain Water District is now the Berrenda Mesa Water District) "There is no usable surface water supply in these three districts except for sporadic flood flows. These districts are relatively undeveloped and have generally similar ground water conditions. There are no commercially irrigated lands in the Belridge Water Storage District. A few thousand acres are irrigated by ground water in the Antelope Plain Water District, and about 10,000 acres are irrigated in the Lost Hills Water District from groundwater and occasional surface water from the Kern River.

"The yields of existing wells are for the most part low, and the quality of groundwater is poor. Crops produced on these lands are limited to those which are tolerant to poor quality water. Any significant additional development of these districts is dependent upon an imported water supply.

"Ordinarily, in an area having ground water, there is the opportunity to make efficient use of imported water supplies by re-using that portion of the water which percolates beyond the crop root zone to the underlying ground water basin. In these districts, however, the material under-lying the surface is very dry, and it is believed that virtually all percolating water would be absorbed for several decades.

"In these districts the existing poor quality of ground water provides an additional problem. Even the percolation of additional water will not improve these waters to the point where they could be used without mixing with surface supplies. It seems highly doubtful, however, that this would have any appreciable effect prior to 1990."

Dudley Ridge Water District

"For all practical purposes, there is no local surface water supply available to the District. Only occasionally during storms do the normally dry arroyos of the Kettleman hills have sufficient runoff to reach the District.

"At present, the principal water supply for irrigation of land in the District is conveyed some 40 miles from sources to the east located outside the District. There are some producing wells in the extreme northern part of the District that supply a small portion of the present water supply. Most wells that have been drilled, however, have been abandoned due to poor yield and poor quality of groundwater. Studies made for this report indicate that it would be physically possible to recapture percolate from future imported supply, but the poor quality of water underlying the area would make it unsuitable for reuse, at least for a significant number of years. It is planned that this supply will be used outside the District after water is received from the California Aqueduct."

Based on these conditions, the Districts are currently contracted with DWR for Aqueduct supplies as follows:

District	Irrigated Acreage	Acre-Feet of Water
Belridge Water Storage District	52,000	121,508
Berrenda Mesa Water District	49,000	92,600
Dudley Ridge Water District	17,000	50,343
Lost Hills Water District	56,000	119,110

Several farmers within the Districts have evaluated the potential use of groundwater for irrigation water supply. For example, Bookman-Edmonston Engineering, Inc. (BEE), evaluated groundwater conditions in BMWD (BEE, 1976). BMWD asked BEE to evaluate the feasibility of blending poor quality groundwater from the district with aqueduct water to provide an additional source of irrigation water supply. BEE reviewed the readily available groundwater information and found:

> "Mineral analyses of ground water are available for two wells, both of which are reported to be about 360 feet deep. Well 26/19-12L1 produced sodium sulfate water with a TDS concentration of 3,660 mg/L, a boron content of 2.7 mg/L and a chloride ion concentration of 629 mg/L. Water from well 26/19-25M1 was also sodium sulfate in character and contained 2,354 mg/L of TDS, 1.2 mg/L of boron and 505 mg/L of chloride. The total dissolved solids content is estimated to be about 3,000 milligrams per liter, which renders the water marginal to unsuitable for irrigation of most crops."

Based on this information, BEE recommended installation and testing of a prototype groundwater extraction well (26/19-29A), which was completed in 1977 (BEE, 1977). BEE installed a 14-inch diameter well with perforations between 650 and 1,160 feet in depth. BEE pump tested the well and found:

> "…on the basis of observed data, the well is capable of producing at a short-term rate of not more than 450 gallons per minute. It is probable that prolonged pumping will cause a lowering of the water level and a coincident decline in yield."

A groundwater sample from well 26/19-29A was collected by BEE in May 1977 and analyzed for inorganic constituents:

Well	**EC (µmhos/cm)**	**TDS (mg/L)**	**Boron (mg/L)**
26/19-29A-650/1160'	4,000	2,583	1.8
AGR-Irrigation	3,000	2,000	15
AGR-Livestock	8,000	3,000	5
AGR-Poultry	5,000	na	5

na = not available

The above data show that groundwater in BMWD exceeded recommended agricultural water quality criteria for EC and TDS. Groundwater in this area is not suitable for AGR-Irrigation without substantial blending with fresh water and may not be hydraulically sustainable.

The only currently known AGR-Livestock use within the Districts is for seasonally herded sheep. Three of the Districts (BWSE, BMWD, and LHWD) provide SWP water for sheep watering; sheep consumption reportedly represents approximately 1 acre-foot of water per year within these Districts. There is no known current use of groundwater for AGR-Poultry watering within the Study Area. Livestock grazing is more prevalent in the WSA.

8.5.3 Industrial Service Supply

Groundwater in the vicinity of South Belridge Oil Field, North Belridge Oil Field, and Lost Hills Oil Field has IND uses in oil field operations. Since these IND uses of water "do not depend primarily on water quality," these IND uses are anticipated to continue for the foreseeable future.

8.6 FUTURE BENEFICIAL USES OF GROUNDWATER

As described previously, existing beneficial uses of groundwater almost completely exclude MUN or AGR for irrigation. However, MUN beneficial use of groundwater could be promoted with adequate treatment (desalination) to meet MUN water quality criteria. Similarly, AGR beneficial use of groundwater could be promoted where sufficient imported dilution water is available from the SWP to meet AGR water quality criteria.

8.6.1 Future Municipal Supply

Water that does not exceed the MCLs is currently usable for MUN, with minimal treatment (principally disinfection). However, water that exceeds MCLs is not currently usable for MUN. For salinity, water that exceeds the SMCLs for TDS and EC (1,000 mg/L and 1,600 µmhos/cm) is not currently usable for MUN without expensive desalination treatment. In the *Sources of Drinking Water Policy*, the SWRCB found that water exceeding 3,000 mg/L TDS or 5,000 µmhos/cm EC is not usable for existing or future MUN use. Further, the SWRCB found that waters that “cannot reasonably be treated for domestic use” are not usable for existing or future MUN use.

Groundwater below the Study Area contains concentrations of salts (TDS, boron, chloride, and sulfate) that currently prevent use for MUN. Drinking water treatment facilities can use desalination to remove the dissolved solids in groundwater that are responsible for elevated TDS levels and can treat some of the individual salts to achieve MCLs. The International Desalination Association published the *ABCs of Desalting* in 2000. The International Desalination Association describes the principal methods used for desalination as multi-stage flash distillation for treatment of seawater and RO for treatment of brackish water.

> “Most of the capacity in the USA consists of plants in which the RO process is used to treat brackish water. RO is a pressure-driven process, with the pressure used for separation by allowing fresh water to move through a membrane, leaving the salts behind in a concentrate stream. As such, desalination almost always involves a discharge of…a concentrate stream (also called a brine, reject, or waste stream). This stream contains the salts removed from the saline feed to produce the fresh water product, as well as some of the chemicals that may have been added during the process. It may also contain corrosion by-products. The stream varies in volume, depending on the process, but will almost always be a significant quantity of water. If the desalting plant is located near the sea, the potential for a problem will be considerably less. The major solute in the concentrate stream is salt, and disposing of salt in the sea is generally not a problem. The potential for a more significant problem comes when a desalting facility is constructed inland, away from a natural salt-water body, such as is common for brackish water plants. Care must then be taken so as not to pollute any existing ground or surface water with the salts contained in the concentrate stream.”

RO treatment removes virtually all dissolved substances, including many potentially harmful minerals and hardness. RO treatment can reduce the concentrations of chemical constituents often associated with agriculture; nitrate, nitrite, ammonia, and organic pesticides. It also removes healthy minerals, such as calcium and magnesium. RO-treated water can be filtered through a mineral bed to add magnesium and calcium back into the treated water. The mineral bed can also increase the water pH and decreases the corrosive potential of the treated water (SDWF, 2013).

In California, municipal desalination plants typically involve treatment of seawater and discharge of seawater to the Pacific Ocean. Twenty-one coastal desalination plants are either proposed or in operation in California (SCCWRP, 2012). In 2003, the DWR published *Water Desalination, Findings and Recommendations*. DWR found that:

> "Brackish groundwater desalting is an effective means of treating impaired groundwater, providing a safe water supply and providing capacity for additional groundwater storage in areas with suitable hydrogeology. The primary impediment to brackish groundwater desalting is the need for infrastructure that allows environmentally acceptable disposal of the concentrate discharge, which may contain constituents not found in seawater. Where these issues have been solved, brackish groundwater desalting facilities have been successfully permitted."

Concentrate disposal for inland desalination units is still one of the limiting factors for successful desalination projects. Inland concentrate water disposal can be accomplished by off-site disposal, evaporation in lined storage ponds, or injection in deep saline water formations. Concentrate management costs could be cost prohibitive if the concentrate exceeds a hazardous waste threshold and/or is significantly radioactive. That disposal would be highly regulated and include significant environmental liabilities for process failures. Amec Foster Wheeler has reviewed two projects in Kern County that evaluated the cost of desalination treatment to meet drinking water standards.

In 2008, the Water Reuse Foundation conducted a *Survey of High-Recovery and Zero Liquid Discharge Technologies for Water Utilities* (WRF, 2008). The survey evaluated five convention zero-liquid discharge schemes and three selective salt recovery technologies and concluded:

> "High recovery and zero liquid discharge processing schemes are technically feasible, but, in general, not economically feasible for municipal applications."

The Water Reuse Foundation survey also pointed out another potential cost component that is not currently accounted for in their evaluation of costs. The concentration of salts necessarily includes the concentration of NORMs also known as technically enhanced naturally occurring radioactive materials or TENORMs. NORMs were detected in groundwater samples below the Study Area in the form of uranium (USGS, 1995; see Section 4.1) and gross alpha activity (see Section 5.3). Concentrated NORMs are not formally regulated in California statute or regulation, although several related bills are currently being considered in the California legislature. The survey concluded:

> "Whereas guidelines and regulations for wastes other than those containing radionuclides are well defined and relatively straight-forward, the same is not true radionuclides waste… (the presence of) radionuclides will result in such high disposal costs that disposal will not be feasible…"

Kennedy/Jenks Consultants prepared an *Evaluation of Economic Feasibility of Treating McKittrick Area Groundwater for Use as Drinking Water* (Kennedy/Jenks, 2002). The Study Area for this report is just south of BWSD in the community of McKittrick. This report estimated the costs for RO treatment of groundwater containing 6,100 mg/L of TDS to a TDS concentration less than 500 mg/L. Kennedy/Jenks Consultants considered two sizes of systems: a 0.5 acre-foot-per-day water system and an 8.75 acre-foot-per-day water system. These systems would consist of water pretreatment (filtration, pH control, and water softening), high-pressure RO for desalination, and post-treatment (degassing, pH control, and disinfection). Concentrate disposal was by discharge to an on-site evaporation pond. The estimated cost for the small 0.5 acre-foot-per-day water system was $34,500 per acre-foot of drinking water. The estimated cost for the larger 8.75 acre-foot-per-day system was $5,800 per acre-foot of drinking water. Kennedy/Jenks Consultants found that desalination treatment of McKittrick area groundwater was not economically feasible because the estimated costs were 10 to 70 times more than the McKittrick community's current imported water supply cost ($455 per acre-foot).

Carollo Engineers more recently published the results of a pilot study *Evaluating Zero Liquid Discharge Desalting for Inland Desert Communities* (Carollo, 2010) on behalf of Indian Wells Valley Water District in eastern Kern County. Carollo Engineers conducted a pilot treatment of 1,400 mg/L TDS raw groundwater with RO and electrodialysis (ED) to about 140 mg/L TDS for drinking water purposes. The RO/ED concentrate waste (16,500 mg/L TDS) was further treated with a brine concentrator (to 330,000 mg/L TDS). The concentrate did not exceed hazardous waste characteristics and was disposed off site. Carollo Engineers estimated that a full-scale RO/ED system for Indian Wells Valley Water District could provide 3,000 acre-feet per year of potable water for $1,780 to $2,350 per acre-foot, plus the cost of water distribution. Carollo Engineers also estimated that the cost of concentrate disposal was 65% of the project total cost; primary desalination only represented 35% of the total cost.

For comparison with desalination costs, Amec Foster Wheeler estimated the cost of importing SWP water to the Districts for municipal supply. Projected 2015 delivery costs for SWP water (without filtration/disinfection treatment) in the vicinity of the Districts is $108 per acre-foot (DWR, 2009). The EPA estimated the cost for filtration/disinfection treatment for small systems (1 million gallons per day capacity) at $230 to $270 per acre-foot (EPA, 2005). Based on these estimates, the cost for water delivery with filtration/disinfection treatment would be about $340 to $370 per acre-foot, plus the cost of water distribution.

The following table summarizes the above cost estimates (cost per acre-foot of supplied drinking water).

	Kennedy/Jenks (2002 $/acre-foot)	**Carollo (2010 $/acre-foot)**	**Amec Foster Wheeler (2015 $/acre-foot)**
Treated Surface Water	$455	--	$340-$370
RO Treated Brackish Groundwater	$5,800-$34,500	$1,780 - $2,350	--

Considering that imported MUN supplies can currently be treated for municipal use for significantly less than 25% of the reported cost for desalination of brackish groundwater, desalination for MUN is not currently economically feasible within the Study Area. Without a dramatic improvement in desalination technology, desalination of groundwater for MUN is anticipated to be infeasible within the Study Area, based on cost. Considering that desalination also includes environmental liabilities associated with concentrate containment (lined pond containment and/or injection wells for liquids, or lined landfill for solids), desalination of groundwater for MUN is not considered to be economically feasible within the Study Area for the foreseeable future and would meet the following SWRCB criteria for designation of MUN:

a. The TDS exceed 3,000 mg/L (5,000 µmhos/cm EC) and it is not reasonably expected by the RWQCB to supply a public water system, or

b. There is contamination, either by natural processes or by human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices,

8.6.2 Future Agricultural Supply

Based on the poor mineral quality, groundwater below the Study Area could occasionally be used for irrigation AGR, if heavily diluted with imported water. A previous attempt did not prove successful (BEE, 1976), in part due to poor groundwater production. These conditions are not expected to change in the future. Use of groundwater for AGR-Irrigation is anticipated to be feasible for only short-term use. As such, the RWQCB should amend the AGR-Irrigation in parts of the Study Area where first encountered groundwater cannot meet water quality criteria for AGR-Irrigation. Such an amendment would limit AGR beneficial use for short-term use, when imported SWP allocations are limited and additional irrigation water is blended with limited SWP supplies to supplement available irrigation supply.

Because of the volume of water used for AGR-Irrigation and the high cost of desalination, desalination is not often considered for irrigation water supply. However, the DWR funded a demonstration project to evaluate desalination of tile drainage in BVWSD (Boyle, 2003). The demonstration used a multi-stage RO system to treat drainage water containing about 4,200 mg/L TDS (6,500 µmohs/cm EC). The treated water contained about 180 mg/L TDS (300 µmohs/cm EC) and the RO concentrate contained about 12,000 mg/L TDS (18,000 µmohs/cm EC). Boyle estimated the full-scale treatment cost at $460 to $640 per acre-foot (depending on the system treatment capacity), excluding the cost of concentrate disposal. Boyle concluded that "A suitable method for disposing of the concentrate must be determined before implementation is possible." Concentrate disposal can cost as much or more than the RO treatment costs. Based on the projected 2015 delivery costs for SWP water ($108 per acre-foot; DWR, 2009), desalination of brackish groundwater for AGR-Irrigation ($460 to $640 per acre-foot, plus concentrate disposal cost) is not currently feasible. Based on the environmental liabilities associated with concentrate disposal, desalination of brackish groundwater below the Study Area is not anticipated to be feasible for the foreseeable future.

Groundwater within some parts of the Study Area appears to be potentially suitable for limited AGR-Livestock. Similarly, groundwater may also be usable for watering herded sheep (FAO, 1994; see Section 7.3.2). As such, the Districts' request that the RWQCB protect groundwater for future AGR-Livestock uses in areas that meet the stock water quality criteria. This refinement of AGR beneficial use could be adopted similarly to the "sub-categories of use" described in federal regulations (40 CFR 131.10) for surface water beneficial uses:

> "(c) States may adopt sub-categories of a use and set the appropriate criteria to reflect varying needs of such sub-categories of uses, for instance, to differentiate between cold water and warm water fisheries."

Although the above federal regulation applies to surface waters, it demonstrates that beneficial uses can be refined to reflect sub-categories of actual existing and potential beneficial use. For example, the upper EC limit for AGR-Livestock (8,000 µmhos/cm) is more than twice the upper EC limit for AGR-Irrigation (3,000 µmhos/cm). Obviously, this brackish water that is potentially usable for stock watering may not be usable for AGR-Irrigation.

8.6.3 Future Industrial Service Supply

Groundwater within the Study Area that is also within oil fields has IND uses of groundwater in oil field operations. The Coalition indicates these IND uses are for enhanced recovery of oil within the oil fields. Since these IND uses of water "do not depend primarily on water quality," these IND uses, including dust control, are anticipated to continue for the foreseeable future.

9.0 GROUNDWATER QUALITY ASSESSMENT REPORT

The General Order and its Monitoring and Reporting Program indicate that farmers within the Tulare Lake Basin shall submit a GAR to the RWQCB: The GAR is intended to include assessment of:

a. Known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities.

b. The merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under this Order. This shall include specific findings and conclusions and provide the rationale for conclusions.

c. A ranking of high vulnerability areas to provide a basis for prioritization of work plan activities.

d. A discussion on pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications, graphics, and tables, as appropriate, in order to clearly convey pertinent data, support data analysis, and show results.

9.1 GROUNDWATER IMPACTS FROM IRRIGATED AGRICULTURE

Amec Foster Wheeler has reviewed available groundwater quality data from groundwater studies conducted by the USGS, CDPH/SWRCB, CDPR and others (see Section 6.0). Groundwater quality impacts from previous studies include elevated concentrations of EC, TDS, and sulfate, which are based primarily on naturally occurring background conditions, which includes groundwater in contact with saline, soils, and marine sediments.

The General Order requires that the GAR identify areas "where known groundwater quality impacts exist for which irrigated agriculture operations are a potential contributor." Specifically, the General Order specifically requires evaluation of impacts from "pesticides, fertilizers and soil amendments." To address this requirement, Amec Foster Wheeler has prepared the following subsections.

9.1.1 Pesticides

As summarized in Section 7.4.7, pesticides were infrequently detected in groundwater samples from the Study Area and the detections were at concentrations well below corresponding MCLs. With the exception of the infrequent, trace detections of atrazine, diuron, simazine, and DCP, Amec Foster Wheeler has found no pesticide groundwater quality impacts within the Study Area for which former irrigated agriculture operations are a potential contributor.

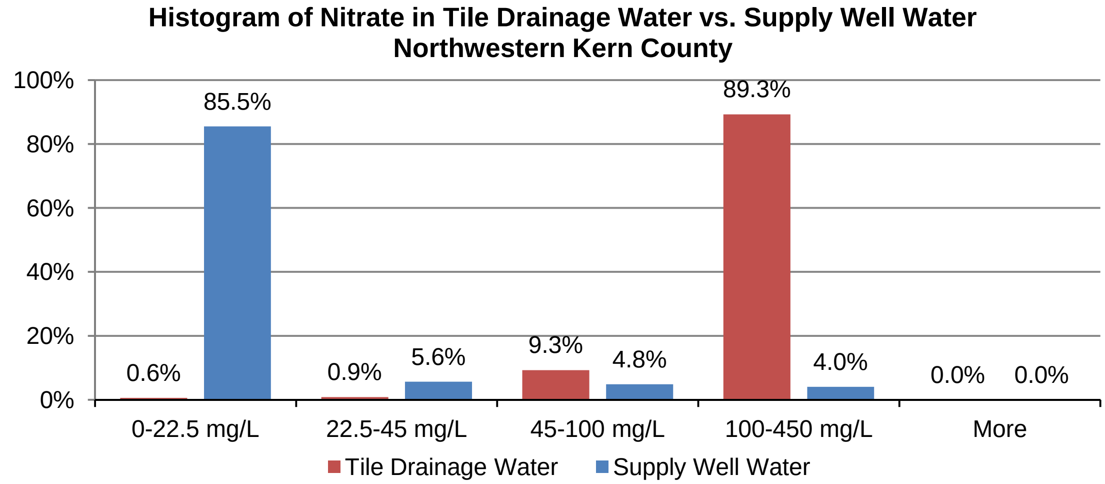
9.1.2 Fertilizers

The major plant nutrients of fertilizers are nitrogen, phosphorus, and potassium. The principal nutrient of concern for groundwater is nitrate. Nitrate can be used in the form of inorganic fertilizers or in the form of inorganic soil amendments (described below). This evaluation considers published analytical data for nitrate in well water from the Study Area. For purposes of this evaluation, nitrate concentrations greater than the MCL in drinking water (45 mg/L nitrate) are considered elevated above background water quality and derived from an anthropomorphic source.

Tile drainage water samples for nitrate analysis were collected by DWR from 1985 through 2012. Within the western Kern County, DWR collected 344 water samples from five tile drains within the perched groundwater area in the eastern half of LHWD. Nitrate concentrations ranged from 2.6 to 382 mg/L (DWR Ag Drainage Database).

Well water sampling for nitrate analysis was conducted within the northwestern Kern County by DPH, DWR, and USGS in the 1950s through the early 1990s. Within northwestern Kern County, 125 water samples were collected from supply wells and analyzed for nitrate between January 1953 and December 1992; nitrate concentrations ranged from <0.1 to 420 mg/L (GeoTracker GAMA database). The University of California, Davis (UCD) has developed the "California Ambient Spatio-Temporal Information on Nitrate in Groundwater" (CASTING) database, which was also reviewed as part of our evaluation.

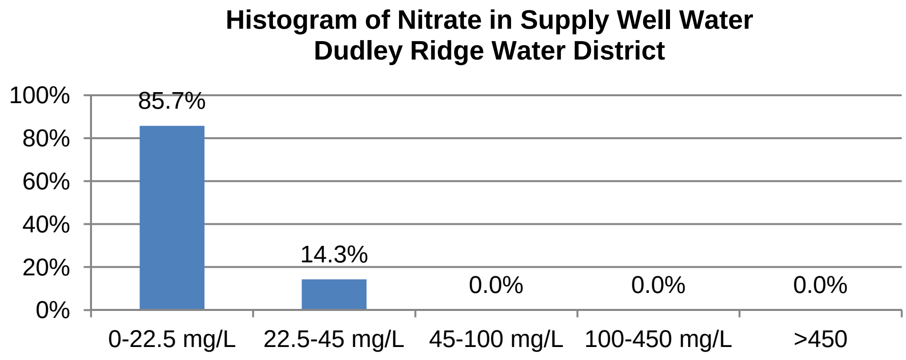
The following histogram chart is a comparison of the nitrate concentrations in tile drainage and in deeper water supply wells from the area in terms of the frequency of detection within certain concentration ranges:



The above chart shows that 98.6% of tile drainage water samples exceeded 45 mg/L nitrate (MCL). If tile drainage water containing elevated nitrate concentrations were migrating into underlying semi-confined groundwater aquifer in which area supply wells are screened, we would anticipate a similar nitrate concentration distribution. However, only 8.8% of supply well water samples exceeded 45 mg/L. This comparison indicates little, if any, tile drainage water has migrated vertical downward into the semi-confined groundwater aquifer below. Supply wells with elevated nitrate concentrations that exceed the MCL of 45 mg/L in groundwater are shown on Figure 14.

Based on a comparison of the above tile drainage water and supply well water, it is apparent that nitrate concentrations are markedly different. Of the tile drainage water samples, only 14% contain elevated nitrate (greater than 45 mg/L). This suggests that there is little communication between the shallow tile drainage water in LHWD and water supply wells and minimal impact on nitrate concentrations in supply wells from irrigated agricultural operations.

For nitrate in groundwater within the vicinity of DRWD, Amec Foster Wheeler has evaluated nitrate concentrations in water samples from supply wells, as summarized in the GeoTracker GAMA and the CASTING databases for supply wells in DRWD west of Interstate 5. Supply wells with elevated nitrate concentrations (greater than 45 mg/L) and those that exceed the MCL of 45 mg/L in groundwater are shown on Figure 14.



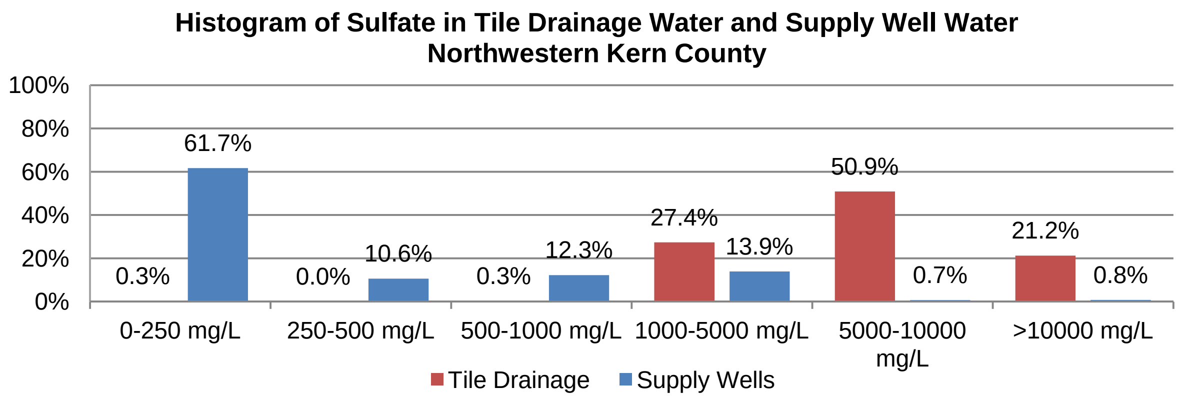
The above data show that nitrate in supply well water within DRWD is mostly unaffected by irrigated agriculture.

9.1.3 Soil Amendments

There are two broad categories of soil amendments: organic and inorganic. Organic amendments can include peat, wood chips, straw, compost, manure, biosolids, sawdust, and wood ash. Organic amendments contain biologically derived nitrogen, phosphorus, and potassium. Inorganic amendments can include industrial produced fertilizers containing nitrogen, phosphorous, and potassium; gypsum; lime; and sulfur. Other than nitrate addressed in Section 8.3.2, the principal constituent of concern for soil amendments in groundwater is sulfur from amendments containing elemental sulfur or from gypsum. As such, this evaluation considers published analytical data for sulfate in well water from the Study Area. For purposes of this evaluation, sulfate concentrations greater than secondary contaminant level (500 mg/L) will be considered elevated. Sediments within the Study Area include naturally occurring gypsum (calcium sulfate) deposits in the alluvium and Tulare Formation (USGS, 1910), including some larger deposits that have been mined economically. Within the Study Area, water percolating through deposits containing gypsum or other sulfur bearing minerals have resulted in naturally occurring, elevated sulfate concentrations in groundwater below the Study Area (see Section 7.4.6).

Tile drainage water samples were analyzed for sulfate by DWR from 1985 through 2012. DWR collected 391 water samples within the Study Area from five tile drains within the perched groundwater area in the eastern half of LHWD. Sulfate concentrations ranged from 83 to 14,600 mg/L (DWR Ag Drainage Database). Of those results, 389 samples (99.7%) exceeded the SMCL of 500 mg/L sulfate. These data indicate that elevated sulfate concentrations are a naturally occurring condition. Due to this condition, it is not clear whether historical agricultural operations may have had an impact on sulfate concentrations in shallow agricultural drainage groundwater.

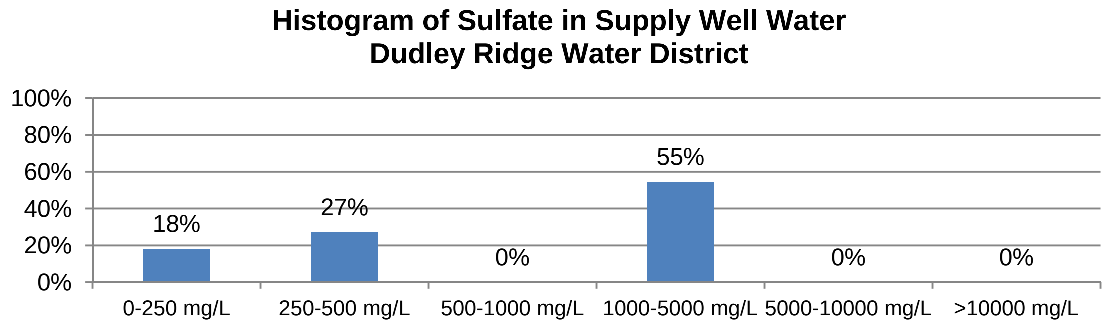
Sampling of supply wells for sulfate analysis was conducted within the Study Area by USGS and DWR. Within northwestern Kern County, 1,137 water samples were collected from supply wells analyzed for sulfate between April 1950 and May 2014. Sulfate concentrations ranged from non-detect to 27,000 mg/L (GeoTracker GAMA database). Of those results, 178 samples (16%) exceeded the SMCL of 500 mg/L sulfate.



This histogram chart shows that 84.4% of tile drainage water samples exceeded 500 mg/L sulfate (SMCL). If tile drainage water containing elevated sulfate concentrations were migrating vertically downward into semi-confined groundwater aquifer in which area supply wells are screened, we would anticipate a similar sulfate concentration pattern. However, only 27.7% of supply well water samples exceeded 500 mg/L of sulfate. This comparison indicates little, if any, tile drainage water has migration vertically into the semi-confined groundwater below. Supply wells with elevated sulfate concentrations (greater than 500 mg/L) in water are shown on Figure 15.

A comparison of sulfate concentrations in tile drainage water and supply well water indicate that sulfate concentrations are markedly different. Of the tile drainage water samples, more than 99% contain elevated sulfate (greater than 500 mg/L), while only 28% of supply well water samples contained elevated sulfate. This suggests that there is little communication between the shallow tile drainage water in perched groundwater in the eastern portion of LHWD and the underlying groundwater aquifers. These data show minimal impact from irrigated agricultural operations on sulfate concentrations for supply wells in western Kern County.

Between 1952 and 1969, DWR collected water samples from 11 supply wells within western DRWD for sulfate analysis. Reported sulfate concentrations ranged from 194 to 2,360 mg/L (GeoTracker GAMA database).



Of those results, six well water samples (54%) contained elevated sulfate concentrations. These six wells are adjacent to the base of the Kettleman Hills, which includes gypsum deposits. Considering a likely natural source for elevated sulfate, it is not clear that irrigated agricultural operations may have contributed to sulfate concentrations in groundwater.

9.2 GROUNDWATER VULNERABILITY

The General Order's definition of high vulnerability areas is:

> …where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities.

The SWRCB has evaluated areas within California that may be vulnerable to movement of contaminants to groundwater. In such areas, the SWRCB has designated hydrogeologically vulnerable areas (HVAs). The SWRCB map of HVAs did not identify any HVAs within or near the Study Area, except in a small portion of southern BWSD (SWRCB, 2000) (Figure 15).

The CDPR has evaluated areas within California that may be vulnerable to the movement of pesticides to groundwater according to either leaching or runoff processes. In such areas, the CDPR has established Ground Water Protection Areas (GWPAs). CDPR maps for Kern and Kings Counties do not indicate any GWPAs established within or near the Study Area (CDPR, 2004a and 2004b).

9.2.1 Methodology

Groundwater vulnerability assessments are general planning tools and should not be expected to be predictive of present or future water quality impacts. Such assessments should be used to focus efforts and resources in areas of relatively obvious concern. For groundwater vulnerability, Amec Foster Wheeler has evaluated the Study Area using the Nitrogen Groundwater Pollution Hazard Index (NHI) process (CWR, 2014) and based on current uses of groundwater. The NHI estimates risk of nitrate fertilizer degrading groundwater based on crop type, soil type, and irrigation method. Amec Foster Wheeler has also evaluated depth to groundwater and existing groundwater quality within the Study Area. Amec Foster Wheeler proposes designation of an HVA based on the following HVA criteria:

- first encountered groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- first encountered groundwater salinity less than 5,000 µmhos/cm.

9.2.1.1 Nitrogen Groundwater Pollution Hazard Index

Groundwater vulnerability can also be evaluated on a crop scale using the NHI (CWR, 2014). University of California Center for Water Resources (CWR) has developed the NHI method for evaluating the vulnerability of groundwater based on crop conditions, including:

- soil type,
- crop, and
- irrigation method.

CWR provides numerical risk values for each and estimates the total vulnerability based on multiplication of the individual numerical values. Irrigation methods used within the Study Area include micro-irrigation for permanent crops and sprinkler irrigation for annual field/row crops. Irrigation method risks vary from 1 to 4 (from 1 for micro-irrigation to 4 for furrow irrigation). As a conservative assumption for the NHI calculation, we have used the irrigation risk of sprinkler irrigation (risk = 3). CWR assumed that a total NHI value “less than 20 is of relatively minor concern.” A total NHI value “greater than 20 should be managed to reduce the risk of groundwater contamination.” Amec Foster Wheeler has discussed the NHI as a criterion for designation of a HVA with RWQCB staff and was advised it was not appropriate. However, the General Order requires evaluation of irrigation management practices (irrigation method, crop type, nitrogen application, and nitrogen removal rates, etc.).

9.2.1.2 Depth to Groundwater

Among the variables that affect nitrogen leaching in soils is depth to groundwater. Fertilizer nitrogen in soils can be in several forms: soluble nitrate, soluble ammonia, sorbed ammonium, gaseous ammonia, and organic nitrogen. Soluble nitrate and ammonia will migrate with percolating irrigation water. In areas with shallow groundwater (less than 10 feet bgs), soil natural attenuation processes (mineralization, nitrification, denitrification, fixation, and gaseous diffusion) have little time to modify the soluble forms of nitrogen (nitrate and NH4) leaching to groundwater. However, in areas with deeper groundwater (greater than 50 feet bgs), soil processes in the unsaturated zone have more time to modify the soluble forms of nitrogen leaching through soil. These soil processes are enhanced in deep soils with stratified fine- and coarse-grained soils. As an initial way for groundwater vulnerability analysis, the EPA published the DRASTIC methodology for evaluating groundwater pollution potential (EPA, 1987). For depth to groundwater, EPA proposed a risk ranking for depth to groundwater as follows:

DRASTIC Ranges and Ratings for Depth to Groundwater

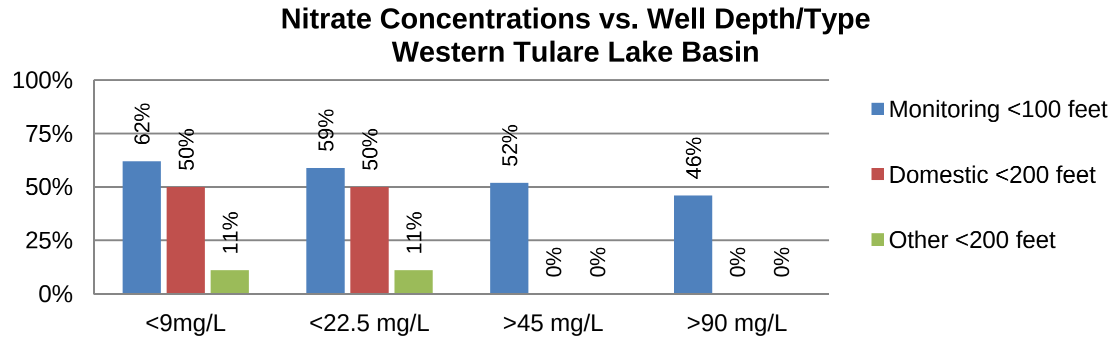
Range (feet)	Rating
0-5	10
5-15	9
15-30	7
30-50	5
50-75	3
75-100	2
100+	1

For the above ranges of groundwater vulnerability, EPA indicates:

> The ranges in depth to water as defined in the DRASTIC system have been determined based on what are considered to be depths where the potential for ground-water pollution significantly changes.

Based on the DRASTIC rating, shallow groundwater (0 to 5 feet in depth) can be 10 times more vulnerable than deeper groundwater (greater than 100 feet in depth). Amec Foster Wheeler does not propose to use the entire DRASTIC methodology, but acknowledges that groundwater below 100 feet in depth is significantly less vulnerable than shallow groundwater.

More recently, the UCD evaluated the occurrence of nitrate in 30 wells within the western alluvial fans of the Tulare Lake Basin for which well construction information was available (UCD, 2012). UCD looked at nitrate concentrations in groundwater monitoring wells (less than 100 feet in depth to top of perforations), shallow domestic wells (less than 200 feet in depth to top of perforations), other shallow wells (less than 200 feet in depth to top of perforations), and municipal water wells (variety of depths to top of perforations, but generally deeper than shallow domestic wells). UCD found the percentage of groundwater samples from the above well categories that fell within ranges of nitrate concentrations:



The above chart shows that the shallowest wells in the westside alluvial fans of the Tulare Lake Basin (monitoring wells with less than 100 feet to top of perforations) are significantly more likely to contain elevated nitrate concentrations than deeper wells (domestic or other wells with perforations less than 200 feet to top of perforations). These data are also consistent with the depth-to-groundwater assumption of DRASTIC, as described above. However, the number of wells evaluated by UCD is too small to be predictive of groundwater vulnerability within the Study Area. Amec Foster Wheeler has discussed depth to groundwater as a criterion for designation of a HVA with RWQCB staff and was advised it was not appropriate. However, the General Order requires evaluation of vulnerability based on depth to groundwater.

9.2.1.3 Groundwater Salinity

Groundwater vulnerability is also dependent upon its current and potential uses, which in the Study Area are limited by groundwater salinity. For example, the SMCL for salinity in drinking water is 1,600 µmhos/cm. Groundwater in excess of the SMCL typically has aesthetic effects (taste, odor, color, and/or turbidity) that are usually not palatable for human consumption. EPA summarizes SMCLs as follows:

> EPA believes that if these contaminants are present in your water at levels above these standards (SMCLs), the contaminants may cause the water to appear cloudy or colored, or to taste or smell bad. This may cause a great number of people to stop using water from their public water system…

As in the Study Area, most humans will find alternate drinking water supply for unpalatable water and drinking water risks would be corresponding reduced. Groundwater TDS of greater than 1,000 mg/L or salinity (EC) greater than1,600 µmhos/cm has prevented and currently prevents MUN use of groundwater without treatment.

However, future groundwater resources may include desalination treatment of groundwater for purposes of MUN. The SWRCB has determined groundwater is suitable for future MUN use unless the TDS exceeds 3,000 mg/L or the EC exceeds 5,000 µmohs/cm (SWRCB, 2006). As such, we anticipate that TDS concentrations less than 3,000 mg/L or an EC of less than 5,000 µmohs/cm is appropriate criteria for designation of a HVA.

9.2.1.4 Nitrate Concentration

Nitrate is one of the principal plant nutrients that could indicate an impact on groundwater quality. Nitrate is taken up by plant roots. However, nitrate that is not taken up by the crop will readily migrate in soil with percolating water, if it is not transformed to less mobile forms (ammonium and organic nitrogen). Nitrate in soils can be converted to less-leachable forms (ammonium and organic nitrogen) by a variety of mechanisms. Nitrate is typically detected at background concentrations in California groundwater. For example:

> Levels of nitrate below 9 mg/L (2 mg/L nitrate as nitrogen) are generally considered background and levels above 18 mg/L (4 mg/L as nitrate as nitrogen) are thought to reflect water that has been impacted… (UCD, 2012)

The MCL for nitrate in drinking water is 45 mg/L nitrate (10 mg/L nitrate as nitrogen). Groundwater that exceeds the MCL for nitrate is not currently usable for MUN, without treatment. As such, we anticipate that a nitrate concentration of 45 mg/L (10 mg/L nitrate as nitrogen) is an appropriate criterion for designation of a HVA.

9.2.2 Belridge Water Storage District

For evaluating groundwater vulnerability within BWSD, Amec Foster Wheeler has considered vulnerability designations by others (CDPR and SWRCB), prepared a NHI (CWR, 2014) assessment, examined depth to groundwater, and plotted salinity and nitrate concentrations for first encountered groundwater. However, for HVA designation of first encountered groundwater, we have used the following criteria:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- groundwater salinity less than 5,000 µmhos/cm.

The CDPR has not identified a GWPA within BWSD. The SWRCB has not identified a HVA within BWSD, except in a relatively small area of the far southern part of the District (Figure 15). The SWRCB basis for this HVA designation was:

> Areas delineated as highest "susceptibility" based on absence of so-called Corcoran Clay which impedes vertical flow from shallow groundwater to deeper, higher quality drinking water production zones across much of the San Joaquin Valley.

The SWRCB's did not base this HVA designation on groundwater quality; the SWRCB's GeoTracker GAMA database has no groundwater quality data for the area of this HVA. In any case, the SWRCB's HVA encompasses oil field operations (Cymric, Monument Junction, and South Belridge oil fields), rather than irrigated agricultural operations.

The Clean Harbors waste management facility is located within or near this SWRCB HVA. The RWQCB's WDRs for the Clean Harbors facility (Order R5-2012-0111, RWQCB, 2012) indicate:

> Three groundwater zones have been identified in the upper 600 feet of sedimentary sequence. The Board, Department of Toxic Substance Control (DTSC) and the Environmental Protection Agency (EPA) have defined these zones as follows: the Upper Perched Zone, the Intermediate Perched Zone, and the Lower Water Table Zone groundwater quality in all three groundwater zones is generally considered to be poor with total dissolved solids (TDS) concentrations ranging from 2,070 to 7,380 milligrams per liter in all three zones. There are no producing wells within a one-mile radius, other than two water supply wells located at the Facility, used primarily for dust control and equipment washing.

Based on the above findings, deeper groundwater is protected by shallow-fine grained units sufficient to perch shallow groundwater. Also, the deep groundwater is characterized as "poor" (TDS concentrations ranging from 2,070 to 7,380 mg/L) and unused in the area, except for IND uses. Based on these findings, groundwater within the SWRCB's HVA (southern BWSD) is not particularly vulnerable to impacts from irrigated agriculture and the HVA applied to the southern part of the BWSD appears unwarranted for purposes of this GAR.

The principal soil types within BWSD are Panoche loam, Milham loam, and Kimberlina loam. The percent acreage these soils occupy within BWSD is summarized in the following table along with the relative soil hazard applied to each in the NHI (CWR, 2014):

Soil Series	**Acreage Percent**	**Soil Hazard**
Panoche loam	31.7%	3
Milham loam	30.0%	3
Kimberlina loam	25.3%	4
Lokern clay	6.7%	1
Others	5.8%	2.5

The principal crops grown with BWSD are pistachios and almonds. The crop acreage percentage and a NHI-assigned crop hazards (CWR, 2014) are:

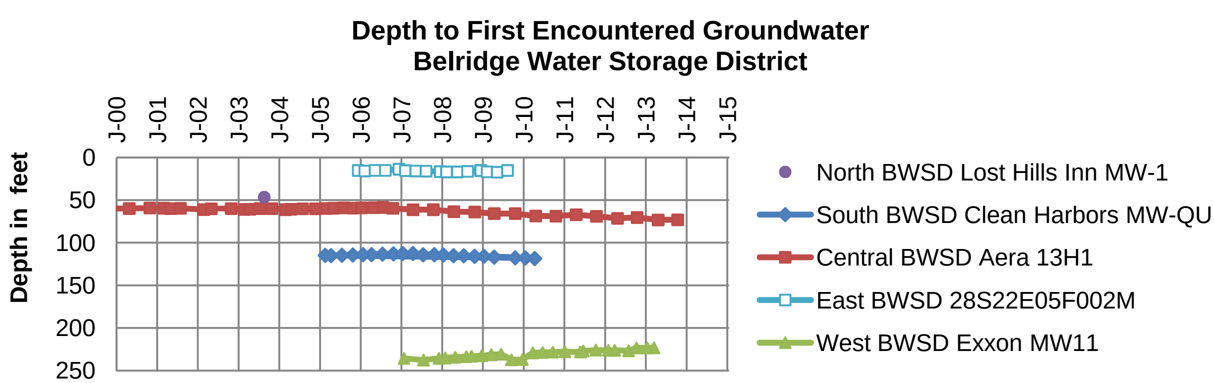
Crop	Acreage Percentage	Crop Hazard
Almonds	54.4%	2
Pistachios	30.7%	2

The principal irrigation methods used on pistachios and almonds is drip or microspray, each of which has an irrigation hazard of 2. Multiplying the soil, crop, and irrigation hazards, the following NHI for areas with these soil/crop/irrigation pairings are calculated:

Soil Series	Soil Hazard	Crop Hazard	Irrigation Hazard	NHI
Panoche loam	3	2	2	12
Milham loam	3	2	2	12
Kimberlina loam	4	2	4	16
Lokern clay	1	2	2	4
Others	2.5	2	2	10

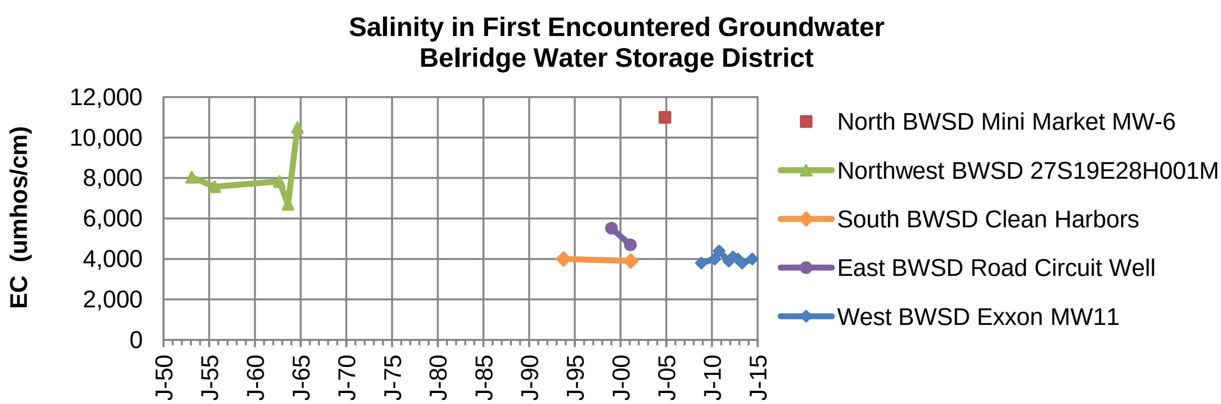
The calculated NHI for the above soil/crop/irrigation hazards are all well below a NHI value of 20. CWR indicates that a total NHI value "greater than 20 should be managed to reduce the risk of groundwater contamination."

For evaluating the depth to groundwater criterion for designating an HVA in BWSD, Amec Foster Wheeler has plotted depth-to-groundwater measurements for five wells within the District. Four of the wells are completed into first encountered groundwater for groundwater monitoring at RWQCB-regulated facilities located in the north, south, west, and central parts of BWSD. The fifth well is monitored by the DWR in the east part of BWSD. The depth-to-groundwater measurements for these wells are presented in the following chart.



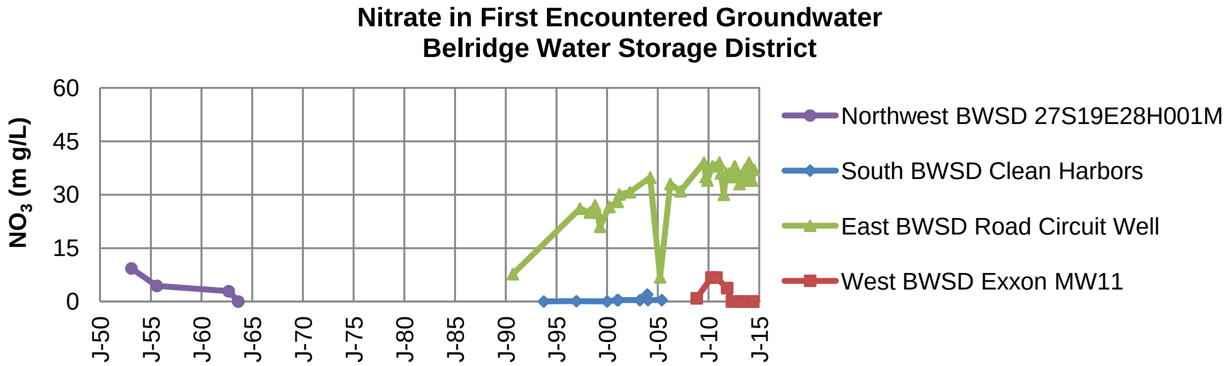
The chart above shows that depths to groundwater have been relatively consistent over the past 15 years. Depths to groundwater in the west and south parts of BWSD exceed 100 feet and would not meet the HVA criterion for depth (100 feet). Based on EPA's DRASTIC methodology for HVA evaluation, groundwater below 100 feet in depth is significantly less vulnerable than shallower groundwater. However, groundwater within the north, east, and central parts of BWSD are less than 100 feet in depth and these areas meet the HVA criterion for depth.

For evaluating the HVA criterion for groundwater salinity, Amec Foster Wheeler has plotted EC data for five wells in north, northwest, south, east, and west parts of BWSD:



Based on the above data, groundwater below the BWSD would not meet the HVA criterion for groundwater salinity (less than 1,600 µmhos/cm).

To further evaluate groundwater vulnerability, Amec Foster Wheeler has evaluated historical nitrate concentrations reported for groundwater in BWSD as potential groundwater quality impacts for which irrigated agricultural operations may be potential contributor. Theoretically, these data could suggest a nitrate contribution to area groundwater from irrigated agricultural operations. The following chart plots nitrate concentrations in groundwater from four wells in BWSD:



Nitrate concentrations in well water from the northwest, south, and west parts of BWSD varied from non-detect to 9.3 mg/L. These data would not appear to suggest a significant agricultural source of nitrate from irrigated agriculture. Groundwater nitrate in the east of BWSD varied from 8 to 39 mg/L and showed a generally increasing trend in concentration; this trend in nitrate concentration may suggest a contribution from irrigated agriculture and/or other nitrogen source.

9.2.3 Berrenda Mesa Water District

For evaluating groundwater vulnerability within BMWD, Amec Foster Wheeler has considered vulnerability designations by others (CDPR and SWRCB), prepared a NHI (CWR, 2014) assessment, examined depth to groundwater, and plotted salinity and nitrate concentrations for first encountered groundwater. However, for HVA designation of first encountered groundwater, we have used the following criteria:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- groundwater salinity less than 5,000 µmhos/cm.

Neither the SWRCB nor the CDPR has identified HVA or GWPA within BMWD.

Amec Foster Wheeler has also evaluated BMWD using the NHI process (CWR, 2014). The principal soil types within BMWD are Panoche loam, Milham loam, and Kimberlina loam. The percent acreage these soils occupy within BWSD is summarized in the following table along with the relative soil hazard applied to each in the NHI (CWR, 2014):

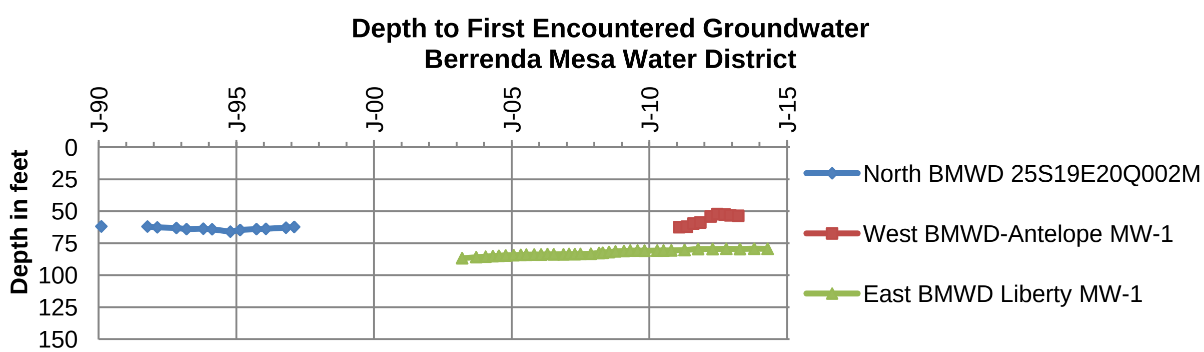
Soil Series	Acreage Percent	Soil Hazard
Twisselman clay	38.4%	2
Panoche clay loam	21.7%	3
Nahrub clay	12.5%	2
Kimberlina sandy loam	11.3%	4
Others	11.5%	2.4 (avg.)

The principal crops grown with BMWD are almonds, pistachios, and pomegranates. The principal irrigation methods used on almonds, pistachios, and almonds is drip or microspray irrigation, each of which has an irrigation hazard of 2. Multiplying the soil, crop, and irrigation hazards the following NHI for areas with these soil/crop/irrigation pairings are calculated:

Soil Series	Soil Hazard	Crop Hazard	Irrigation Hazard	NHI
Twisselman clay	2	2	2	8
Panoche clay loam	3	2	2	12
Nahrub clay	2	2	2	8
Kimberlina sandy loam	4	2	2	16
Others	2.4	2	2	9.6

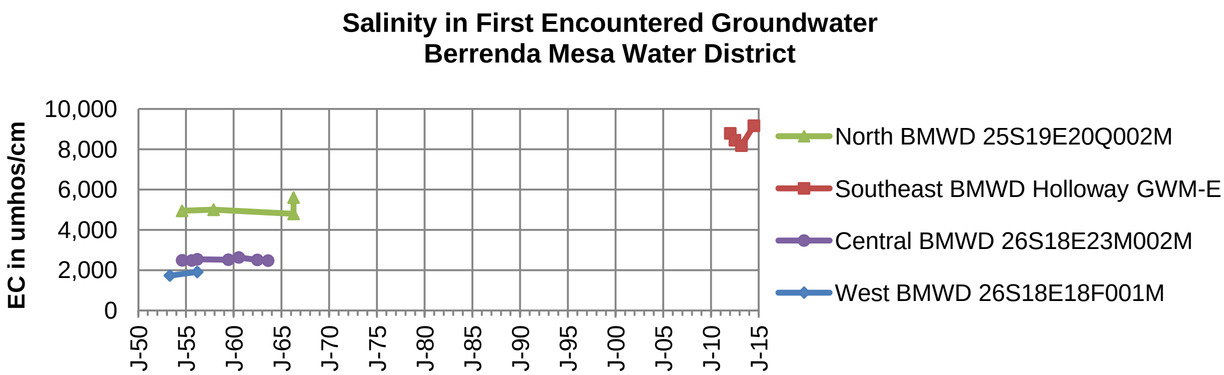
The calculated NHI for the above soil/crop/irrigation hazards are all well below a NHI value of 20. CWR indicates that a total NHI value “greater than 20 should be managed to reduce the risk of groundwater contamination.”

Amec Foster Wheeler has plotted depth-to-groundwater measurements for three wells within the District. Two of the wells are completed into first encountered groundwater for groundwater monitoring at RWQCB-regulated facilities located in the east and west parts of BMWD. The third well is monitored by the DWR in the north part of BMWD. The depth-to-groundwater measurements for these wells are presented in the following chart:



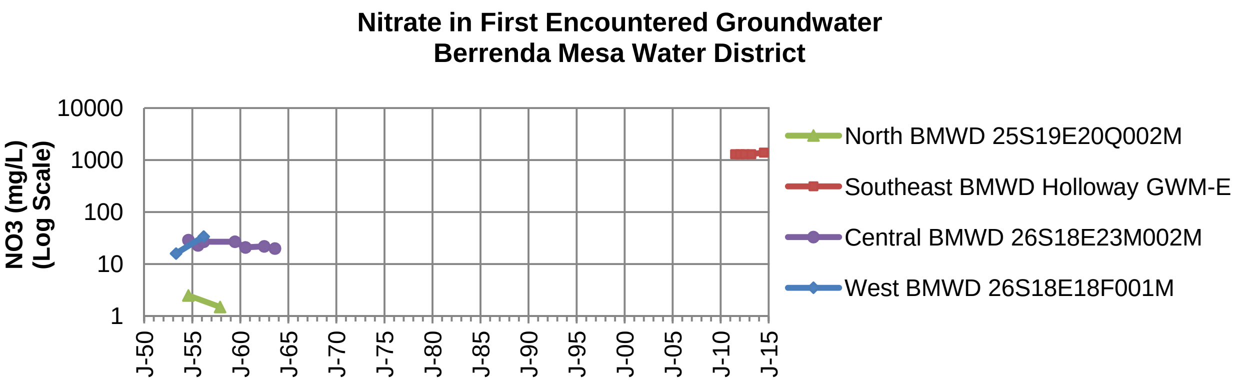
Based on EPA's DRASTIC methodology for HVA evaluation, groundwater below 100 feet in depth is significantly less vulnerable than shallower groundwater. The chart above shows that depths to groundwater in BWSD do not exceeded 100 feet.

For evaluating the groundwater salinity criterion for designating an HVA in the BMWD, Amec Foster Wheeler has plotted the available groundwater conductance data within the BMWD. Salinity measurements were available for wells in the north, west, southeast, and central parts of the BMWD (25S19E20Q002M, 26S18E18F001M, Holloway GWM-E, and 26S18E23M002M, respectively). Samples were collected by DWR between 1953 and 1967, except for 2012/14 data for Holloway WWM-E). The measured EC for these samples are presented in the following chart:



Based on the above data, groundwater in the north, southeast, and central parts of BMWD exceed 1,900 µmhos/cm and do not meet the HVA criterion for salinity. Groundwater in the far west of BMWD (26S18E18F001M) hovered above and below 1,900 µmhos/cm in the early 1950s; more current data for this well are not available. Groundwater in the far west of BMWD may meet the HVA criterion for salinity.

To further evaluate groundwater vulnerability, Amec Foster Wheeler has evaluated historical nitrate concentrations reported for groundwater in BMWD as potential groundwater quality impacts for which irrigated agricultural operations may be potential contributor. As with the other BMWD groundwater data, most of the nitrate concentration data are from 1953 through 1986. These data are from more than 25 years in the past and more current nitrate data were not available. Theoretically, these data could suggest a nitrate contribution to area groundwater from historical irrigated agricultural operations. The following chart plots nitrate concentrations in groundwater from four wells in BMWD:



Nitrate concentrations varied from 1.5 to 27 mg/L in wells within northern, central, and west BMWD. These data would not suggest a significant impact to nitrate concentrations from irrigated agriculture. However, first encountered groundwater just east of BMWD (Holloway GWM-3) ranged from 1,300 to 1,400 mg/L nitrate, which appears to represent a release of nitrate to groundwater. However, the Holloway facility is an operating waste management facility, which is a likely the source of the nitrate. As such, groundwater in western BMWD appears to have an impact on nitrate in groundwater from a source other than irrigated agriculture.

9.2.4 Dudley Ridge Water District

For evaluating groundwater vulnerability within DRWD, Amec Foster Wheeler has considered vulnerability designations by others (CDPR and SWRCB), prepared a NHI (CWR, 2014) assessment, examined depth to groundwater, and plotted salinity and nitrate concentrations for first encountered groundwater. However, for HVA designation of first encountered groundwater, we have used the following criteria:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- groundwater salinity less than 5,000 µmhos/cm.

Neither the SWRCB nor the CDPR has identified HVA or GWPA within DRWD.

For NHI assessment, we look at surface soils, crops, and irrigations systems. The principal soil types within DRWD are Panoche loam, Milham loam, and Kimberlina loam. The percent acreage these soils occupy is summarized in the following table along with the relative soil hazard applied to each in the NHI (CWR, 2014):

Soil Series	Acreage Percent	Soil Hazard
Panoche loam	35%	3
Milham sandy loam	17%	3
Wasco sandy loam	14%	5
Westhaven loam	12%	3
Garces loam	11%	2
Others	12%	2.7 (avg.)

The principal crops that were grown within DRWD by percentage of acreage are:

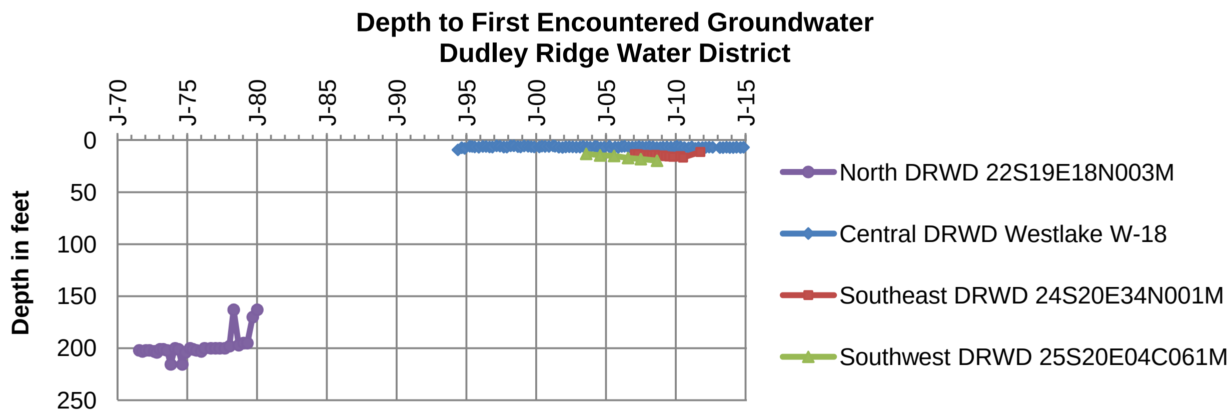
Crop	Acreage Percentage	Crop Hazard
Pistachios	43.9%	2
Almonds	28.3%	2
Pomegranates	14.7%	2

These crops are permanent orchards with drip or microspray irrigation, each of which has an irrigation hazard of 2.

Soil Series	Soil Hazard	Crop Hazard	Irrigation Hazard	NHI
Panoche loam	3	2	2	12
Milham sandy loam	3	2	2	12
Wasco sandy loam	5	2	2	20
Westhaven loam	3	2	2	12
Garces loam	2	2	2	8
Others	2.7	2	2	10.8

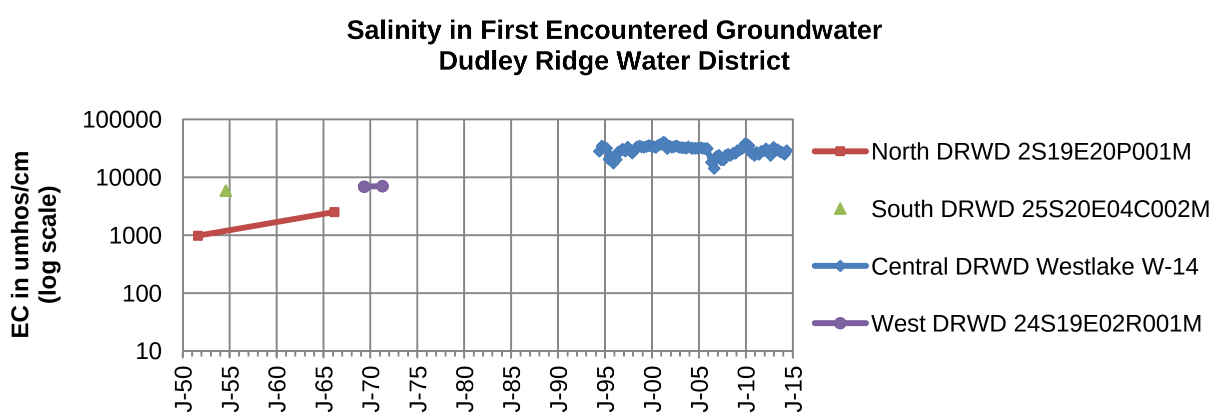
The calculated NHI for the above soil/crop/irrigation hazards are all below or equal to a NHI value of 20. CWR indicates that a total NHI value "greater than 20 should be managed to reduce the risk of groundwater contamination."

For evaluating the depth to groundwater in DRWD, Amec Foster Wheeler has plotted depth-to-groundwater measurements for three wells within the District. One of the wells (Westlake W-18) is completed into first encountered groundwater for groundwater monitoring at a RWQCB-regulated facility located in the central part of DRWD. The additional two wells are monitored by the DWR in the southeast and southwest parts of DRWD. The depth-to-groundwater measurements for these wells are presented in the following chart:



Based on EPA's DRASTIC methodology for HVA evaluation, groundwater below 100 feet in depth is significantly less vulnerable than shallower groundwater. The chart above shows that groundwater in the southeast, southwest, and central parts of DRWD are less than 100 feet in depth. However, groundwater at the far northern end of DRWD, which is adjacent to Kettleman City, is reportedly much deeper (160 to 220 feet bgs).

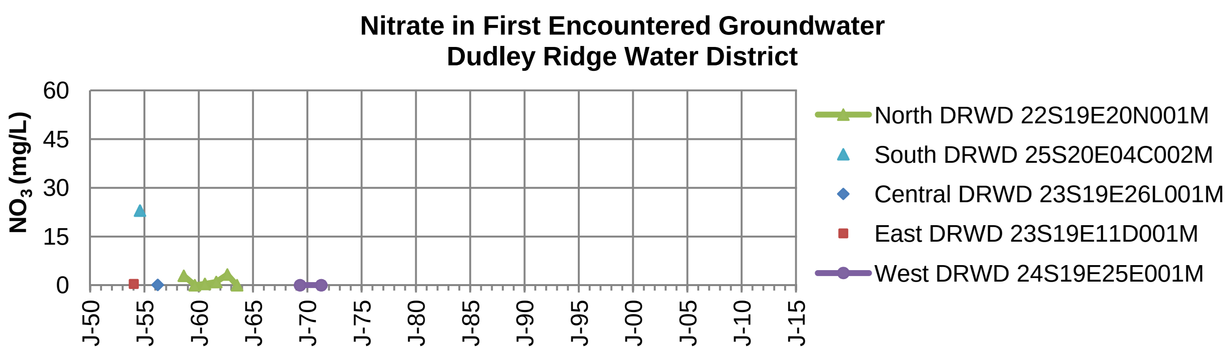
For evaluating the groundwater salinity criterion for designating an HVA in DRWD, Amec Foster Wheeler has plotted the selected groundwater conductance data within the DRWD. One well (Westlake MW-18) in central DRWD is monitored for compliance with the RWQCB order. Conductance data have also been collected by DWR in three wells within DRWD. Conductance data for these wells are summarized in the following chart:



Groundwater salinity in central, southern, and western DRWD varies from 6,000 to 33,000 µmhos/cm. These data show that first encountered groundwater below much of DRWD exceeds 1,900 µmhos/cm and, as such, does not meet the HVA criterion for salinity. However, first encountered groundwater in the north DRWD (2S19E20P001M adjacent to

Kettleman City) is lower in salinity. Water samples from this northern well ranged in EC from 983 to 2,920 µmhos/cm between 1950 and 1967; more recent data from this northern well were not available. More recent groundwater samples (2005 to 2010) collected from a well further north and outside of the DRWD were tested by USGS for salinity and varied from 1,110 to 1,180 µmhos/cm. Based on these data, it appears that fair quality groundwater in the vicinity of the far northern part of DRWD may meet the HVA criterion for salinity.

To further evaluate groundwater vulnerability, Amec Foster Wheeler has evaluated historical nitrate concentrations reported for groundwater in DRWD as potential groundwater quality impacts for which irrigated agricultural operations may be potential contributor. As with the other DRWD groundwater data, most of the nitrate concentration data are from 1953 through 1970. These data are from more than 25 years in the past and more current nitrate data were not available. Theoretically, these data could suggest a nitrate contribution to area groundwater from historical irrigated agricultural operations. The following chart plots nitrate concentrations in groundwater from five wells in DRWD:



Based on the above data, groundwater below DRWD varies between 0 and 23 mg/L. These data would not suggest a significant impact to nitrate in groundwater from agricultural operations.

9.2.5 Lost Hills Water District

For evaluating groundwater vulnerability within LHWD, Amec Foster Wheeler has considered vulnerability designations by others (CDPR and SWRCB), prepared a NHI (CWR, 2014) assessment, examined depth to groundwater, and plotted salinity and nitrate concentrations for first encountered groundwater. However, for HVA designation of first encountered groundwater, we have used the following criteria:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and

- groundwater salinity less than 5,000 µmhos/cm.

Neither the SWRCB nor the CDPR has identified HVA or GWPA within LHWD.

For NHI assessment, we look at surface soils, crops, and irrigations systems. The principal soil types within LHWD are Panoche loam, Milham loam, Wasco sandy loam, Westhaven loam, and Garces loam. The percent acreage these soils occupy within LHWD is summarized in the following table along with the relative soil hazard applied to each in the NHI (CWR, 2014):

Soil Series	Acreage Percent	Soil Hazard
Panoche loam	35%	3
Milham sandy loam	17%	3
Wasco sandy loam	14%	5
Westhaven loam	12%	3
Garces loam	11%	2
Others	12%	2.7 (avg.)

The principal crops that were recently grown (2013) within LHWD by percentage of acreage are:

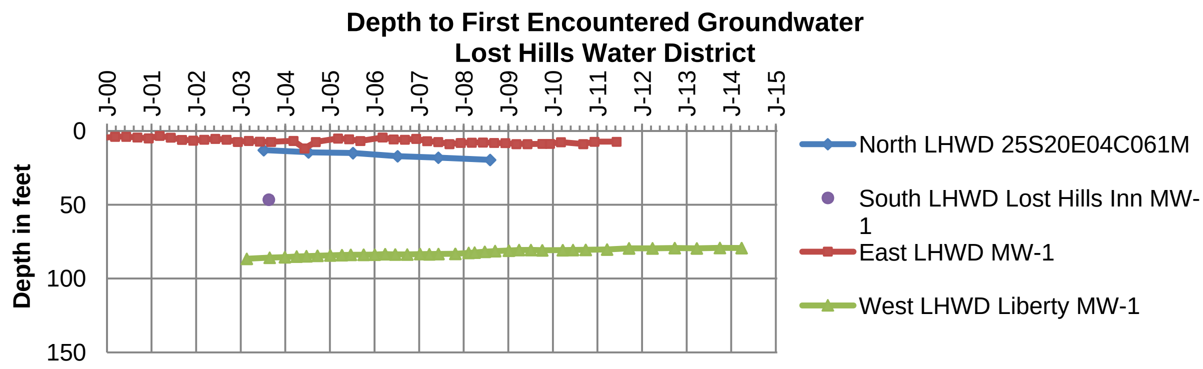
Crop	Acreage Percentage	Crop Hazard
Pistachios	42.9%	2
Pomegranates	30.3%	2
Almonds	23.0%	2

These crops are permanent orchards with drip or microspray irrigation, each of which has an irrigation hazard of 2. The calculated NHI for each soil series are:

Soil Series	Soil Hazard	Crop Hazard	Irrigation Hazard	NHI
Panoche loam	3	2	2	12
Milham sandy loam	3	2	2	12
Wasco sandy loam	5	2	2	20
Westhaven loam	3	2	2	12
Garces loam	2	2	2	8
Others	2.7	2	2	10.8

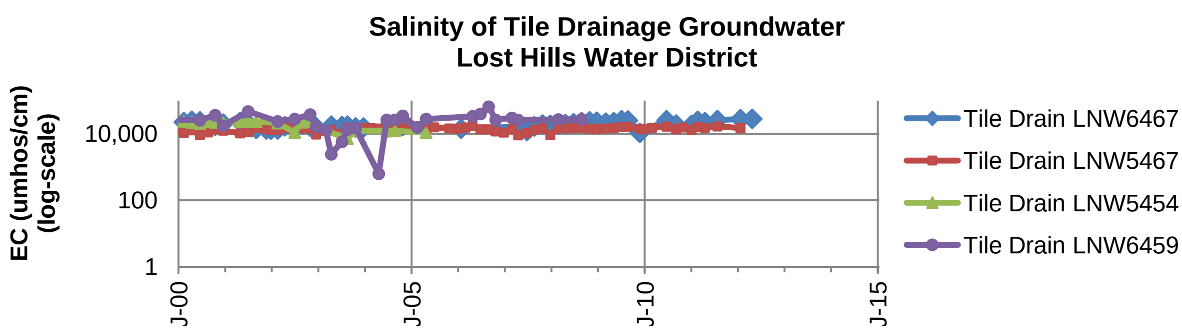
The calculated NHI for the above soil/crop/irrigation hazards are all below or equal to a NHI value of 20. CWR indicates that a total NHI value "greater than 20 should be managed to reduce the risk of groundwater contamination."

Amec Foster Wheeler has plotted depth-to-groundwater measurements for four wells within LHWD for evaluating the depth-to-groundwater criterion for designating an HVA. Three of the wells (LHWD MW-1, Lost Hills Inn MW-1, and Liberty MW-1) are completed into first encountered groundwater for groundwater monitoring at RWQCB-regulated facilities located in the south, east, and west parts of LHWD. The additional well is monitored by the DWR in the north part of LHWD. The depth-to-groundwater measurements for these wells are presented in the following chart:



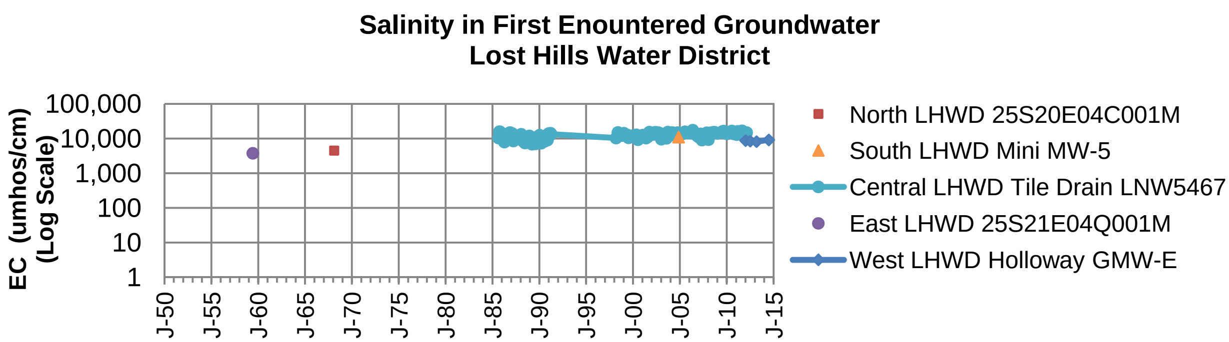
Based on EPA's DRASTIC methodology for HVA evaluation, groundwater below 100 feet in depth is significantly less vulnerable than shallower groundwater. The chart above shows that depths to groundwater in the west part of LHWD approached but did not exceeded 100 feet. Perched groundwater within the north, south, and east parts of LHWD are also less than 100 feet in depth.

For evaluating the groundwater salinity criterion for designating an HVA in LHWD, Amec Foster Wheeler has plotted the selected groundwater conductance data within the LHWD. Conductance data have been collected by DWR for tile drainage groundwater at four locations within LHWD. These tiles drain into LHWD's agricultural drainage ponds located just east of Highway 99 (Figure 11). Conductance data for these tile drains are summarized in the following chart:



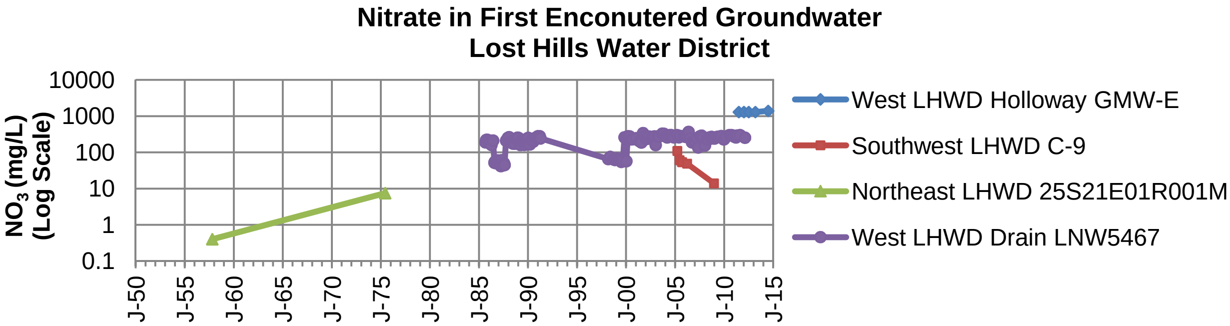
The salinity of tile drainage groundwater ranges between 9,000 and 40,000 µmhos/cm, except for a very few (possibly anomalous) measurements. As such, tile drainage groundwater within LHWD typically exceeds 1,900 µmhos/cm and would not meet the HVA criterion for salinity.

The salinity of first encountered groundwater from wells ranges between 3,700 and 11,000 µmhos/cm based on published data from two groundwater monitoring wells (Holloway GWM-E and Mini MW-5) and historical DWR sampling of wells, as shown in the following chart:



The above data show that first encountered groundwater below LHWD exceeds 1,900 µmhos/cm and, as such, does not meet the HVA criterion for salinity. However, first encountered groundwater in the northeastern corner of LHWD (adjacent the Refuge) is lower in salinity. In the1980s to 1990s, the USGS samples four wells located just west of the Refuge; the depth to groundwater ranged from 5.6 to 8 feet bgs. Water samples from these wells ranged in EC from 1,680 to 16,700 µmhos/cm. Based on these data, it appears that there are some pockets of fair quality shallow groundwater in the immediate vicinity of the Refuge that may meet the HVA criterion for salinity.

Amec Foster Wheeler has evaluated nitrate concentrations reported for groundwater in LHWD to further evaluate groundwater vulnerability. Nitrate impacts to groundwater quality may be an indicator of irrigated agricultural operations as a potential contributor. Theoretically, these data could suggest a nitrate contribution to area groundwater from historical irrigated agricultural operations. The following chart plots nitrate concentrations in groundwater from four wells in LHWD:



Based on the above data, groundwater below northeastern LHWD ranges from 0.4 to 7.5 mg/L of nitrate. These data would not suggest a significant impact from irrigated agriculture. Perched tile drainage groundwater in west and southwest LHWD ranges in nitrate concentration from 14 to 369 mg/L. These data suggest a significant impact to the quality of perched groundwater from agricultural operations. Groundwater in far western LHWD (Holloway GWM-3) ranged from 1,300 to 1,400 mg/L of nitrate, which appears to represent a release of nitrate to groundwater. However, the Holloway facility is an operating waste management facility, which is likely a source of nitrate. Groundwater in western LHWD appears to include impacts of nitrate from a source other than irrigated agriculture.

9.2.6 Western Supplemental Area

For evaluating groundwater vulnerability within WSA, Amec Foster Wheeler has considered vulnerability designations by others (CDPR and SWRCB), prepared a NHI (CWR, 2014) assessment, examined depth to groundwater, and plotted salinity and nitrate concentrations for first encountered groundwater. However, for HVA designation of first encountered groundwater, we have used the following criteria:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- groundwater salinity less than 5,000 µmhos/cm.

Neither the SWRCB nor the CDPR has identified HVA or GWPA within WSA.

For NHI assessment, we look at surface soils, crops, and irrigations systems. For the WSA, little of the area is in irrigated agriculture because of steep slopes, thin soil, and rocky outcrops. As described by NRCS, about 85% of the WSA soils are described as suitable for rangeland or dry land farming, most of these soils do not have an associated soil index in the NHI. About 14% of the WSA is described as suitable for irrigation, assuming a water supply can be provided. The percentages of irrigable acreages are summarized in the following table along with the relative soil hazard applied to each in the NHI (CWR, 2014):

Soil Series	Percent	Soil Hazard
Panoche	5.65%	3
Kimberlina	3.27%	4
Yribarren	2.22%	2
Milham	2.05%	3
Others	0.85%	2.4

Using the USDA's CropScape database for 2013, we estimate that more than 99% of the acreage within the WSA was not irrigated. A summary of the land uses, the percent of associated acreage within the WSA, and the crop reportedly grown within the WSA during 2013 are:

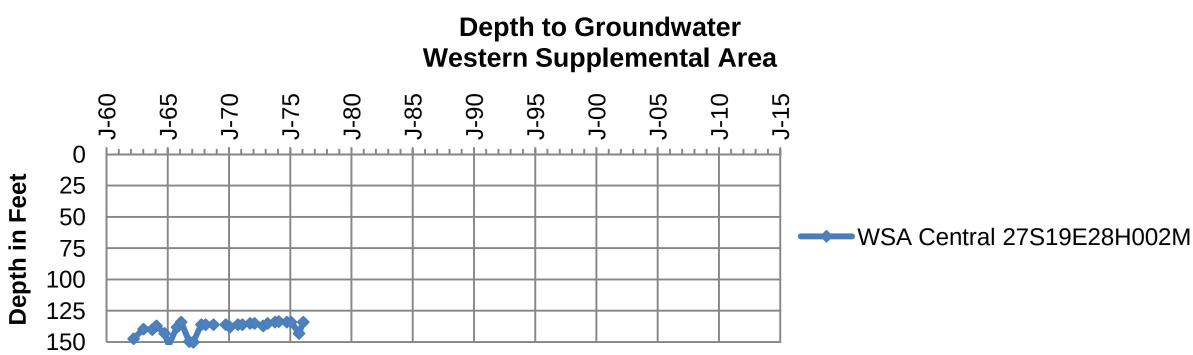
Category	Percentage	Crop Hazard
Grass/Pasture	58%	na
Shrubland	32%	na
Barren	6%	na
Developed/Open Space	3%	na
Barley	0.3%	3
Others	0.1%	na

The barley production was identified in Choice Valley along Bitterwater Creek in western Kern County and eastern San Luis Obispo County. Choice Valley soils include Balcom, Cropley, and Rincon series soils. Barley can be irrigated by sprinkler or surface irrigation. In Choice Valley, the barley is dry farmed (no irrigation). However, assuming barley was irrigated on WSA soils, the theoretical irrigation hazards would be 3 for sprinkler and 3 for surface irrigation.

Soil Series	Soil Hazard	Crop Hazard	Irrigation Hazard	NHI
Panoche	3	3	3	27
Kimberlina	4	3	3	36
Yribarren	2	3	3	18
Milham	3	3	3	27
Others	2.4	3	3	22

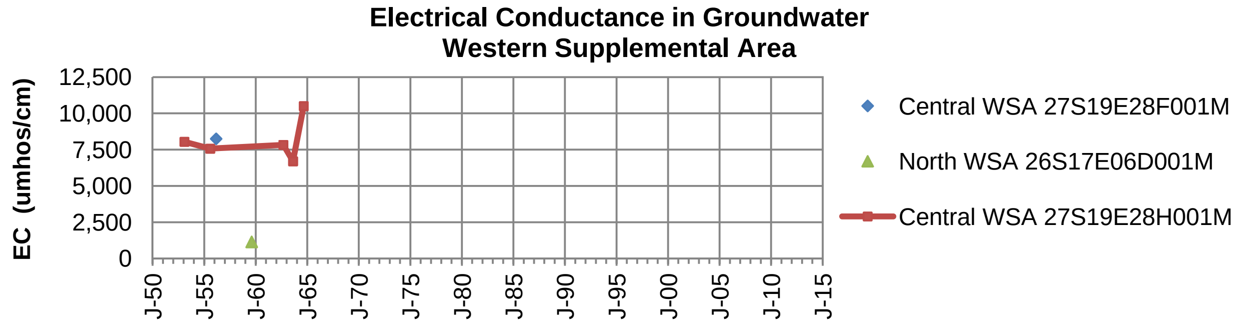
Based on the above calculated NHI, Kimberlina soil (3.3% of the WSA acreage), Panoche (5.6% of the WSA acreage), and Milham (2.1% of the WSA acreage) may meet the HVA criteria for nitrogen hazard, if sprinkler or surface irrigated. Since the barley in Choice Valley is dry farmed, groundwater below is not currently vulnerable to impacts from irrigated agriculture.

Amec Foster Wheeler has plotted the available depth-to-groundwater measurements within the WSA for evaluating the depth-to-groundwater criterion for designating an HVA in the WSA. Groundwater depth measurements were available only for one well in the central part of the WSA (27S19E28H002M). The well was monitored by the DWR between 1960 and 1980; the depth-to-groundwater measurements for this well are presented in the following chart:



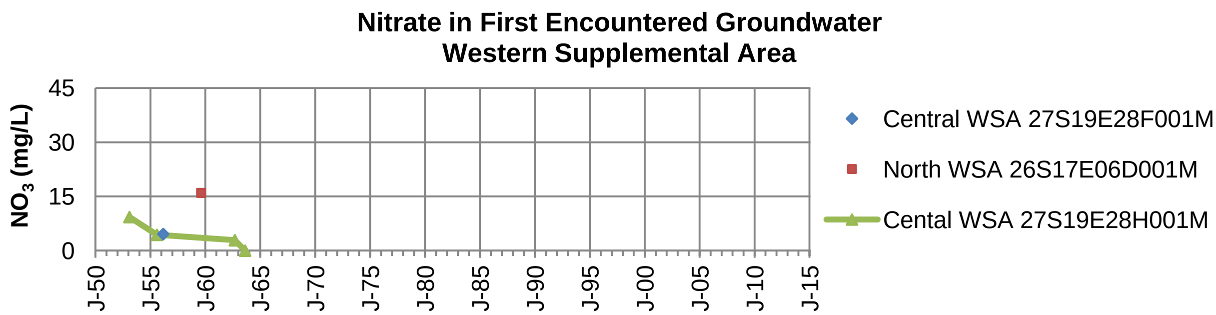
Based on EPA's DRASTIC methodology for HVA evaluation, groundwater below 100 feet in depth is significantly less vulnerable than shallower groundwater. The available depth-to-groundwater data show groundwater between 138 and 152 feet bgs. Based on these data, groundwater within central WSA does not meet the HVA criterion for depth to groundwater. Since the geology of the WSA is highly variable, we cannot extrapolate the depth to groundwater from central WSA to other parts of the WSA. Should irrigated agriculture be developed in parts of the WSA, an updated evaluation of this HVA criterion should be implemented.

Amec Foster Wheeler has plotted the available groundwater conductance data within the WSA for evaluating the groundwater salinity criterion for designating an HVA. Salinity measurements were available for only one well in the northern part of the WSA (26S17E06D001M) and two wells in the central part of the WSA (27S19E28F001M and 27S19E28H002M). Samples were collected by DWR between 1953 and 1954; the measured EC for these samples is presented in the following chart:



The available data for salinity of groundwater within the central WSA show an EC ranging from 6,700 to 10,500 µmhos/cm. Groundwater in the far northern part of the WSA had better quality water in 1959 with an EC of 1,150 µmhos/cm. Based on these data, groundwater does may meet the HVA criterion for groundwater salinity in the far northern part of the WSA. Should irrigated agriculture be developed in other parts of the WSA, this HVA criterion should be reevaluated.

To further evaluate groundwater vulnerability, Amec Foster Wheeler has evaluated historical nitrate concentrations reported for groundwater in the WSA as potential groundwater quality impacts for which irrigated agricultural operations may be potential contributor. As with the other WSA groundwater data, most of the nitrate concentration data is from 1953 through 1965. These data are from more than 40 years in the past and more current nitrate data were not available. Theoretically, these data could suggest nitrate contribution to area groundwater from historical irrigated agricultural operations. The following chart plots nitrate concentrations in groundwater from three wells the WSA:



Based on the above data, groundwater in central and northern WSA contains nitrate concentrations ranging from 0 to 16 mg/L. The wells represented by these data are not in areas of irrigated agricultural development and represent background groundwater quality.

9.3 PROPOSED HYDROGEOLOGICALLY VULNERABLE AREAS

The above preliminary HVA evaluation is based on limited point data. Based on the available data in our database (Section 7.4), Amec Foster Wheeler has mapped the data representing the HVA criteria as overlays on a map of BWSD, BMWD, DRWD, LHWD, and the WSA (Figures 15 and 16). The base map shows the Study Area and the outline of the Coalition area. The following HVA criteria are mapped as overlays on the map:

- groundwater exceeding the MCL for nitrate (45 mg/L nitrate or 10 mg/L nitrate as nitrogen), and
- groundwater salinity less than 5,000 µmhos/cm.

Nitrate concentrations in first encountered groundwater within the Study Area vary widely from "none detected to 5,850 mg/L. The highest concentrations are in the immediate vicinity of an industrial facility (Holloway Gypsum waste management facility).

Groundwater salinities also vary widely over the Study Area from 983 µmhos/cm in far northern DRWD to more than 10,000 µmhos/cm in parts of DRWD, LHWD, and the WSA. Groundwater salinity contours of 5,000 µmhos/cm are presented on Figure 16. Fifteen areas meet the HVA criterion (nitrate greater than 45 mg/L and EC less than 5,000 µmhos/cm), as shown on Figure 16. Areas of the study that exceed the HVA criteria include:

- Six areas in LHWD (HVA-1 through HVA-6): five in the western portion of LHWD and one in the northeast portion of the District.
- Three areas in BWSD (HVA-7 through HVA-9): three in the western portion of the District.
- Four areas (HVA-10 through HVA-13): two in the west central portion, one in the east central portion, and one in the southern portion of the District.
- Two areas (HVA-14 and HVA-15) in the extreme southern portion of the Coalition area.

9.4 PRIORITIZATION OF HIGH VULNERABILITY AREAS

Based on the General Order, the GAR is required to "Establish priorities for implementation of groundwater monitoring and studies within high vulnerability areas." To address this requirement, Amec Foster Wheeler has numbered each of the identified 15 HVAs on Figure 16 and evaluated each separately.

Several of the HVAs are not within immediate proximity to current irrigated agriculture. If not within immediate proximity of irrigated agricultural operations, monitoring in that area will not provide information to describe irrigated agricultural impacts on groundwater and, as such, are designated a low priority.

Several of the HVAs are located in immediate proximity to other sources of nitrate and/or salinity, and as such are designated a low priority. Where groundwater is already impacted by operations other than irrigated agriculture, groundwater monitoring cannot feasibly provide information to define irrigated agricultural impacts on groundwater, and as such, are designated a low priority.

Several of the HVAs are in close proximity (within 1 mile) of first encountered groundwater that exceeds a salinity of 5,000 µmhos/cm. Pumping of wells from the first encountered groundwater in this area and near the elevated salinity will likely promote migration of the elevated salinity groundwater into the area and render the groundwater unusable for MUN and most other uses of groundwater.

The remainder of the numbered HVAs are designated a high priority for groundwater monitoring, as summarized in the following table:

HVA No.	Discussion	Priority
1	Irrigated Agriculture more than 5 miles from HVA.	Low
2	Irrigated agriculture adjacent to HVA. HVA within 0.4 miles of 5,000 µmhos/cm EC contour.	Low
3	Irrigated agriculture adjacent to HVA. HVA within 0.4 miles of 5,000 µmhos/cm EC contour.	Low
4	Irrigated agriculture within HVA. HVA within 0.4 miles of 5,000 µmhos/cm EC contour.	Low
5	Irrigated agriculture within HVA. HVA area includes other source of nitrate to first encountered groundwater: Westlake Farms.	Low
6	No irrigated agriculture within 0.8 miles from HVA. HVA adjacent to source of high salinity greater than 5,000 µmhos/cm EC contour: Holloway Gypsum and Lost Hills Oil Field.	Low
7	No irrigated agriculture within 1 mile from HVA.	Low
8	Irrigated agriculture within HVA. HVA within adjacent to 5,000 µmhos/cm EC contour.	Low
9	Irrigated agriculture within HVA.	High
10	Irrigated agriculture within HVA. HVA is within 1.7 miles of 5,000 µmhos/cm EC contour. Portion of the HVA is in the North Belridge Oil Field and includes a source of high salinity greater than 5,000 µmhos/cm: North Belridge Oil Field impoundments.	Low
11	No irrigated agriculture within HVA. HVA is within 1.7 miles of 5,000 µmhos/cm EC contour. Portion of the HVA is in the North Belridge Oil Field and includes a	Low

HVA No.	Discussion	Priority
	source of high salinity greater than 5,000 µmhos/cm: Belridge Oil Field impoundments.	
12	Irrigated agriculture within HVA. HVA is in an area influenced by a source of high salinity greater than 5,000 µmhos/cm and high nitrate: Belridge Oil Field impoundments.	Low
13	Irrigated agriculture within HVA. HVA is in an area influenced by a source of high salinity greater than 5,000 µmhos/cm and high nitrate: Belridge Oil Field impoundments.	Low
14	No irrigated agriculture within HVA. HVA is in an area influenced by a source of high salinity greater than 5,000 µmhos/cm and high nitrate: Belridge Oil Field impoundments. It also overlies a portion of the area occupied by the Safety Clean facility.	Low
15	Irrigated agriculture within HVA. HVA is adjacent to an EC contour of 5,000 µmhos/cm.	Low

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TABLE 1

WATER QUALITY CRITERIA

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District,
Dudley Ridge water District, and Lost Hills Water District

Constituent	Units	MUN[1]	AGR Irrigation[2]	AGR Livestock[2]	AGR Poultry[2]	IND[3]
Electrical Conductance	µmohs/cm	1,600	3,000	8,000	5,000	na
Total Dissolved Solids	mg/L	1,000	2,000	5,000	na	na
Arsenic	µg/L	10	100	200	200	na
Boron	mg/L	5	15	5	5	na
Chloride	mg/L	500	na	na	na	na
Magnesium	mg/L	na	500	500	400	na
Sodium	mg/L	20 [4]	na	na	na	na
Sulfate	mg/L	500	na	3,000	na	na

1. Secondary maximum contaminant levels for electrical conductance, total dissolved solids, chloride and sulfate (Section 64449, Title 22, CCR - California code of regulations). Maximum Contaminant Level for arsenic (Section 64444, Title 22, CCR). Health Advisories for boron and sodium (EPA, 2003 and 2008). MUN - Municipal Supply µmhos/cm - micromhos per centimeter, mg/L - milligrams per liter µg/L - micrograms per liter.
2. *Water Quality for Agriculture* , FAO Paper 29 (NATO, 1994), except for AGR-Livestock TDS and sulfate from Livestock Water Quality (USDA, 2013). AGR - Agricultural Supply, na - not available or not applicable.
3. "Uses of water for industrial activities that do not depend primarily on water quality..." (RWQCB, 2004). IND - Industrial Service Supply
4. "The EPA guidance was developed for those individuals restricted to a total sodium intake of 500 mg/day…" (EPA, 2003)

TABLE 2

PRODUCTION WELLS SAMPLED IN MAY 2013[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District

Well GPS Location	Use	Latitude[2]	Longitude[2]	Depth to Groundwater[3] (feet)	Pump	Discharge	Comment(s)	Property	Associated Well ID In Database
Belridge 1	AGR-I	35.405213	-119.651392	278	none	none	Bailer needed	Starrh	Unknown
Belridge 3	AGR-I	35.419416	-119.640997	290.7	none	none	Bailer needed	Starrh	Starrh_WW6
Belridge 6	AGR-I	35.419379	-119.62469	Obstructed	PTO Turbine 250HP	Irrigation System / Pond	PTO attached to diesel engine. Sample at pond discharge.	Starrh	Starrh_9M_No1
Belridge 7	AGR-I	35.419402	-119.615797	Pumping	PTO Turbine 250HP	Irrigation System / Field	PTO attached to diesel engine. Sample at field discharge?	Starrh	Starrh_9K_No2
Belridge 9	AGR-I	35.498879	-119.620318	No Sounding Tube	Electric Turbine 300HP	Irrigation System	Totalizer and sample port on discharge pipe	Stievfvater	Lerdo #4? (Well #1)
Belridge 10	AGR-I	35.492379	-119.618944	No Sounding Tube	Electric Turbine 300HP	Irrigation System	Totalizer and sample port on discharge pipe	Stievfvater	028S022E22D001M_USGS_WS-Paper1999-H (Well#2)
Belridge 11	AGR-I	35.485202	-119.618917	No Sounding Tube	Electric Turbine 300HP	Irrigation System	Totalizer and sample port on discharge pipe	Stievfvater	028S022E17R061M (Well#3)
Belridge 12	AGR-I	35.506259	-119.622467	No Sounding Tube	Electric Turbine 300HP	Irrigation System	Totalizer and sample port on discharge pipe	Stievfvater	Unknown (Well#4)
Belridge 13	AGR-I	35.513387	-119.625182	No Sounding Tube	Electric Turbine 300HP	Irrigation System	Totalizer and sample port on discharge pipe	Stievfvater	Well #5 (Belridge16 on GPS)
Belridge 15	IND	35.60863	-119.6995	Pumping	Electric Turbine	Lost Hills Plant Water	Totalizer and sample port on discharge pipe	Chevron 20-14	--
Belridge 16	AGR-I	35.424245	-119.607166	Pumping	--	Irrigation System	Sample port on discharge line	--	--
Berenda Mesa 1	DOM	35.668823	-120.090742	No Sounding Tube	Submersible	Domestic	Sample port on discharge line. Note: House reportedly fitted with point-of-use desalination water treatment system.	Roden Ranch	Unknown
Berenda Mesa 2	AGR-I	35.642892	-119.92154	Pumping	Electric Turbine 200 HP	Irrigation System	Totalizer and sample port on discharge pipe	A&P	Unknown
Berenda Mesa 3	AGR-I	35.636519	-119.948648	Obstructed	PTO Turbine 200HP	Irrigation System	PTO attached to diesel engine. Totalizer and sample port on discharge pipe	A&P	Unknown
Berenda Mesa 4	AGR-I	35.638383	-119.952611	Obstructed	PTO Turbine 200HP	Irrigation System	PTO attached to diesel engine. Totalizer and sample port on discharge pipe	A&P	Unknown
Berenda Mesa 6	AGR-I	35.691167	-119.850616	163.12	none	Irrigation System	Bailer needed. Pump may be replaced soon. Totalizer and sample port on discharge pipe	Elex	026S024E02H001M
Lost Hills 1	AGR-I	35.716102	-119.849774	96.64	Electric Turbine 50HP	Irrigation System	Totalizer and sample port on discharge pipe	Anderson	Unknown_14
Lost Hills 3	AGR-I	35.667022	-119.673165	No Sounding Tube	125HP	Irrigation System	PTO attached to diesel engine. Totalizer and sample port on discharge pipe	Ferini	026S021E14H002M

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TABLE 2

PRODUCTION WELLS SAMPLED IN MAY 2013[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District

Well GPS Location	Use	Latitude[2]	Longitude[2]	Depth to Groundwater[3] (feet)	Pump	Discharge	Comment(s)	Property	Associated Well ID In Database
Lost Hills 4	AGR-I	35.719635	-119.679725	Pumping	Electric Turbine	Wetlands	Totalizer on discharge pipe. Sample from outfall.	LHWD Mitigation	025S021E26P001M
Lost Hills 5	AGR-I	35.680238	-119.867359	Obstructed	PTO Turbine 200HP	Irrigation System	PTO attached to diesel engine. Totalizer and sample port on discharge pipe	Primex	Unknown_03 (LHWD paper record)
Dudely Ridge 1	DOM	--	--	--	--	--	Note: Water reportedly used for toilets and sinks; bottled water provided for drinking.	--	--

1. GPS - Global Positioning System, MUN - municipal water use, AGR-I - irrigation water use, DOM - domestic water use, AGR-L - livestock water use, AGR-P - poultry water use, and feet MSL - feet above mean sea level.
2. Well latitude, longitude, and surface elevation by portable GPS system. Well locations shown on Figure 4
3. Depth to groundwater as measured in the field using a portable well sounder.

TABLE 3

2013 PRODUCTION WELL GROUNDWATER ANALYTICAL RESULTS FOR MINERAL CONSTITUENTS[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District

Well[2]		Sample Date	EC (µmhos/cm)	TDS (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Na (mg/L)	Cl (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)	NO_2-N (mg/L)	NO_3-N (mg/L)	SO_4 (mg/L)	Calculated Total Cations (meq/L)	Calculated Total Anions (meq/L)	Calculated Cation/ Anion Balance
Belridge 1	W-012	5/22/2013	21,000	18,000	1,300	460	14	3,600	7,800	<30	670	<10	<44	2,200	260	280	-3.7%
Belridge 1 (DUP)	W-013	5/22/2013	21,000	18,000	1,400	510	15	3,500	7,600	<30	620	<10	<44	2,100	260	270	-1.9%
Belridge 3	W-014	5/22/2013	9,600	6,800	390	90	6.9	1,700	3,100	<3	37	<5	<100	1,000	100	110	-4.8%
Belridge 6	W-001	5/21/2013	6,500	4,700	550	170	4.3	710	1,700	<3	120	<2.5	<11	1,100	73	74	-0.7%
Belridge 7	W-002	5/21/2013	3,700	2,700	310	100	2.4	400	790	<3	83	<1	<4.4	950	41	44	-3.5%
Belridge 9	W-004	5/21/2013	4,800	3,200	280	26	4.3	780	1,100	<3	92	<2.5	<11	860	50	51	-1.0%
Belridge 10	W-005	5/21/2013	6,800	5,000	640	79	5.7	850	1,900	<3	180	<2.5	<11	800	75	75	0.0%
Belridge 11	W-006	5/21/2013	6,100	4,500	600	85	5.3	730	1,600	<3	160	<2.5	<11	880	69	68	0.7%
Belridge 12	W-007	5/21/2013	3,600	2,200	210	17	3.8	510	870	<3	58	<1	<4.4	510	35	36	-1.4%
Belridge 13	W-008	5/21/2013	2,900	1,800	180	14	3.8	410	620	<3	58	<0.5	<2.2	510	28	29	-1.8%
Belridge 15	W-021	5/30/2013	6,200	3,900	340	48	5.6	1,100	1,300	<3	81	<2.5	<11	1,200	68	65	2.3%
Belridge 16	W-003	5/21/2013	3,000	2,300	220	68	2.3	400	420	<3	87	<0.5	<2.2	1,100	34	36	-2.9%
Berrenda Mesa 1	W-009	5/21/2013	1,800	1,300	59	78	<2	220	200	<3	190	<2.5	16	450	19	20	-2.6%
Berrenda Mesa 2	W-015	5/22/2013	3,200	2,600	150	130	12	450	310	<3	220	<1	6	1,200	38	39	-1.3%
Berrenda Mesa 3	W-016	5/22/2013	2,400	1,800	89	99	3.3	340	220	<3	220	<0.5	6.5	830	28	28	0.0%
Berrenda Mesa 4	W-017	5/22/2013	2,300	1,700	81	97	2.7	300	220	<3	200	<0.5	6.4	800	25	27	-3.8%
Berrenda Mesa 6	W-018	5/22/2013	2,700	2,100	170	80	3.2	360	280	<3	140	<0.5	<2.2	1,000	31	32	-1.6%
Dudley Ridge 1	W-020	5/22/2013	4,500	3,000	310	46	2.8	690	950	<3	87	<1	<4.4	1,200	50	52	-2.0%
Lost Hills 1	W-019	5/22/2013	3,100	2,500	220	96	2.8	410	340	<3	130	<1	<4.4	1,300	37	39	-2.6%
Lost Hills 3	W-010	5/21/2013	5,800	4,000	400	43	3.8	970	1,200	<3	310	<2.5	<11	1,300	66	66	0.0%
Lost Hills 4	W-011	5/21/2013	5,100	3,200	330	32	2.9	770	1,400	<3	98	<2.5	<11	470	52	52	0.0%
Lost Hills 5	W-022	5/30/2013	2,700	2,000	170	91	3.3	370	240	<3	160	<0.5	<2.2	1,000	32	31	1.6%
MUN[3]			*1,600*	*1,000*	*--*	*--*	*--*	*20*	*500*	*--*	*--*	*1*	*10*	*500*			
AGR-Irrigation			*3,000*	*2,000*	*--*	*500*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*			
AGR-Livestock			*8,000*	*5,000*	*--*	*500*	*--*	*--*	*--*	*--*	*--*	*10*	*100*	*3,000*			
AGR-Poultry			*5,000*	*--*	*--*	*400*	*--*	*--*	*--*	*--*	*--*	*10*	*100*	*--*			

1. MUN - Municipal Supply, AGR - Agricultural Supply, µmhos/cm - micromhos per centimeter, mg/L - milligrams per liter, and meq/L - milliequivalents per liter, -- - not available or not applicable. Constituent concentration in mg/L milligrams per liter. TDS - total dissolved solids; Ca - calcium, Mg - magnesium, K - potassium, Na - sodium, Cl - chloride, CO_3 - carbonate, HCO_3 - bicarbonate, NO_2-N - nitrite nitrogen, NO_3-N - nitrate nitrogen, and SO4 - sulfate, EC - electrical conductance in µmhos/cm - micromhos per centimeter.
2. Well designation is by California well numbering system. Well locations shown on Figure 4.
3. MUN is MCL - maximum contaminant level or SCML - secondary maximum contaminant level. For Na - Sodium, the EPA Drinking Water Health Advisory (DWHA) of 20 mg/L was listed for MUN. AGR-Irrigation, AGR-Livestock and AGR-Poultry are from *Water Quality for Agriculture.* Concentrations at or greater than the MUN criterion (MCL/SMCL/DWHA) are highlighted.

TABLE 4

2013 PRODUCTION WELL GROUNDWATER ANALYTICAL RESULTS FOR METAL CONSTITUENTS[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District, Dudley Ridge Water District, and Lost Hills Water District

Well[2]		Sample Date	Al (µg/L)	Sb (µg/L)	As (µg/L)	Ba (µg/L)	Be (µg/L)	B (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	Fe (µg/L)	Pb (µg/L)	Mn (µg/L)	Hg (µg/L)	Mo (µg/L)	Ni (µg/L)	Se (µg/L)	Si (µg/L)	Ag (µg/L)	Tl (µg/L)	V (µg/L)	Zn (µg/L)	Gross Alpha (pCi/L)
Belridge 1	W-012	5/22/2013	<50	<2	<4	36	<2	45,000	<1	<20	<50	<30	<5	1,100	0.42	<20	<20	210	43,000	<10	<1	<20	<50	479
Belridge 1 (DUP)	W-013	5/22/2013	<50	<2	<4	41	<2	47,000	<1	<20	<50	<30	<5	1,200	0.44	22	<20	250	46,000	<10	<1	<20	<50	447
Belridge 3	W-014	5/22/2013	<50	<2	<2	23	<1	32,000	<1	<10	<50	15,000	<5	4,100	<0.2	<10	<10	95	1,700	<10	<1	<10	<50	6.62
Belridge 6	W-001	5/21/2013	<50	<2	2	23	<1	17,000	<1	<10	<50	<30	<5	170	<0.2	69	69	55	3,300	<10	<1	<10	<50	25.9
Belridge 7	W-002	5/21/2013	<50	<2	3.1	16	<1	9,100	<1	<10	<50	<30	<5	160	<0.2	68	<10	20	3,400	<10	<1	29	<50	23.7
Belridge 9	W-004	5/21/2013	<50	<2	27	60	<1	6,500	<1	<10	<50	<30	<5	960	<0.2	78	<10	20	50,000	<10	<1	<10	<50	9.38
Belridge 10	W-005	5/21/2013	<50	<2	26	93	<1	10,000	<1	<10	<50	140	<5	2,000	<0.2	41	<10	40	54,000	<10	<1	<10	<50	17.7
Belridge 11	W-006	5/21/2013	<50	<2	28	96	<1	9,700	<1	<10	<50	<30	<5	1,900	<0.2	47	<10	37	59,000	<10	<1	<10	<50	12.7
Belridge 12	W-007	5/21/2013	<50	<2	32	52	<1	4,300	<1	<10	<50	<30	<5	510	<0.2	44	<10	16	51,000	<10	<1	<10	<50	4.42
Belridge 13	W-008	5/21/2013	<50	<2	33	45	<1	3,800	<1	<10	<50	<30	<5	480	<0.2	22	<10	13	51,000	<10	<1	<10	60	6.62
Belridge 15	W-021	5/30/2013	<50	<2	18	19	<1	3,300	<1	<10	<50	<30	<5	30	<0.2	61	<10	26	30,000	<10	<1	<10	<50	7.73
Belridge 16	W-003	5/21/2013	<50	<2	22	11	<1	6,700	<1	<10	<50	<30	<5	<10	<0.2	110	<10	10	45,000	<10	<1	21	<50	10.5
Berrenda Mesa 1	W-009	5/21/2013	<50	<2	<2	17	<1	1,600	<1	<10	<50	<30	<5	<10	<0.2	44	<10	28	39,000	<10	<1	<10	<50	2.76
Berrenda Mesa 2	W-015	5/22/2013	<50	<2	5.2	12	<1	2,800	<1	<10	<50	<30	<5	190	<0.2	69	<10	34	65,000	<10	<1	18	<50	29.3
Berrenda Mesa 3	W-016	5/22/2013	<50	<2	<2	13	<1	2,500	<1	<10	<50	<30	<5	19	<0.2	86	<10	45	49,000	<10	<1	<10	<50	11
Berrenda Mesa 4	W-017	5/22/2013	<50	<2	<2	12	<1	2,100	<1	<10	<50	<30	<5	13	<0.2	65	<10	38	47,000	<10	<1	<10	<50	12.1
Berrenda Mesa 6	W-018	5/22/2013	<50	<2	<2	11	<1	2,500	<1	<10	<50	<30	<5	470	<0.2	67	<10	12	44,000	<10	<1	<10	<50	12.1
Dudley Ridge 1	W-020	5/22/2013	<50	<2	14	37	<1	1,200	<1	<10	<50	<30	<5	41	<0.2	30	<10	15	28,000	<10	<1	<10	<50	<3
Lost Hills 1	W-019	5/22/2013	<50	<2	<2	8.3	<1	3,000	<1	<10	<50	48	<5	15	<0.2	79	<10	21	38,000	<10	<1	<10	<50	7.73
Lost Hills 3	W-010	5/21/2013	<50	<2	6	23	<1	3,300	<1	<10	51	<30	<5	3,100	<0.2	84	<10	22	24,000	<10	<1	<10	<50	12.1
Lost Hills 4	W-011	5/21/2013	<50	<2	10	34	<1	800	<1	<10	<50	<30	<5	1,100	<0.2	19	<10	29	23,000	<10	<1	<10	<50	22.6
Lost Hills 5	W-022	5/30/2013	<50	<2	<2	13	<1	2,600	<1	<10	<50	<30	<5	46	<0.2	80	<10	8.6	46,000	<10	<1	<10	<50	11
MUN[3]			*1,000*	*6*	*10*	*1,000*	*4*	*5,000*	*5*	*50*	*1,300*	*300*	*15*	*50*	*2*	*--*	*100*	*50*	*--*	*100*	*2*	*--*	*5,000*	*15*
AGR-Irrigation			*5,000*	*--*	*100*	*--*	*100*	*15,000*	*10*	*100*	*200*	*5,000*	*5,000*	*200*	*--*	*10*	*200*	*20*	*--*	*--*	*--*	*100*	*2,000*	*--*
AGR-Livestock			*5,000*	*--*	*200*	*--*	*100*	*5,000*	*50*	*1,000*	*500*	*--*	*100*	*50*	*10*	*--*	*--*	*50*	*--*	*--*	*--*	*100*	*24,000*	*--*
AGR-Poultry			*5,000*	*--*	*200*	*--*	*100*	*5,000*	*50*	*1,000*	*500*	*--*	*100*	*50*	*10*	*--*	*--*	*50*	*--*	*--*	*--*	*100*	*24,000*	*--*

1. Metals concentration in micrograms per liter: Al - aluminum, Sb - antimony, As - arsenic, Ba - barium, Be - beryllium, B - boron, Cd - cadmium, Cr - chromium, Cu - copper, Fe - iron, Pb - lead, Mn - manganese, Hg - mercury, Mo - molybdenum, Ni - nickel, Se - selenium, Si - silicon, Ag - silver, Tl - thallium, V - vanadium, and Zn - zinc, MUN - Municipal Supply, AGR - Agricultural Supply, -- - not available or not applicable.
2. Well designation is by California well numbering system. Well locations shown on Figure 4.
3. MUN is maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL). under MUN. For Al, the MCL has been listed rather than the SMCL (200 micrograms per liter (µg/L), under MUN. For Al, the MCL has been listed rather than the SMCL (200 µg/L), under MUN. AGR-Irrigation, AGR-Livestock and AGR-Poultry are from Water Quality for Agriculture. Concentrations at or greater than the MUN criterion (MCL/SMCL/DWHA) are highlighted.

TABLE 5

2013 PRODUCTION WELL GROUNDWATER, OTHER ANALYTICAL, AND CALCULATED RESULTS[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District,
Dudley Ridge water District, and Lost Hills Water District

Well[2]		Sample Date	pH	Calculated Hardness (mg/L)	TKN (mg/L)	Calculated SAR	EC (µmhos/cm)
Belridge 1	W-012	5/22/2013	7	5,100	1.6	22	21,000
Belridge 1 (DUP)	W-013	5/22/2013	6.9	5,600	1.7	20	21,000
Belridge 3	W-014	5/22/2013	6.8	1,400	4.4	20	9,600
Belridge 6	W-001	5/21/2013	7.6	2,100	<1	6.8	6,500
Belridge 7	W-002	5/21/2013	7.8	1,200	<1	5.1	3,700
Belridge 9	W-004	5/21/2013	7.8	810	1.2	12	4,800
Belridge 10	W-005	5/21/2013	7.7	1,900	1.7	8.4	6,800
Belridge 11	W-006	5/21/2013	7.7	1,800	1.6	7.4	6,100
Belridge 12	W-007	5/21/2013	7.8	600	1	9.1	3,600
Belridge 13	W-008	5/21/2013	7.8	510	1.3	7.9	2,900
Belridge 15	W-021	5/30/2013	7.9	1,000	3.4	15	6,200
Belridge 16	W-003	5/21/2013	7.8	820	<1	6	3,000
Berrenda Mesa 1	W-009	5/21/2013	8.2	470	<1	4.4	1,800
Berrenda Mesa 2	W-015	5/22/2013	7.9	890	<1	6.5	3,200
Berrenda Mesa 3	W-016	5/22/2013	8	630	<1	5.9	2,400
Berrenda Mesa 4	W-017	5/22/2013	8	600	<1	5.3	2,300
Berrenda Mesa 6	W-018	5/22/2013	7.9	760	<1	5.7	2,700
Dudley Ridge 1	W-020	5/22/2013	8	960	1.7	9.7	4,500
Lost Hills 1	W-019	5/22/2013	7.9	950	<1	5.8	3,100
Lost Hills 3	W-010	5/21/2013	7.9	1,200	<1	12	5,800
Lost Hills 4	W-011	5/21/2013	7.9	940	1.3	11	5,100
Lost Hills 5	W-022	5/30/2013	8	790	<1	5.6	2,700
MUN[3]			*6.5-8.5*	*180*	--	--	
AGR-Irrigation[3]			*6.5-8.4*	--	--	12, if EC < 500 µmhos/cm 20, if EC <1,300 µmhos/cm 40, if EC <2,900 µmhos/cm	
AGR-Livestock[3]			--	--	--	--	
AGR-Poultry[3]			--	--	--	--	

1. MUN - Municipal Supply, AGR - Agricultural Supply, mg/l - milligrams per liter, µmhos/cm - micromhos per centimeter, < - less than, and -- - not available or not applicable. pH - standard units, EC - Electrical conductance in µmhos/cm - micromhos per centimeter. Constituent concentration in mg/L - milligrams per liter; TKN - total Kjeldahl nitrogen. For sodium adsorption ration (SAR), Water Quality for Agriculture indicates that acceptable SAR is dependent upon EC.

Footnotes Continued on Next Page

TABLE 5

2013 PRODUCTION WELL GROUNDWATER, OTHER ANALYTICAL, AND CALCULATED RESULTS[1]

2. Well locations shown on Figure 4.
3. MUN is MCL - maximum contaminant level or SMCL - secondary maximum contaminant level, for pH, the federal SMCL has been listed for MUN.
   For hardness, the U.S. Geological Survey characterization of "very hard" water, under MUN.
   AGR-Irrigation, AGR-Livestock and AGR-Poultry are from *Water Quality for Agriculture.*
   For pH, the "normal range" of irrigation water from *Water Quality for Agriculture* has been listed.

TABLE 6

SOIL TEXTURE DATA STATISTICS[1]

Westside Districts Groundwater Study
Belridge Water Storage District, Berrenda Mesa Water District,
Dudley Ridge water District, and Lost Hills Water District

Layer	Depth[2] Interval Centroid	Depth[2] Interval Range	Number of Texture Points	Minimum[3] Percent Coarse Grained	Maxiumum Percent Coarse Grained	Average Percent Coarse Grained
1	25	0-50	932	19.25	75.00	42.43
2	75	51-100	932	12.81	83.53	41.51
3	125	101-150	932	11.47	87.76	43.95
4	175	151-200	932	17.31	86.50	43.77
5	225	201-250	932	15.38	83.79	42.40
6	275	251-300	932	13.68	87.88	42.12
7	325	301-350	932	8.09	86.82	42.27
8	375	351-400	932	11.27	86.82	40.52
9	425	401-450	932	10.24	84.71	45.31
10	475	451-500	932	9.68	85.89	43.38
11	525	501-550	932	6.94	73.97	43.54
12	575	551-600	932	6.94	72.62	41.58
13	625	601-650	932	0.00	68.61	39.84
14	675	651-700	932	0.00	80.26	40.71
15	725	701-750	932	0.00	68.61	34.93
16	775	751-800	932	0.00	68.61	35.27
17	825	801-850	932	0.00	70.21	39.99
18	875	851-900	932	0.00	59.81	34.08
19	925	901-950	932	0.00	55.88	31.90
20	975	951-1000	932	0.00	57.93	33.57
21	1025	1001-1050	932	18.42	61.19	39.31
22	1075	1051-1100	932	15.45	64.84	39.03
23	1125	1101-1150	932	12.09	47.86	32.93
24	1175	1151-1200	932	14.43	53.78	35.66
25	1225	1201-1250	932	7.56	59.63	38.83
26	1275	1251-1300	932	17.64	50.94	36.32
27	1325	1301-1350	932	19.44	52.50	35.23
28	1375	1351-1400	932	22.51	58.73	36.85
29	1425	1401-1450	932	22.23	68.74	42.46
30	1475	1451-1500	932	23.04	69.49	41.54
					Minimum	**31.90**
					Maximum	**45.31**
					Average	**39.38**

Footnotes provided on the following page.

TABLE 6

SOIL TEXTURE DATA STATISTICS[1]

1. Texture data locations shown on figures provided in Appendix E.
2. Depth in feet below ground surface.
3. U.S. Geologic Survey defines coarse grained as sediments consisting of sand, gravel pebbles, boulders, cobbles, or conglomerates. Fine grained units are sediments consisting of clay, silt, mud, loam, or lime (Faunt, 2010).

amec foster wheeler

APPENDIX A

General Order for Growers in the Tulare Lake Basin and Westside Water Districts' Preliminary Water Quality Report

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2013-0120

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR GROWERS WITHIN THE TULARE LAKE BASIN AREA THAT ARE MEMBERS OF A THIRD-PARTY GROUP

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

Order R5-2013-0120

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR GROWERS IN THE TULARE LAKE BASIN AREA THAT ARE MEMBERS OF A THIRD-PARTY GROUP

The California Regional Water Quality Control Board, Central Valley Region (hereafter, Central Valley Water Board or Water Board), finds that:

Findings

SCOPE AND COVERAGE OF THIS ORDER

1 This Order serves as general waste discharge requirements (WDRs) for waste discharges from irrigated lands (or "discharges") that could affect ground and/or surface waters of the state. The discharges result from runoff or leaching of irrigation water and/or stormwater from irrigated lands. Discharges can reach waters of the state directly or indirectly.[1]

2 This Order applies to owners and operators of irrigated lands within the Tulare Lake Basin, excluding the area of the Westlands coalition (hereafter the Tulare Lake Basin Area). Either the owner or operator may enroll an irrigated lands parcel under this Order. The owners or operators that enroll the respective irrigated lands parcels are considered members of a third-party representing all or a portion of this area (hereinafter "Members"). The Member is required to provide written notice to the non-Member owner or operator that the parcel has been enrolled under the Order. Enforcement action by the board for non-compliance related to an enrolled irrigated lands parcel may be taken against both the owner and operator. Although a third-party representative has not yet been selected, this Order contains eligibility requirements for a third-party representative and describes the process by which the Executive Officer may approve a request for third-party representation. This Order applies throughout the Tulare Lake Basin Area, within which one or more third parties may represent Members based on geographic area. If multiple third-parties apply to serve different portions of the Tulare Lake Basin Area, the applications, along with the proposed boundaries of third-party responsibility, shall be coordinated to ensure that all areas within the Tulare Lake Basin Area may be represented by a third-party.

3 The Tulare Lake Basin Area is bounded by the crest of the Sierra Nevada Mountain Range to the east, the San Joaquin River to the north, the Westlands coalition and the crest of the Southern Coast Ranges to the west, and the crest of the San Emigdio and Tehachapi Mountains to the south. This area is referred to as the "Tulare Lake Basin Area", or "Order watershed area" in this Order. See Figure 1 for a map of the Tulare Lake Basin Area.

4 "Irrigated lands" means land irrigated to produce crops or pasture used for commercial purposes including lands that are planted to commercial crops that are not yet marketable

[1] Definitions for "waste discharges from irrigated lands," "waste," "groundwater," "surface water," "stormwater runoff," and "irrigation runoff," as well as all other definitions, can be found in Attachment E to this Order. It is important to note that irrigation water, the act of irrigating cropland, and the discharge of irrigation water unto itself is not "waste" as defined by the California Water Code, but that irrigation water may contain constituents that are considered to be a "waste" as defined by California Water Code section 13050(d).

(e.g., vineyards and tree crops). Irrigated lands also include nurseries, and privately and publicly managed wetlands.

5 This Order is not intended to regulate water quality as it travels through or remains on the surface of a Member's agricultural fields or the water quality of soil pore liquid within the root zone.[2]

6 This Order does not apply to discharges of waste that are regulated under other Central Valley Water Board issued WDRs or conditional waiver of WDRs (waiver). If the other Central Valley Water Board WDRs/waiver only regulate some of the waste discharge activities (e.g., application of treated wastewater to crop land) at the regulated site, the owner/operator of the irrigated lands must obtain regulatory coverage for any discharges of waste that are not regulated by the other WDRs/waiver. Such regulatory coverage may be sought through enrollment under this Order or by obtaining appropriate changes in the owner/operator's existing WDRs or waiver.

7 This Order implements the long-term Irrigated Lands Regulatory Program (ILRP) in the Tulare Lake Basin Area. The long-term ILRP has been conceived as a range of potential alternatives and evaluated in a programmatic environmental impact report (PEIR).[3] The PEIR was certified by the Central Valley Water Board on 7 April 2011; however, the PEIR did not specify any single program alternative. The regulatory requirements contained within this Order fall within the range of alternatives evaluated in the PEIR. This Order, along with other orders to be adopted for irrigated lands within the Central Valley, will constitute the long-term ILRP. Upon adoption of this Order, Order R5-2006-0053, Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Coalition Group Conditional Waiver), is rescinded as applied to irrigated lands within the Tulare Lake Basin Area. Existing Members that had previously enrolled under the Coalition Group Conditional Waiver will be enrolled under this Order upon timely submittal of a Notice of Confirmation (see section VII.A of this Order).

GROWERS REGULATED UNDER THIS ORDER

8 This Order regulates both landowners and operators of irrigated lands from which there are discharges of waste that could affect the quality of any waters of the state. In order to be covered by this Order, the landowners or operators must be Members. Because this Order regulates both landowners and operators, but does not require enrollment of both parties, the provisions of this Order require that the Member provide notification to the non-Member responsible party of enrollment under this Order. A third-party group representing Members will assist with carrying out the conditions of this Order. Both the landowner and operator are ultimately responsible for complying with the terms and conditions of this Order.

9 A third-party entity proposing to represent Members in the Tulare Lake Basin Area, or a portion thereof, (the third-party) is required to submit to the Central Valley Water Board an application to represent growers within this Order's coverage area or identify the area the third-party proposes to cover. The third-party representation will become effective upon

[2] Water that travels through or remains on the surface of a Member's agricultural fields includes ditches and other structures (e.g., ponds, basins) that are used to convey supply or drainage water within that Member's parcel or between contiguous parcels owned or operated by that Member.

[3] ICF International. 2011. *Irrigated Lands Regulatory Program, Program Environmental Impact Report.* Final and Draft. March. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

Central Valley Water Board Executive Officer approval of the third party's application. If a third-party proposes to cover a portion of the Order's coverage area, the Executive Officer will determine and identify the geographic area covered by the third-party in the Notice of Applicability. The Southern San Joaquin Valley and Buena Vista Water Quality Coalitions served as the third-party groups representing owners and operators of irrigated lands within the Order watershed area during the interim irrigated lands regulatory program, Order R5-2006-0053 (Coalition Group Conditional Waiver).

10 The third-party will be responsible for fulfilling the regional requirements and conditions (e.g., surface and groundwater monitoring, regional management plan development and tracking) of this Order and associated Monitoring and Reporting Program Order R5-2013-0120 (MRP). By retaining its third-party membership or establishing a new membership, a Member is agreeing to be represented by the third-party for the purposes of this Order. Any requirements or conditions not fulfilled by the third-party are the responsibility of the individual Member. The Member and non-Member owners and operators are responsible for conduct of operations on the Member's enrolled property.

11 To apply for coverage under this Order, a grower that is not a current Member in the third-party group will have different application requirements depending on the timing of its request for regulatory coverage (see section VII.A of this Order for specific requirements). Growers that enroll within 180 days of Executive Officer approval of the third-party will enroll under this Order by obtaining membership in the applicable third-party group. This will streamline the initial enrollment process for the bulk of the irrigated agricultural operations within the Tulare Lake Basin Area. Growers who do not enroll within 180 days of Executive Officer approval of the third-party, or whom are prompted to apply by Central Valley Water Board enforcement or inspection, are required to submit a Notice of Intent (NOI) to comply with the terms and conditions of this Order to the Central Valley Water Board and obtain membership with the third-party group. This additional step for late enrollees is intended to provide incentive for growers to enroll promptly. There will be an administrative fee for submitting an NOI to the board. The fee will help recover costs for board efforts to conduct outreach to ensure growers subject to this Order enroll or submit reports of waste discharge.

REASON FOR THE CENTRAL VALLEY WATER BOARD ISSUING THIS ORDER

12 The Tulare Lake Basin Area has approximately 2.89 million acres of cropland under irrigation[4] and approximately 10,700 growers[5] with "waste discharges from irrigated lands," as defined in Attachment E to this Order. Currently, approximately 350,000 acres are regulated under the Water Board's General Order for Existing Milk Cow Dairies (R5-2007-0035) and 1.04 million acres are regulated under the Coalition Group Conditional Waiver. Approximately 7,200 new growers and an additional 1,500,000 associated irrigated acres will require regulatory coverage under this Order or other WDRs or waivers. Small Farming Operations are those with a total farming operation that comprises less than 60 acres of irrigated land. In counties within the Tulare Lake Basin Area, Small Farming Operations are operated by approximately

[4] Calculated using values reported in the ICF International. 2010, Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program and Westlands Coalition and Pleasant Valley GIS layers.
[5] For the purposes of this estimate, the number of farms in the Tulare Lake Basin Area as reported in the United States Department of Agriculture, 2007, *Census of Agriculture* has been used to approximate the number of growers.

58 percent of the growers, but account for approximately 4.6 percent of the total irrigated lands.[6]

13 The Tulare Lake Basin Area region contains all or portions of seventeen groundwater basins/sub basins and has approximately 10,600 linear miles of surface water courses that are, or could be, affected by discharges of waste from irrigated lands. This does not include surface water courses in the foothill and mountainous regions of the third-party area, where there are few irrigated lands operations. Discharges of waste from irrigated lands could adversely affect the quality of the "waters of the state," as defined in Attachment E to this Order.

14 Within the third-party area, there are approximately 981,000 acres of irrigated lands within Department of Pesticide Regulation (DPR) Groundwater Protection Areas (GWPAs). DPR identifies these areas as vulnerable to groundwater contamination from the agricultural use of certain pesticides, based upon either pesticide detections in groundwater or upon the presence of certain soil types (leaching and/or runoff) and a depth to groundwater shallower than 70 feet. Of the 981,000 acres, approximately 490,000 acres of the irrigated lands are within DPR GWPAs that are characterized as vulnerable to leaching of pesticides (leaching areas), approximately 491,000 acres are within GWPAs that are characterized as vulnerable to movement of pesticides to groundwater by runoff from fields to areas were they may move to groundwater (runoff areas). For leaching areas, certain water soluble pesticides are carried mainly with excess irrigation water or rainwater through the soil profile and potentially to the underlying aquifer. For runoff areas, certain water soluble pesticides are carried mainly with runoff over the land surface to potential conduits to groundwater. However, DPR has not established or analyzed the GWPAs with fertilizers and nitrate in mind, and its GWPAs are established based upon detections of certain pesticides, many of which are of lower solubility. Solubility is one factor that can lead to groundwater contamination. Depending on the frequency of application and amount applied, certain water soluble constituents, such as nitrate, may share common pathways to groundwater with soluble pesticides. This Order includes consideration of DPR's vulnerability factors and GWPAs by the third-party in the determination of high vulnerability areas for nitrate.

15 The Central Valley Water Board's *Irrigated Lands Regulatory Program Existing Conditions Report* (ECR)[7] identifies waters of the state with impaired water quality attributable to or influenced by irrigated agriculture, including within the third-party area. The *Irrigated Lands Regulatory Program Environmental Impact Report* (PEIR) describes that "*[f]rom a programmatic standpoint, irrigated land waste discharges have the potential to cause degradation of surface and groundwater….*"

16 Approximately 11 water bodies encompassing 300 linear miles of surface water courses have been listed as impaired pursuant to Clean Water Act section 303(d)[8] within the third-party area. Approximately 5 of those water bodies identify the potential source of the impairment as agriculture, and the remaining water bodies identify an unknown source impairment. For example, Elk Bayou and Kings River (Pine Flat to Island Weir) are listed as impaired by the pesticide chlorpyrifos. Agriculture is identified as a potential source of impairment.

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[6] Data are for Tulare County and portions of Fresno, Kings, and Kern Counties; United States Department of Agriculture, 2007, *Census of Agriculture*.
[7] California Regional Water Quality Control Board, Central Valley Region, and Jones and Stokes. 2008. *Irrigated Lands Regulatory Program Existing Conditions Report.* Sacramento, CA.
[8] 2008-2010 303(d) List.

17 Elevated levels of nitrates in drinking water can have significant negative health effects on sensitive individuals. The Basin Plan contains a water quality objective for nitrate to protect the drinking water uses. The water quality objective for nitrate is the maximum contaminant level (MCL) of 10 mg/L for nitrate plus nitrite as nitrogen (or 45 mg/L of nitrate as nitrate) established by the California Department of Public Health (22 CCR § 64431) that has been set at a level to protect the most at risk groups – infants under six months old and pregnant women.[9]

In some areas, nitrate from both agricultural and non-agricultural sources has resulted in degradation and/or pollution of groundwater beneath agricultural areas in the Central Valley.[10] Available data (see Information Sheet and the PEIR) indicate that there are a number of wells within the Tulare Lake Basin Area that have exceeded the MCL for nitrate. Groundwater in the Tulare Lake Basin Area has been designated for drinking water uses; therefore, the water quality objective of 10 mg/L for nitrate plus nitrite (as nitrogen) applies to groundwater in the Tulare Lake Basin Area. Where nitrate groundwater quality data are not available, information on the hydrogeological characteristics of the area suggest that significant portions of the Tulare Lake Basin Area are vulnerable to nitrate contamination. Sources of nitrate in groundwater include leaching of excess fertilizer, confined animal feeding operations, septic systems, discharge to land of wastewater, food processor waste, unprotected well heads, improperly abandoned wells, and lack of backflow prevention on wells.

18 The Central Valley Water Board's authority to regulate waste discharges that could affect the quality of the waters of the state, which includes both surface water and groundwater, is found in the Porter-Cologne Water Quality Control Act (California Water Code Division 7).

19 California Water Code section 13263 requires the Central Valley Water Board to prescribe WDRs, or waive WDRs, for proposed, existing, or material changes in discharges of waste that could affect water quality. The board may prescribe waste discharge requirements although no discharge report under California Water Code section 13260 has been filed. The WDRs must implement relevant water quality control plans and the California Water Code. The Central Valley Water Board may prescribe general waste discharge requirements for a category of discharges if all the following criteria apply to the discharges in that category:

a. The discharges are produced by the same or similar operations;
b. The discharges involve the same or similar types of waste;
c. The discharges require the same or similar treatment standards; and
d. The discharges are more appropriately regulated under general requirements than individual requirements.

The rationale for developing general waste discharge requirements for irrigated agricultural lands in the Tulare Lake Basin Area includes: (a) discharges are produced by similar operations (irrigated agriculture); (b) waste discharges under this Order involve similar types of wastes (wastes associated with farming); (c) water quality management practices are similar for irrigated agricultural operations; (d) due to the large number of operations and their contiguous location, these types of operations are more appropriately regulated under general

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[9] See, for example, the California Department of Public Health Nitrate Fact Sheet: http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Nitrate/FactSheet-Nitrate-05-23-2012.pdf.
[10] PEIR, Appendix A

rather than individual requirements; and (e) the geology and the climate are similar, which will tend to result in similar types of water quality problems[11] and similar types of solutions.

20 Whether an individual discharge of waste from irrigated lands may affect the quality of the waters of the state depends on the quantity of the discharge, quantity of the waste, the quality of the waste, the extent of treatment, soil characteristics, distance to surface water, depth to groundwater, crop type, management practices and other site-specific factors. These individual discharges may also have a cumulative effect on waters of the state. Waste discharges from some irrigated lands have impaired or degraded and will likely continue to impair or degrade the quality of the waters of the state within the Central Valley Region if not subject to regulation pursuant to the Porter-Cologne Water Quality Control Act (codified in California Water Code Division 7).

21 California Water Code section 13267(b)(1) states: "(1) *In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports. (2) When requested by the person furnishing a report, the portions of a report that might disclose trade secrets or secret processes may not be made available for inspection by the public but shall be made available to governmental agencies for use in making studies. However, these portions of a report shall be available for use by the state or any state agency in judicial review or enforcement proceedings involving the person furnishing the report."*

22 Technical reports are necessary to evaluate Member compliance with the terms and conditions of this Order and to assure protection of waters of the state. Consistent with California Water Code section 13267, this Order requires the implementation of a monitoring and reporting program (MRP) that is intended to determine the effects of Member waste discharges on water quality, to verify the adequacy and effectiveness of the Order's conditions, and to evaluate Member compliance with the terms and conditions of the Order. The requirements for reports and monitoring specified in this Order and attached MRP are based in part on whether an operation is within a high or low vulnerability area. The third-party is tasked with describing high and low vulnerability areas based on definitions provided in Attachment E to this Order and guidance provided in the MRP for development of the Groundwater Quality Assessment Report. The Executive Officer will review third-party proposed high and low vulnerability areas and make the final determination of these areas. High and low vulnerability areas will be reviewed and updated throughout the implementation of this Order. A Member who is covered under this Order must comply with MRP Order R5-2013-0120 which is part of this Order, and future revisions thereto by the Executive Officer or board.

[11] "Water quality problem" is defined in Attachment E.

23 The surface water quality monitoring and trend groundwater quality monitoring under this Order are regional and representative in nature and do not measure individual field discharge. The surface water quality monitoring will take place in surface water bodies that are representative of surface waters receiving irrigated agricultural discharges. The trend groundwater monitoring will take place in aquifers that are representative of aquifers receiving irrigated agricultural discharges. The benefits of regional monitoring include the ability to determine whether water bodies accepting discharges from numerous irrigated lands are meeting water quality objectives and to determine whether practices, at the watershed level, are protective of water quality. There is a cost savings with representative monitoring, since all surface waters or all groundwater aquifers that receive irrigated agricultural discharges do not need to be monitored. Surface water and groundwater monitoring sites are selected to represent areas with similar conditions (e.g., crops grown, soil type). However, there are limitations to regional monitoring's effectiveness in determining possible sources of water quality problems, the effectiveness of management practices, and individual compliance with this Order's requirements.

Therefore, through the Management Practices Evaluation Program and the Surface Water Quality Management Plans and Groundwater Quality Management Plans, the third-party must evaluate the effectiveness of management practices in protecting water quality. In addition, Members must report the practices they are implementing to protect water quality. Through the evaluations and studies conducted by the third-party, the reporting of practices by the Members, and the board's compliance and enforcement activities, the board will be able to determine whether a Member is complying with the Order.

Where required monitoring and evaluation does not allow the Central Valley Water Board to determine potential sources of water quality problems or identify whether management practices are effective, this Order requires the third-party to provide technical reports at the direction of the Executive Officer. Such technical reports are needed when monitoring or other available information is not sufficient to determine the effects of irrigated agricultural waste discharges to state waters. It may also be necessary for the Central Valley Water Board to conduct investigations by obtaining information directly from Members to address individual compliance.

24 The Central Valley Water Board's *Water Quality Control Plan for the Tulare Lake Basin* (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives, contains programs of implementation needed to achieve water quality objectives, and references the plans and policies adopted by the State Water Board. The water quality objectives are developed to protect the beneficial uses of waters of the state. Compliance with water quality objectives will protect the beneficial uses listed in Findings 27 and 28.

25 The Tulare Lake Basin Plan identifies the greatest long-term problem facing the Basin as the increase in salinity in groundwater. Because of the closed nature of the Tulare Lake Basin, there is little subsurface outflow. Thus salts accumulate within the Basin due to the importation and evaporative use of water. A large portion of this increase is due to the intensive use of soil and water resources by irrigated agriculture. The Tulare Lake Basin Plan recognizes that degradation is unavoidable without a plan for removing salts from the Basin and that salt sources should be managed to the extent practicable to reduce the rate of groundwater degradation until there is a long-term solution to the salt imbalance.

26 This Order implements the Basin Plan by requiring the implementation of management practices to achieve compliance with applicable water quality objectives and requiring the

prevention of nuisance. The Order requires implementation of a monitoring and reporting program to determine effects of discharges on water quality and the effectiveness of management practices designed to comply with applicable water quality objectives.

27 Pursuant to the Basin Plan and State Water Board plans and policies, including State Water Board Resolution 88-63, and consistent with the federal Clean Water Act, the existing and potential beneficial uses of surface waters in the Tulare Lake Basin Area may include:

a. Municipal and Domestic Supply;
b. Agricultural Supply;
c. Industrial Service Supply;
d. Industrial Process Supply;
e. Hydropower Generation;
f. Water Contact Recreation;
g. Non-Contact Water Recreation;
h. Warm Freshwater Habitat;
i. Cold Freshwater Habitat;
j. Wildlife Habitat;
k. Rare, Threatened, and Endangered Species;
l. Spawning, Reproduction and/or Early Development;
m. Migration of Aquatic Organisms;
n. Groundwater Recharge;
o. Freshwater Replenishment;
p. Aquaculture;
q. Preservation of Biological Habitats of Special Significance; and
r. Navigation.

28 Pursuant to the Basin Plan and State Water Board plans and policies including State Water Board Resolution 88-63, all ground waters in the region are considered as suitable or potentially suitable at a minimum, for:

a. Municipal and Domestic Supply;
b. Agricultural Supply;
c. Industrial Service Supply; and
d. Industrial Process Supply.

29 The board recognizes that some areas within the Tulare Lake Basin Area overlie groundwater containing naturally occurring constituents, including salts, that may exceed water quality objectives for specific beneficial use designations. In such cases, the use may be unattainable, even in the absence of any waste discharge, and de-designation or modification of the designated use may be appropriate. It is reasonable, under circumstances described below, to delay the imposition of monitoring and reporting associated with high vulnerability areas in these circumstances. This Order allows, with Executive Officer approval, portions of the high vulnerability areas identified within the Groundwater Quality Assessment Report (GAR) to temporarily operate under reduced monitoring and reporting requirements when 1) a third-party, board, or other group is actively pursuing a basin plan amendment to de-designate or modify the beneficial use; and 2) the third-party provides the required information indicating

that it is reasonably likely that the beneficial use is not appropriate in the area of the proposed de-designation. The requirements for pursuing reduced monitoring and reporting as a condition of a basin plan amendment are described in section VIII.M of this Order and section V.E of the MRP.

30 In May 2004, the State Water Board adopted the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Policy). The purpose of the NPS Policy is to improve the state's ability to effectively manage NPS pollution and conform to the requirements of the Federal Clean Water Act and the Federal Coastal Zone Act Reauthorization Amendments of 1990. The NPS Policy requires, among other key elements, an NPS control implementation program's ultimate purpose to be explicitly stated. It also requires implementation programs to, at a minimum, address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements.

31 This Order constitutes an NPS Implementation Program for the discharges regulated by the Order. The ultimate purpose of this program is expressly stated in the goals and objectives for the ILRP, described in the PEIR and Attachment A to this Order. Attachment A, Information Sheet, describes the five key elements required by the NPS Policy and provides justification that the requirements of this Order meet the requirements of the NPS Policy. This Order is consistent with the NPS Policy.

32 The United States Environmental Protection Agency adopted the National Toxics Rule (NTR) on 5 February 1993 and the California Toxics Rule (CTR) on 18 May 2000, which was modified on 13 February 2001. The NTR and CTR contain water quality criteria which, when combined with beneficial use designations in the Basin Plans, constitute enforceable water quality standards for priority toxic pollutants in California surface waters.

33 It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This order promotes that policy by, among other things, utilizing a tiered system that imposes more stringent requirements in areas deemed “high vulnerability” based on threat to surface or groundwater quality, requiring surface and groundwater monitoring and management plans, an identification and evaluation of management practices that are protective of groundwater quality, and requiring discharges to meet applicable water quality objectives, which include maximum contaminant levels designed to protect human health and ensure that water is safe for domestic uses. Protection of the beneficial uses of surface and groundwater is described throughout this Order, including the discussion in Attachment A to this Order of State Water Board Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality Waters in California*.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

34 For purposes of adoption of this Order, the Central Valley Water Board is the lead agency pursuant to CEQA (Public Resources Code sections 21100 et seq.). Pursuant to board direction in Resolutions R5-2006-0053 and R5-2006-0054, a Program Environmental Impact Report (PEIR) was prepared. In accordance with CEQA, the Central Valley Water Board, acting as the lead agency adopted Resolution R5-2011-0017 on 7 April 2011, certifying the PEIR for the Irrigated Lands Regulatory Program.

35 This Order relies on the environmental impact analysis contained in the PEIR to satisfy the requirements of CEQA. Although the Order is not identical to any of the PEIR alternatives, the Order is comprised entirely of elements of the PEIR's wide range of alternatives. Therefore, the PEIR identified, disclosed, and analyzed the potential environmental impacts of the Order. The potential compliance activities undertaken by the regulated Members in response to this Order fall within the range of compliance activities identified and analyzed in the PEIR. Therefore, all potentially adverse environmental impacts of this Order have been identified, disclosed, and analyzed in the PEIR. If it is determined that a grower filing for coverage under this Order could create impacts not identified in the PEIR, individual WDRs would be prepared for that grower and additional CEQA analysis performed, which would likely tier off the PEIR as necessary. (See Title 14, CCR § 15152).

36 The requirements of this Order are based on elements of Alternatives 2 through 6 of the PEIR. The PEIR concludes that implementation of some of these elements has the potential to cause significant adverse environmental impacts. Such impacts are associated, directly and indirectly, with specific compliance activities growers may conduct in response to the Order's regulatory requirements. Such activities are expected to include implementation of water quality management practices and monitoring well installation and operation. Attachment A of this Order describes example water quality management practices that may be implemented as a result of this Order and that monitoring wells may be installed as a result of this Order. The types and degrees of implementation will be similar to those described in the PEIR for Alternatives 2 through 6. Also, because the cost of this Order is expected to fall within the range of costs described for Alternatives 2 through 6, significant impacts to agriculture resources under this Order will be similar to those described in the PEIR. Because of these similarities, this Order relies on the PEIR for its CEQA analysis. A listing of potential environmental impacts, the written findings regarding those impacts consistent with § 15091 of the CEQA Guidelines, and the explanation for each finding are contained in a separate Findings of Fact and Statement of Overriding Considerations document (Attachment D), which is incorporated by reference into this Order.

37 Where potentially significant environmental impacts identified in Attachment D may occur as a result of Members' compliance activities, this Order requires that Members either avoid the impacts where feasible or implement identified mitigation measures, if any, to reduce the potential impacts to a less than significant level. Where avoidance or implementation of identified mitigation is not feasible, use of this Order is prohibited and individual WDRs would be required. The Monitoring and Reporting Program (MRP) Order, Attachment B, includes a Mitigation Monitoring and Reporting Program to track the implementation of mitigation measures.

38 The PEIR finds that none of the program alternatives will cause significant adverse impacts to water quality. Consistent with alternatives in the PEIR, this Order contains measures needed to achieve and maintain water quality objectives and beneficial uses, reduce current pollutant loading rates, and minimize further degradation of water quality. As such, this Order will not cause significant adverse impacts to water quality.

STATE WATER RESOURCES CONTROL BOARD RESOLUTION 68-16

39 State Water Resources Control Board (State Water Board) Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Resolution 68-16 or "antidegradation policy") requires that a Regional Water Quality Control Board maintain high quality waters of the state unless the board determines that any authorized degradation is

consistent with maximum benefit to the people of the state, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in a Regional Water Quality Control Board's policies (e.g., quality that exceeds applicable water quality objectives). The board must also assure that any authorized degradation of existing high quality waters is subject to waste discharge requirements which will result in the best practicable treatment or control (BPTC) of the discharge necessary to assure that pollution, or nuisance will not occur and the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

40 The Central Valley Water Board has information in its records that has been collected by the Central Valley Water Board, growers, educational institutions, and others that demonstrates that many water bodies within the Central Valley Region are impaired for various constituents, including pesticides, nitrates, and salts. Many water bodies have been listed as impaired pursuant to Clean Water Act section 303(d).

Appendix A to the PEIR for the Irrigated Lands Program describes that "*there may be cases where irrigated agricultural waste discharges threaten to degrade high quality waters.*" For discharges to water bodies that are high quality waters, this Order is consistent with Resolution 68-16. Attachment A to this Order summarizes applicable antidegradation requirements and provides detailed rationale demonstrating how this Order is consistent with Resolution 68-16. As indicated in the summary, this Order authorizes degradation of high quality waters, not to exceed water quality objectives, threaten beneficial uses, or cause a condition of pollution or nuisance. The Order will also result in the implementation of BPTC by those discharging to high quality waters and assure that any change in water quality will be consistent with maximum benefit to the people of the state.

CALIFORNIA WATER CODE SECTIONS 13141 AND 13241

41 California Water Code section 13141 states that "*prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in any regional water quality control plan.*" Section 13141 concerns approvals or revisions to a water quality control plan and does not necessarily apply in a context where an agricultural water quality control program is being developed through waivers and waste discharge requirements rather than basin planning. However, the Basin Plan includes an estimate of potential costs and sources of financing for the long-term irrigated lands program. The estimated costs were derived by analyzing the six alternatives evaluated in the PEIR. This Order, which implements the long-term ILRP within the Tulare Lake Basin Area, is based on Alternatives 2-6 of the PEIR; therefore, estimated costs of this Order fall within the Basin Plan cost range.[12] The total average annual cost of compliance with this Order, e.g., summation of costs for administration, monitoring, reporting, tracking, implementation of management practices, is expected to be approximately $8.90 per acre greater than the current surface water only protection program under the Coalition Group Conditional Waiver. The total estimated average cost of compliance of continuation of the previous Coalition Group Conditional Waiver within the Tulare Lake Basin Area is expected to be approximately 51.0 million dollars per year ($17.65 per acre annually). The total estimated average cost of compliance with this Order is expected to be approximately 76.7 million dollars per year ($26.55 per acre annually).

[12] When compared on a per irrigated acre basis; as the Basin Plan cost range is an estimate for all irrigated lands in the Central Valley versus this Order's applicability to a portion thereof (irrigated lands in Tulare Lake Basin Area).

Approximately $20.21 of the estimated $26.55 per acre average annual cost of the Order is associated with implementation of management practices. This Order does not require that Members implement specific water quality management practices.[13] Many of the management practices that have water quality benefits can have other economic and environmental benefits (e.g., improved irrigation can reduce water and energy consumption, as well as reduce runoff). Management practice selection will be based on decisions by individual Members in consideration of the unique conditions of their irrigated agricultural lands; water quality concerns; and other benefits expected from implementation of the practice. As such, the cost estimate is an estimate of potential, not required costs of implementing specific practices. Any costs for water quality management practices will be based on a market transaction between Members and those vendors or individuals providing services or equipment and not based on an estimate of those costs provided by the board. The cost estimates include estimated fees the third-party may charge to prepare the required reports and conduct the required monitoring, as well as annual permit fees that are charged to permitted dischargers for permit coverage. In accordance with the State Water Board's Fee Regulations, the current annual permit fee charged to Members covered by this Order is $0.56/acre. The combined total estimated average administrative costs that include third-party and state fees are estimated to be $4.63/acre annually. These costs have been estimated using the same study used to develop the Basin Plan cost estimate, which applies to the whole ILRP being overseen by the Central Valley Water Board. The basis for these estimates is provided in the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.*[14] Attachment A includes further discussion regarding the cost estimate for this Order.

42 California Water Code section 13263 requires that the Central Valley Water Board consider the following factors, found in section 13241, when considering adoption of waste discharge requirements.

(a) Past, present, and probable future beneficial uses of water;

(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;

(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;

(d) Economic considerations;

(e) The need for developing housing within the region; and

(f) The need to develop and use recycled water.

These factors have been considered in the development of this Order. Attachment A, Information Sheet, provides further discussion on the consideration of section 13241 factors.

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[13] Per California Water Code section 13360, the Central Valley Water Board may not specify the manner in which a Member complies with water quality requirements.

[14] ICF International. 2010. *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.* Draft. July. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

RELATIONSHIP TO OTHER ONGOING WATER QUALITY EFFORTS

43 Other water quality efforts conducted pursuant to state and federal law directly or indirectly serve to reduce waste discharges from irrigated lands to waters of the state. Those efforts will continue, and will be supported by implementation of this Order.

44 The Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative has the goal of developing sustainable solutions to the increasing salt and nitrate concentrations that threaten the achievement of water quality objectives in Central Valley surface and groundwater. This Order requires actions that will reduce nitrate discharges and should result in practices that reduce salt loading. The board intends to coordinate all such actions with the CV-SALTS initiative. CV-SALTS may identify additional actions that need to be taken by irrigated agriculture and others to address these constituents. This Order can be amended in the future to implement any policies or requirements established by the Central Valley Water Board resulting from the CV-SALTS process. This Order includes provisions to promote coordination with CV-SALTS and to support the development of information needed for the CV-SALTS process.

45 Total Maximum Daily Loads (TMDLs) are established for surface waters that have been placed on the State Water Board's 303(d) list of Water Quality Limited Segments for failure to meet applicable water quality standards. A TMDL, which may be adopted by the Central Valley Water Board as Basin Plan amendments, is the sum of allowable loads of a single pollutant from all contributing point sources and nonpoint sources. A TMDL has not been adopted for any surface water in the Tulare Lake Basin Area. This Order will implement any future TMDLs to the extent they include established requirements that pertain to irrigated agriculture.

46 The General Order for Existing Milk Cow Dairies (R5-2007-0035) and NPDES Dairy General Permit CAG015001 (Dairy General Orders) regulates discharges of waste to surface waters and groundwater from existing milk cow dairies in the Central Valley. Discharges from irrigated agricultural parcels are regulated by the Dairy General Orders if the owner or operator of the parcel applies dairy waste from its dairy operation. Irrigated agricultural parcels that receive dairy or other confined animal facility[15] waste from external sources must obtain regulatory coverage for their discharge under this Order or waste discharge requirements that apply to individual growers. The Central Valley Water Board encourages the dairy industry and the third-party to coordinate the surface water and groundwater quality monitoring required of the two orders and coordinate their response to identified water quality problems.

47 The Executive Officer approved the Southern San Joaquin Valley Water Quality Coalition Management Plan for the Main Drain Canal on 23 October 2012 and for the Tule River on 5 December 2012. Additional Management Plans required by data collected under Order 2006-0053, Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Coalition Waiver) have not been completed. The approved plans (along with updates and modifications approved by the Executive Officer) will continue to be implemented under this Order to address the surface water quality problems identified therein, unless and until such time the Executive Officer requires modification of the plan or deems it to be complete, as described in this Order. Management Plans required by data

[15] "Confined animal facility" is defined in Title 27 CCR section 20164 as "*… any place where cattle, calves, sheep, swine, horses, mules, goats, fowl, or other domestic animals are corralled, penned, tethered, or otherwise enclosed or held and where feeding is by means other than grazing*."

gathered under the Coalition Waiver, which have not been approved by the date the Order is adopted, will be completed in accordance with the requirements of Appendix MRP-1 of this Order. Any request to consider management plans approved under the Conditional Waiver complete will be evaluated in accordance with this Order.

COORDINATION AND COOPERATION WITH OTHER AGENCIES

48 *Integrated Regional Water Management Plans:* Pursuant to part 2.75 of Division 6 of the California Water Code (commencing with section 10750), local agencies are authorized to adopt and implement groundwater management plans (hereinafter "local groundwater management plans"), including integrated regional water management plans. The legislation provides recommended components to the plans such as control of saline water intrusion, regulation of the migration of contaminated water, monitoring of groundwater levels and storage, and the development of relationships with regulatory agencies. The information collected through implementation of groundwater management plans can support or supplement efforts to evaluate potential impacts of irrigated agricultural discharges on groundwater. This Order requires the third-party to develop regional groundwater monitoring workplans and, where necessary, Groundwater Quality Management Plans (GQMPs). The third-party is encouraged to coordinate with local groundwater management plans and integrated regional water management plans, where applicable, when developing regional groundwater monitoring workplans and GQMPs.

49 *California Department of Pesticide Regulation (DPR)*: DPR has developed a Groundwater Protection Program under the authority of the Pesticide Contamination Prevention Act (PCPA) (commencing with Food and Agriculture Code section 13142). The program is intended to prevent contamination of groundwater from the legal application of pesticides. In addition to activities mandated by the PCPA, DPR's program has incorporated approaches to identify areas vulnerable to pesticide movement, develop mitigation measures to prevent pesticide contamination, and monitor domestic drinking water wells located in groundwater protection areas. The Groundwater Protection Program can provide valuable information on potential impacts to groundwater from agricultural pesticides. If necessary, DPR and the county agricultural commissioners can use their regulatory authorities to address any identified impacts to groundwater or surface water attributable to pesticide discharges from agricultural fields.

50 *California Department of Food and Agriculture (CDFA)*: The CDFA Fertilizer Research and Education Program (FREP) coordinates research to advance the environmentally safe and agronomically sound use and handling of fertilizer materials. Currently, CDFA is developing nitrogen management training programs for farmers and Certified Crop Advisors (CCA). Among other certification options available for nitrogen management plans, the CDFA training programs will be recognized as providing the training necessary for a farmer or CCA to certify nitrogen management plans in high vulnerability groundwater areas. This Order leverages CDFA's work and expertise with respect to nitrogen management training and technical support to the professionals and third-parties that will be developing nitrogen management plans for individual Members.

51 *Nitrogen Management and Control* – CDFA, in coordination with the Water Boards is convening a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The CDFA Task Force may identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.

In the Report to the Legislature[16], the State Water Resources Control Board (SWRCB) has committed to convene a panel of experts from a broad spectrum of relevant disciplines (Expert Panel) to assess existing agricultural nitrate control programs and develop recommendations, as needed, to ensure that ongoing efforts are protective of groundwater quality. The Expert Panel will evaluate ongoing agricultural control measures that address nitrate in groundwater, and will propose new measures, if necessary. In its assessment of existing agricultural nitrate control programs and development of recommendations for possible improvements in the regulatory approaches being used, the Expert Panel will consider groundwater monitoring, mandatory adoption of best management practices, tracking and reporting of nitrogen fertilizer application, estimates of nitrogen use efficiency or a similar metric, and farm-specific nutrient management plans as source control measures and regulatory tools.

The deadlines for preparation of a nitrogen management plan and associated reporting have been established to allow the board to make any necessary adjustments to this Order based on the findings and recommendations of the CDFA Task Force and the SWRCB Expert Panel and prior to the established compliance dates.

52 The Central Valley Water Board will continue to work cooperatively with the other state agencies to identify and leverage their efforts.

ENFORCEMENT FOR NONCOMPLIANCE WITH THIS ORDER

53 California Water Code section 13350 provides that any person who violates Waste Discharge Requirements may be: 1) subject to administrative civil liability imposed by the Central Valley Water Board or State Water Board in an amount of up to $5,000 per day of violation, or $10 per gallon of waste discharged; or 2) be subject to civil liability imposed by a court in an amount of up to $15,000 per day of violation, or $20 per gallon of waste discharged. The actual calculation and determination of administrative civil penalties must be set forth in a manner that is consistent with the State Water Board's Water Quality Enforcement Policy.

54 The State Water Board's Water Quality Enforcement Policy (Enforcement Policy) endorses progressive enforcement action for violations of waste discharge requirements when appropriate, but recommends formal enforcement as a first response to more significant violations. Progressive enforcement is an escalating series of actions that allows for the efficient and effective use of enforcement resources to: 1) assist cooperative Members in achieving compliance; 2) compel compliance for repeat violations and recalcitrant violators; and 3) provide a disincentive for noncompliance. Progressive enforcement actions may begin with informal enforcement actions such as a verbal, written, or electronic communication between the Central Valley Water Board and a Member. The purpose of an informal enforcement action is to quickly bring the violation to the Member's attention and to give the Member an opportunity to return to compliance as soon as possible. The highest level of informal enforcement is a Notice of Violation.

The Enforcement Policy recommends formal enforcement actions for the highest priority violations, chronic violations, and/or threatened violations. Violations of this Order that will be considered a priority include, but are not limited to:

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[16] State Water Board Resources Control Board. 2013. Report to the Legislature, Recommendations Addressing Nitrate in Groundwater <http://www.swrcb.ca.gov/water_issues/programs/nitrate_project/docs/nitrate_rpt.pdf>

a) Failure to obtain required regulatory coverage;

b) Failure to meet receiving water limitations, unless the Member is implementing a Central Valley Water Board approved SQMP or GQMP in accordance with the time schedule provisions of this Order (section XII);[17]

c) The discharge of waste to lands not owned, leased, or controlled by the Member without written permission from the landowner;

d) Failure to prevent future exceedances of water quality objectives once made aware of an exceedance;

e) Falsifying information or intentionally withholding information required by applicable laws, regulations or an enforcement order;

f) Failure to implement a SQMP/GQMP;

g) Failure to pay annual fees, penalties, or liabilities;

h) Failure to monitor or provide information to the third-party as required;

i) Failure to submit required reports on time; and

j) Failure to implement the applicable management practices, or equivalent practices, identified as protective of groundwater in the Management Practices Evaluation Report.

55 Under this Order, the third-party is tasked with developing monitoring plans, conducting monitoring, developing water quality management plans, and informing Members of requirements. It is intended that the following progressive enforcement steps will generally be taken in the event that the third-party fails to comply with the terms and conditions of this Order or attached MRP:

a) *First notification of noncompliance to the third-party*. The Central Valley Water Board intends to notify the third-party of the non-compliance and allow a period of time for the third-party to come back into compliance. This notification may be in the form of a verbal notice, letter, or written notice of violation, depending on the severity of the noncompliance.

b) *Second notification of noncompliance to the third-party*. If the third-party fails to adequately respond to the first notification, the board intends to provide written notice to the third-party and potentially affected Members of the failure to address the first notice.

c) *Failure of the third-party to adequately respond to the second notification*. Failure to adequately respond to the second notification may result in partial (e.g., affected areas or Members) or full disapproval of the third-party to act as a lead entity, depending on the severity of noncompliance. Growers that were Members affected by a partial or full third-party disapproval would be required to obtain coverage for their waste discharge under other applicable general waste discharge requirements or submit a Report of Waste Discharge to the Central Valley Water Board.

[17] A Member participating in a Management Practices Evaluation Program study (i.e., the study is taking place on the Member's farm) where data indicate the discharge from the study area is not meeting receiving water limitations will not be a priority for enforcement, if the Member is implementing a Central Valley Water Board approved SQMP or GQMP in accordance with the time schedule provisions of this Order (section XII).

GENERAL FINDINGS

56 This Order does not authorize violation of any federal, state, or local law or regulation.

57 This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "take" will result from any action authorized under this Order, the Member shall obtain authorization for an incidental take prior to construction or operation of the project. The Member shall be responsible for meeting all requirements of the applicable Endangered Species Act.

58 This Order does not supersede the Central Valley Water Board's Basin Plans and policies, or the State Water Board's plans and policies.

59 As stated in California Water Code section 13263(g), the discharge of waste into waters of the state is a privilege, not a right, and regulatory coverage under this Order does not create a vested right to continue the discharge of waste. Failure to prevent conditions that create or threaten to create pollution or nuisance will be sufficient reason to modify, revoke, or enforce this Order, as well as prohibit further discharge.

60 This Order requires Members to provide the third-party with contact information of the person(s) authorized to provide access to the enrolled property for inspections. This requirement provides a procedure to enable board staff to contact grower representatives so that it may more efficiently monitor compliance with the provisions of this Order.

61 Any instance of noncompliance with this Order constitutes a violation of the California Water Code and its regulations. Such noncompliance is grounds for enforcement action, and/or termination of coverage for waste discharges under this Order, subjecting the discharger to enforcement under the California Water Code for further discharges of waste to surface or groundwater.

62 All discharges from the irrigated agricultural operation are expected to comply with the lawful requirements of municipalities, counties, drainage districts, and other local agencies regarding discharges to storm drain systems or to other courses under their jurisdiction.

63 The fact that it would have been necessary to halt or reduce the discharge in order to maintain compliance with this Order shall not be a defense for violations of the Order by the Member.

64 This Order is not a National Pollutant Discharge Elimination System Permit issued pursuant to the Federal Clean Water Act. Coverage under this Order does not exempt a facility from the Clean Water Act. Any facility required to obtain such a permit must notify the Central Valley Water Board.

65 California Water Code section 13260(d)(1)(A) requires persons subject to waste discharge requirements to pay an annual fee established by the State Water Board.

66 The Findings of this Order, supplemental information and details in the attached Information Sheet (Attachment A), and the administrative record of the Central Valley Water Board relevant to the Irrigated Lands Regulatory Program, were considered in establishing these waste discharge requirements.

67 The Central Valley Water Board has notified interested agencies and persons of its intent to adopt this Order for discharges of waste from irrigated lands within the Tulare Lake Basin Area, and has provided them with an opportunity for a public hearing and an opportunity to submit comments.

68 The Central Valley Water Board, in a public meeting, heard and considered all comments pertaining to this Order.

69 Any person affected by this action of the Central Valley Water Board may petition the State Water Board to review this action. The State Water Board must receive the petition within 30 days of the date on which the Central Valley Water Board adopted this Order. Copies of the law and regulations applicable to filing petitions will be provided upon request.

IT IS HEREBY ORDERED that, pursuant to California Water Code sections 13260, 13263, and 13267 and in order to meet the provisions contained in Division 7 of the California Water Code and regulations and policies adopted there under; all Members of a third-party group[18], their agents, successors, and assigns shall comply with the following:

I. Coverage

1. Order R5-2006-0053, Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Coalition Group Conditional Waiver), is hereby rescinded as it applied to Members of the Southern San Joaquin Valley and Buena Vista Water Quality Coalitions in the Tulare Lake Basin Area.

2. The area to be covered by a third-party group will be identified in its Notice of Applicability (NOA). A third-party group receiving an NOA under this Order is responsible for all third-party group requirements within the geographic area identified in its NOA.

II. Prohibitions

1. The discharge of waste to waters of the state, from irrigated agricultural operations other than those defined in the Findings of this Order, is prohibited.

2. The discharge of hazardous waste, as defined in California Water Code section 13173 and Title 23 CCR section 2521(a), respectively, is prohibited.

3. The discharge of wastes (e.g., fertilizers, fumigants, pesticides) into groundwater via backflow through a water supply well is prohibited.

4. The discharge of any wastes (e.g., fertilizers, fumigants, pesticides) down a groundwater well casing is prohibited.

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[18] References to “the third-party group” in this Order apply to each of the entities (if more than one) that are approved as a third-party group under this Order.

III. Receiving Water Limitations

A. Surface Water Limitations[19]

1. Wastes discharged from Member operations shall not cause or contribute to an exceedance of applicable water quality objectives in surface water, unreasonably affect applicable beneficial uses, or cause or contribute to a condition of pollution or nuisance.

B. Groundwater Limitations[20]

1. Wastes discharged from Member operations shall not cause or contribute to an exceedance of applicable water quality objectives in the underlying groundwater, unreasonably affect applicable beneficial uses, or cause or contribute to a condition of pollution or nuisance.

IV. Provisions

A. General Specifications

1. The third-party will assist its Members in complying with the relevant terms and provisions of this Order, including required monitoring and reporting as described in MRP Order R5-2013-0120. However, individual Members of the third-party group continue to bear ultimate responsibility for complying with this Order.

2. Irrigated lands owners or operators with waste discharges to state waters (or “Dischargers”) that are not Members of the third-party group, or whose property is not enrolled by a Member of the third-party group, shall not be subject to coverage provided by the terms of this Order. Such Dischargers shall be required to obtain coverage for their waste discharge under individual waste discharge requirements or any applicable general waste discharge requirements that apply to individuals that are not represented by a third-party.

3. Members who are subject to this Order shall implement water quality management practices, as necessary, to protect water quality and to achieve compliance with applicable water quality objectives. Where applicable, the implementation of practices must be in accordance with the time schedule contained in an approved Groundwater Quality Management Plan or Surface Water Quality Management Plan

4. Installation of groundwater monitoring wells or implementation of management practices to meet the conditions of this Order at a location or in a manner that could cause an adverse environmental impact as identified in the *Irrigated Lands Regulatory Program, Final Program Environmental Impact Report* (PEIR)[21] shall be mitigated in accordance with the mitigation measures provided in Attachment C of this Order.

5. The provisions of this Order are severable. If any provision of the Order is held invalid, the remainder of the Order shall not be affected.

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[19] These limitations are effective immediately except where Members are implementing an approved Surface Water Quality Management Plan (SQMP) for a specified waste parameter in accordance with an approved time schedule authorized pursuant to sections VIII.I and XII of this Order.
[20] These limitations are effective immediately except where Members are implementing an approved Groundwater Quality Management Plan (GQMP) for a specified waste parameter in accordance with an approved time schedule authorized pursuant to sections VIII.I and XII of this Order.
[21] On 7 April 2011, the Central Valley Water Board adopted Resolution R5-2011-0017, certifying the PEIR for the long-term irrigated lands regulatory program.

B. Requirements for Members of the Third-Party Group

1. Members shall comply with all applicable provisions of the California Water Code, the *Water Quality Control Plan for the Tulare Lake Basin,* and State Water Board plans and policies.

2. All Members shall comply with the attached Monitoring and Reporting Program (MRP) R5-2013-0120, and future revisions thereto.

3. Members who are covered under this Order shall comply with the terms and conditions contained in this Order.

4. Each Member shall participate in third-party outreach events, at least annually, if any of the Member's parcels are in a designated "high vulnerability" area or governed by a SQMP/GQMP. The Member shall review outreach materials to become informed of any water quality problems to address and the management practices that are available to address those issues. The Member shall provide annual confirmation to the third-party that the Member has attended an outreach event during the previous year and reviewed the applicable outreach materials.

5. All Members shall provide the third-party with information requested for compliance with this Order.

6. All Members shall implement water quality management practices in accordance with any water quality management plans approved by the Central Valley Water Board Executive Officer, and/or as necessary to protect water quality and to achieve compliance with surface and groundwater receiving water limitations of this Order (sections III.A and B). Water quality management practices can be instituted on an individual basis, or implemented to serve multiple growers discharging to a single location.

7. All Members shall implement effective sediment discharge and erosion prevention practices to minimize or eliminate the discharge of sediment above background levels. Members with the potential to cause erosion and discharge sediment that may degrade surface waters, as identified by the Member in their Farm Evaluation, by the third-party in the Sediment Discharge and Erosion Assessment Report, or by the Executive Officer shall prepare and implement a Sediment and Erosion Control Plan as specified in section VII.C below.

8. All Members shall implement practices that minimize excess nutrient application relative to crop consumption. Members shall prepare and implement a farm-specific nitrogen management plan as required by section VII.D of this Order.

9. In addition to the reports identified in section VII of this Order, the Executive Officer may require the Member to submit additional technical reports pursuant to California Water Code section 13267.

10. The requirements prescribed in this Order do not authorize the commission of any act causing injury to the property of another, or protect the Member from liabilities under other federal, state, county, or local laws. However, enrollment under this Order does protect the Member from liability alleged for failing to comply with California Water Code section 13260.

11. This Order does not convey any property rights or exclusive privileges.

12. This Order shall not create a vested right, and all such discharges of waste shall be considered a privilege, as provided for in California Water Code section 13263.

13. The Member understands that the Central Valley Water Board or its authorized representatives, may, at reasonable hours, inspect the facilities and irrigated lands of persons subject to this Order to ascertain whether the purposes of the Porter-Cologne Act are being met and whether the Member is complying with the conditions of this Order. To the extent required by California Water Code section 13267(c) or other applicable law, the inspection shall be made with the consent of the Member, owner or authorized representative, or if consent is withheld, with a duly issued warrant pursuant to the procedure set forth in Title 13 Code of Civil Procedure Part 3 (commencing with section 1822.50). In the event of an emergency affecting the public health and safety, an inspection may be performed without the consent or the issuance of a warrant.

14. The Member shall provide the third-party with the phone number(s) of the individual(s) with authority to provide consent to access its facilities as described in provision IV.B.13 above.

15. The Member shall properly operate and maintain in good working order any facility, unit, system, or monitoring device installed to achieve compliance with the Order.

16. Settling ponds, basins, and tailwater recovery systems shall be constructed, maintained, and operated to prevent groundwater degradation, erosion, slope failure; and minimize the discharge of sediment. The construction and operation must be consistent with the applicable Natural Resources Conservation Service (NRCS) conservation practice standard, an NRCS or University of California Cooperative Extension recommendation, or an equivalent alternative standard.

17. Where applicable, the Member shall follow state, county or local agency standards with respect to water wells and groundwater quality when constructing new wells, modifying existing wells, or destroying wells. Absent such standards, at a minimum, the Member shall follow the standards and guidelines described in the California Department of Water Resources' *Water Well Standards (Bulletins 74-81 & 74-90 combined)*.

18. The Member shall maintain a copy of this Order, either in hard copy or electronic format, at the primary place of business, or the Member's farming operations headquarters. The Member shall also maintain excerpts of the Order's Member requirements that have been provided by the Executive Officer so as to be available at all times to operations personnel. The Member and his/her designee shall be familiar with the content of this Order.

19. The Member, or the third-party on its Member's behalf as applicable, shall submit all required documents in accordance with section IX of this Order.

20. Members shall, at a minimum, implement water quality management practices that meet the following farm management performance standards:
    a. Minimize waste discharge offsite in surface water,
    b. Minimize percolation of waste to groundwater,
    c. Protect wellheads from surface water intrusion.

21. Members shall implement the applicable management practices, or equivalent practices, identified as protective of groundwater in the Management Practices Evaluation Report.

C. Requirements for the Third-Party Group

In order to remain eligible to serve as a third-party representative to Members, the third-party shall perform the following:

1. Provide the Central Valley Water Board documentation of its organizational or management structure. The documentation shall identify persons responsible for ensuring that program requirements are fulfilled. The documentation shall be made readily available to Members.

2. Prepare annual summaries of expenditures of fees and revenue used to comply with this Order. The summaries shall be provided to or made readily available to Members.

3. If the third-party group receives a notice of violation (NOV) from the Central Valley Water Board, the third-party must provide to Members in the area addressed by the NOV appropriate information regarding the reason(s) for the violation. The notification must be provided to all Members within the area affected by the NOV within thirty (30) days of receiving the NOV from the board. The third-party group must provide confirmation to the board of each notification. A summary of all notices of violation received by the third-party group must be provided to all Members annually. The annual NOV summary may be part of a written or electronic communication to Members.

4. Develop and implement plans to track and evaluate the effectiveness of water quality management practices, pursuant to approved Surface Water Quality Management Plans and Groundwater Quality Management Plans.

5. Provide timely and complete submittal of any plans or reports required by this Order.

6. Conduct required water quality monitoring and assessments in conformance with quality assurance/quality control requirements and provide timely and complete submittal of any reports required by this Order.

7. Within 30 days of receiving an NOA from the Central Valley Water Board (as described in section VIII.A), inform Members of this Order's requirements by providing a notice of confirmation form to be completed by each Member.

8. Conduct education and outreach activities to inform Members of program requirements and water quality problems, including exceedances of water quality objectives or degradation of water quality, identified by the third-party or Central Valley Water Board. The third-party shall:

   a. Maintain attendance lists for outreach events, provide Members with information on water quality management practices that will address water quality problems and minimize the discharge of wastes from irrigated lands, and provide informational materials on potential environmental impacts of water quality management practices to the extent known by the third-party group.

   b. Provide an annual summary of education and outreach activities to the Central Valley Water Board. The annual summary shall include copies of the educational and management practice information provided to the growers. The annual summary must report the total number of growers who attended the outreach events and describe how growers could obtain copies of the materials presented at these events.

9. Work cooperatively with the Central Valley Water Board to ensure all Members are providing required information and taking necessary steps to address exceedances or degradation identified by the third-party or board. As part of the Membership List submittal, identify the growers known by the third-party who have: (1) failed to implement improved water quality

management practices within the timeframe specified by an applicable SQMP/GQMP; (2) failed to respond to an information request from the third-party associated with any applicable SQMP/GQMP or other provisions of this Order; (3) failed to participate as requested in third-party studies for which the third-party is the lead; (4) failed to provide confirmation of participation in an outreach event (per section IV.B.4 of this Order); or (5) otherwise failed to maintain good standing of their membership in the third-party group.

10. Ensure that any activities conducted on behalf of the third-party by other groups meet the requirements of this Order. The third-party is responsible for any activities conducted on its behalf.

11. Collect any fees from Members required by the State Water Board pursuant to the fee schedule contained in Title 23 CCR. Such fees shall then be submitted to the State Water Board. The fees invoiced by the State Water Board will be based on the Membership List submitted by the third-party group. The third-party group is responsible for ensuring the Members identified in the Membership List have provided their required portion of the State Water Board fees.

V. Effective Dates

1. This Order is effective upon adoption by the Central Valley Water Board on 19 September 2013, and remains in effect unless rescinded or revised by the Central Valley Water Board.

2. Regulatory coverage under this Order for discharges of waste from Members already enrolled under Order R5-2006-0053 is effective upon adoption of this Order by the Central Valley Water Board. Regulatory coverage under this Order is automatically terminated, if a Notice of Confirmation (NOC) is not received by the third-party from the currently enrolled Member within 180 days of Executive Officer issuance of an NOA to the third-party; or, if the third-party group application for the area in which the Member has irrigated lands is denied; or if the Central Valley Water Board revokes the approval of the third-party representing the Member’s area.

3. Regulatory coverage for Dischargers not already enrolled under Order R5-2006-0053 as of the date of adoption of this Order can be obtained directly through obtaining membership in the third-party group within 180 days of Executive Officer issuance of a Notice of Applicability (NOA) to the third-party. Regulatory coverage is effective when the third-party notifies the Central Valley Water Board that the Discharger’s application for membership has been accepted.

4. After the initial 180-day period following issuance of an NOA to the third-party group, regulatory coverage for Dischargers who are not members of the third-party under section V.2 or V.3 is effective upon notification by the Central Valley Water Board that this Order applies to the Discharger through the issuance of an NOA. The Central Valley Water Board shall only issue an NOA after it has received a Notice of Intent (NOI) as required by section VII.A, and after the Central Valley Water Board has received notification from the third-party that the Discharger is a Member. The Discharger must pay any applicable State Water Board administrative fees associated with the filing of NOIs.

VI. Permit Reopening, Revision, Transfer, Revocation, Termination, and Reissuance

1. This Order may be reopened to address any changes in state statutes, regulations, plans, or policies that would affect the water quality requirements for the discharges, including, but not limited to, the Central Valley Water Board *Water Quality Control Plan* (Basin Plan) *for the Tulare Lake Basin*.

2. The filing of a request by the third-party on behalf of its Members for modification, revocation and re-issuance, or termination of the Order, or notification of planned changes or anticipated noncompliance, does not stay any condition of the Order.

3. The third-party, on behalf of its Members, shall provide to the Executive Officer any information which the Executive Officer may request to determine whether cause exists for modifying, revoking and re-issuing, or terminating the Order, or to determine compliance with the requirements of this Order that apply directly to the third-party. Members shall provide to the Executive Officer, any information which the Executive Officer may request to determine whether cause exists for modifying, revoking and re-issuing, or terminating the Order as applied to the individual Member, or to determine compliance with the provisions of this Order that apply directly to the Member.

4. After notice and opportunity for a hearing, the Order may be terminated or modified for cause as applied to individual Members identified by the Central Valley Water Board. Cause for such termination or modification, includes, but is not limited to:

    a. Violation of any term or condition contained in the Order;
    b. Obtaining Order coverage by misrepresentation; or
    c. Failure to fully disclose all relevant facts.

    A Member's regulatory coverage shall be automatically revoked if the NOC is not timely submitted (see section VII.A).

5. After notice and opportunity for a hearing, the approval of the third-party to act as a lead entity representing Members may be partially (e.g., affected areas or Members) or fully revoked. Cause for such termination or modification includes, but is not limited to consideration of the factors in Finding 54 of this Order, and/or:

    a. Violation of any term or condition contained in the Order that applies directly to the third-party;
    b. Third-party misrepresentation;
    c. Failure by the third-party to fully disclose all known relevant facts; or
    d. A change in any condition that results in the third-party's inability to properly function as the third-party entity representing Member interests or in facilitating Member compliance with the terms and conditions of this Order.

6. The Central Valley Water Board will review this Order periodically and may revise this Order when necessary.

VII. Required Reports and Notices – Member

The Central Valley Water Board or the Executive Officer may require any of the following reports and notices to be submitted electronically as long as the electronic format is reasonably available to the Member, and only to the extent that the Member has access to the equipment that allows for them to submit the information electronically. If the Member does not have such access, reports and notices must be submitted by mail. Reports and notices shall be submitted in accordance with section IX, Reporting Provisions, as well as MRP Order R5-2013-0120. Due dates for Member required reports are summarized in Table 1. at the end of this Order. Members must prepare and maintain the following reports as instructed below, and shall submit or make available such reports to the third-party or the Central Valley Water Board as identified below.

A. Notice of Confirmation / Notice of Intent / Membership Application

1. To confirm coverage under this Order, growers that are enrolled under Order R5-2006-0053 as Members of the Southern San Joaquin or Buena Vista Water Quality Coalitions as of the effective date of this Order, must submit a completed notice of confirmation (NOC) to the third-party within 180 days of Executive Officer approval of the third-party (as provided by issuance of an NOA to the third-party, see section VIII.A of this Order). The third-party will provide a NOC form to Members within 30 days of receiving an NOA (see section VIII.A) from the Central Valley Water Board. As part of the NOC, Members must provide certification that they have provided written notice to any responsible non-Member parties of the Member's enrollment under this Order and of the requirements of this Order (a responsible non-Member is a landowner whose parcel has been enrolled by an operator-Member under this Order or an operator who farms a parcel that has been enrolled by a landowner-Member). If the Member is a landowner that leases their land, the Member must provide the name and contact information of the lessee. If the Member is the lessee, the Member must provide the name and contact information of the landowner.

2. Within 180 days of Executive Officer issuance of an NOA to the third-party, all other growers within this Order's boundaries must become Members of the third-party to avoid additional fees and administrative requirements (see section VII.A.3 below). To obtain membership, a grower must submit a completed third-party Membership application to the third-party group. As part of the membership application, growers must provide certification that they have provided written notice to any responsible non-Member parties of the Member's enrollment under this Order and of the requirements of this Order. Upon submittal of a complete application, the third-party group may confirm membership, after which the Member will be considered covered under this Order.

3. Beginning 181 days after Executive Officer issuance of an NOA to the third-party, any growers within this Order's boundaries that are not Members of a third-party or another third-party group governed by other WDRs or waiver of WDRs must submit (1) a completed Notice of Intent (NOI) to the Central Valley Water Board to comply with the conditions of this Order, (2) any required State Water Board administrative processing fee for the NOI, and (3) a Membership application to the third-party group. Upon submittal of a complete NOI, and after receiving confirmation from the third-party group that the grower is now a Member, the Central Valley Water Board Executive Officer may then issue a Notice of Applicability (NOA), after which the Member will be considered covered under this Order. In lieu of issuing an NOA, the Executive Officer may deny the NOI and require the submittal of a report of waste discharge or issue an NOA for regulatory coverage under any applicable general waste discharge requirements for individual dischargers not represented by a third-party.

4. As an alternative to receiving regulatory coverage under this Order, a discharger may submit a report of waste discharge in accordance with the California Water Code section 13260 or a Notice of Intent for regulatory coverage under any applicable general waste discharge requirements for individual dischargers not represented by a third-party.

B. Farm Evaluation

Members shall complete a Farm Evaluation and submit a copy of the completed Farm Evaluation to the third-party group according to the schedule below.[22] The Member must use the Farm Evaluation Template approved by the Executive Officer (see section VIII.C below). A copy of the Farm Evaluation shall be maintained at the Member's farming headquarters or primary place of business, and must be produced upon request by Central Valley Water Board staff. In addition, Members shall comply with the following requirements where applicable:

1. Members in Low Vulnerability Areas

a. Members with Small Farming Operations

By 1 March 2018, Members with Small Farming Operations (for definition, see Attachment E) must prepare their Farm Evaluation and submit it to the third-party. An updated Farm Evaluation must be prepared and submitted to the third-party every five years thereafter.

b. All other Members

By 1 March 2016, all other Members must prepare their Farm Evaluation and submit it to the third-party. An updated Farm Evaluation must be prepared and submitted to the third-party every five years thereafter.

2. All Members in High Vulnerability Areas (Surface/Groundwater)

By 1 March 2015, all Members within a high vulnerability area must prepare their Farm Evaluation and submit it to the third-party. An updated Farm Evaluation must be prepared and submitted to the third-party by 1 March annually thereafter. As part of the Farm Evaluation, the Member shall provide information on any outreach events attended in accordance with section IV.B.4 of this Order. After 1 March 2018, the Executive Officer may approve reduction in the frequency of updates and submission of Farm Evaluations, if the third-party demonstrates that year to year changes in Farm Evaluation updates are minimal and the Executive Officer concurs that the practices identified in the Farm Evaluations are consistent with practices that, when properly implemented, will achieve receiving water limitations or best practicable treatment or control, where applicable.

C. Sediment and Erosion Control Plan

The requirements and deadlines of this section apply as specified to Members that are required to develop a Sediment and Erosion Control Plan per section IV.B.7 of this Order. The Member must use the Sediment and Erosion Control Plan Template provided by the Executive Officer (see section VIII.C below), or equivalent. The Sediment and Erosion Control Plan must be prepared in one of the following ways:

- The Sediment and Erosion Control Plan must adhere to the site-specific recommendation from the Natural Resources Conservation Service (NRCS), NRCS technical service provider, the University of California Cooperative Extension, the local Resource Conservation District; or conform to a local county ordinance applicable to erosion and sediment control on agricultural lands. The Member must retain written documentation of the recommendation provided and certify that they are implementing the recommendation; or

[22] Any farm map or information on the location of wells on the farm does not need to be provided to the third-party group

- The Sediment and Erosion Control Plan must be prepared and self-certified by the Member, who has completed a training program that the Executive Officer concurs provides necessary training for sediment and erosion control plan development; or

- The Sediment and Erosion Control Plan must be written, amended, and certified by a Qualified Sediment and Erosion Control Plan Developer possessing one of the following registrations or certifications, and appropriate experience with erosion issues on irrigated agricultural lands: California registered professional civil engineer, geologist, engineering geologist, landscape architect; professional hydrologist registered through the American Institute of Hydrology; certified soil scientist registered through the American Society of Agronomy; Certified Professional in Erosion and Sediment Control (CPSEC)™/Certified Professional in Storm Water Quality (CPSWQ)™ registered through EnviroCert International, Inc.; professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET); or

- The Sediment and Erosion Control Plan must be prepared and certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the Sediment and Erosion Control Plan meets the objectives and requirements of this Order.

The plan shall be maintained and updated as conditions change. A copy of the Sediment and Erosion Control Plan shall be maintained at the farming operations headquarters or primary place of business; and must be produced by the Member, if requested, should Central Valley Water Board staff, or an authorized representative, conduct an inspection of the Member's irrigated lands operation.

1. ***Deadline for Members with Small Farming Operations***
   Within one (1) year of the Executive Officer approving the third party's Sediment Discharge and Erosion Assessment Report, Members with Small Farming Operations must complete and implement a Sediment and Erosion Control Plan.

2. ***Deadline for all Other Members***[23]
   Within 180 days of the Executive Officer approving the third party's Sediment Discharge and Erosion Assessment Report, all other Members must complete and implement a Sediment and Erosion Control Plan.

D. Nitrogen Management Plan

Members must prepare and implement a Nitrogen Management Plan and submit the Nitrogen Management Plan Summary Report for the previous crop year as described below. The Member must use the Nitrogen Management Plan Template provided by the Executive Officer (see section VIII.C below). The Nitrogen Management Plan and Nitrogen Management Plan Summary Report shall be maintained at the Member's farming operations headquarters or primary place of business. The Member must provide the Nitrogen Management Plan and Summary Report to board staff, if requested or, should board staff or an authorized representative conduct an inspection of the Member's irrigated agricultural operation. In addition, Members shall comply with the following requirements where applicable:

[23] Members with parcels that do not meet the Small Farming Operation definition (see Attachment E).

1. All Members within a High Vulnerability Groundwater Area

For Members located within a high vulnerability groundwater area, for which nitrate is identified as a constituent of concern, the Member must prepare and implement a certified Nitrogen Management Plan. The plan must be certified in one of the following ways:

- Self-certified by the Member who attends a California Department of Food and Agriculture or other Executive Officer approved training program for nitrogen plan certification. The Member must retain written documentation of their attendance in the training program; or

- Self-certified by the Member that the plan adheres to a site-specific recommendation from the Natural Resources Conservation Service (NRCS) or the University of California Cooperative Extension. The Member must retain written documentation of the recommendation provided; or

- Certified by a nitrogen management plan specialist as defined in Attachment E of this Order. Such specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors[24] certified by the American Society of Agronomy, or Technical Service Providers certified in nutrient management in California by the NRCS; or

- Certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the Nitrogen Management Plan meets the objectives and requirements of this Order.

a. Deadlines for Members with Small Farming Operations

By 1 March 2017, Members with Small Farming Operations shall prepare, and update by 1 March annually thereafter, a Nitrogen Management Plan. By 1 March 2018, and by 1 March annually, thereafter, Members with Small Farming Operations shall submit to the third-party the Nitrogen Management Plan Summary Report for the previous year.

b. Deadlines for all other Members[25]

By 1 March 2015, all other Members shall prepare, and update by 1 March annually thereafter, a Nitrogen Management Plan. By 1 March 2016, and by 1 March annually, thereafter, all other Members shall submit to the third-party the Nitrogen Management Plan Summary Report for the previous year.

c. Deadlines for Members re-designated from Low Vulnerability to High Vulnerability Groundwater Areas

Members with parcel(s) re-designated from low vulnerability to high vulnerability groundwater areas must prepare a Nitrogen Management Plan in compliance with this section (VII.D.1).[26] The schedule for certifying the Nitrogen Management Plan and submitting the initial Nitrogen Management Plan Summary Report will be established by the Executive Officer.

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[24] Should the California Department of Food and Agriculture and the California Certified Crop Adviser's establish a specific nitrogen management certification, any Certified Crop Adviser who certifies a nitrogen management plan must have a nitrogen management certification.

[25] Members with parcels that do not meet the Small Farming Operation definition (see Attachment E).

[26] The designation of the vulnerability area may change based on updates to the Groundwater Quality Assessment Report (see the MRP – Attachment B).

After 1 March 2018, the Executive Officer may approve reduction in the frequency of submission of Nitrogen Management Plan Summary Reports, if the third-party demonstrates that year to year changes in Nitrogen Management Summary Reports are minimal and the Executive Officer concurs that the implemented practices are achieving the performance standard (see section IV.B.8).

2. Members within a Low Vulnerability Groundwater Area

By 1 March 2017, all Members within low vulnerability areas shall prepare, and update by 1 March annually thereafter, a Nitrogen Management Plan. The Member must use the Nitrogen Management Plan Template approved by the Executive Officer (see section VIII.C below), or equivalent. Certification of the Nitrogen Management Plan and submittal of a Nitrogen Management Plan Summary Report are not required.

E. Mitigation Monitoring

As specified in this Order, certain Members are required to implement the mitigation measures included in Attachment C. Such Members shall submit mitigation monitoring by 1 March of each year to the third-party. Mitigation monitoring shall include information on the implementation of CEQA mitigation measures, including the mitigation measure implemented, potential environmental impact the mitigation measure addressed, location of the mitigation measure [parcel number, county], and any steps taken to monitor the ongoing success of the measure.

F. Notice of Termination

If the Member wishes to terminate coverage under this Order and withdraw its membership from the third-party, the Member shall submit a complete notice of termination (NOT) to the Central Valley Water Board and the third-party. Termination of regulatory coverage will occur on the date specified in the NOT, unless the Central Valley Water Board specifies otherwise. All discharges of waste to surface and groundwaters shall cease before the date of termination, and any discharges on or after this date shall be considered in violation of the California Water Code, unless other WDRs or waivers of WDRs regulate the discharge.

VIII. Required Reports and Notices – Third-Party

The Central Valley Water Board or the Executive Officer may require any of the reports and notices to be submitted electronically, as long as the electronic format is reasonably available to the third-party. The third-party shall submit reports and notices in accordance with section IX, Reporting Provisions. Due dates for third-party required reports are summarized in Table 2 at the end of this Order. The third-party must prepare the following reports:

A. Application to Serve as a Third-Party Representing Members

Within 30 days of the effective date of this Order, any group wishing to serve as a third-party must submit a letter to the Executive Officer requesting to serve as a third-party representing Members to carry out the third-party responsibilities. The Executive Officer will consider the following factors in determining whether to approve the request by issuing a Notice of Applicability (NOA) to the third-party. The NOA issued by the Executive Officer will identify the third-party geographic boundaries if the third-party requests to serve as a third-party for a portion of this Order's coverage area.

1. Ability of the third-party to carry out the third-party responsibilities identified in this Order, whether the third-party has clearly identified the geographic area proposed to be covered by the third-party, and should a third-party request to serve as a third-party for only a portion of this Order's coverage area, the reasonableness of the proposed boundaries.

2. Whether the third-party is a legally defined entity (i.e., non-profit corporation; local or state government; Joint Powers Authority) or has a binding agreement among multiple entities that clearly describes the mechanisms in place to ensure accountability to its Members.

3. Whether the third-party has binding agreements with any subsidiary group (e.g., subwatershed group) to ensure any third-party responsibilities carried out by the subsidiary group, including the collection of fees, are done so transparently and with accountability to the third party and its Members. If the third-party will not rely on any subsidiary group to carry out any of its responsibilities, the third-party must state that in its application letter.

4. Whether the third-party has a governance structure that includes a governing board of directors composed in whole or in part of Members, or otherwise provides Members with a mechanism to direct or influence the governance of the third-party through appropriate by-laws.

5. Should the Central Valley Water Board terminate an organization's role as a third-party or should the third-party submit a notice of termination, the Executive Officer will apply the above factors in evaluating the request of any successor organization to serve as a third-party and determining whether to approve the request by issuing an NOA.

6. A new third party may form to represent growers in an existing third party area, or part of that area, after a NOA has been issued to the existing third-party. The Executive Officer will consider the factors in VIII.A.1-4 above in determining whether to approve the request by issuing an NOA to the new third-party. In addition, the Executive Officer will require the new third-party to demonstrate acknowledgement from the existing third-party regarding the application by the new third-party group. The new third-party and its Members must take all actions and submit subsequent reports required by the Order on the timeline originally established by the issuance of the NOA to the original third-party group for the area. The proposed new third party must demonstrate that it can comply with the original time schedule as part of its application to serve as a third-party representing Members. Any required report not submitted by the existing third-party, and due prior to application of the new third-party, must be submitted as part of the application package of the new third-party.

B. Membership (Participant) List

The third-party shall submit a list of its Members to the Central Valley Water Board within 210-days of receiving an NOA from the board and then annually by 31 July of each year (beginning the year following initial submission of the list). The membership list shall identify Members. The list shall also identify growers that have had their membership revoked and Members that are pending revocation. The membership list shall contain, at a minimum, the following information for each member: all parcel numbers covered under the membership, the county of each parcel, the section, township, and range associated with each parcel, the number of irrigated acres for each parcel, the Member's name, mailing address, the contact name and phone number of the individuals authorized to provide access to the enrolled parcels, the name of the farm operator for each parcel, if different from the Member, and identification of each parcel that is part of a Small Farming Operation, if applicable. In lieu of providing Members' phone numbers as part of the membership list, the third-party may provide the office contact name(s) and phone number(s) of a representative of the third-party. Any listed third-party office contact must be available for Central Valley Water Board staff to contact Monday through Friday (except established state holidays) from 8 am to 5 pm.

C. Templates

The Executive Officer will provide templates to the third-party to distribute to its Members. The templates must be used to comply with the requirements of this Order, where applicable. Prior to providing the third-party with the templates, the Executive Officer will provide the third-party and other interested parties with thirty (30) days to comment on proposed templates. The following templates will be provided: Farm Evaluation; Nitrogen Management Plan; Nitrogen Management Plan Summary Report; Sediment and Erosion Control Plan.

D. Groundwater Quality Assessment Report and Evaluation/Monitoring Workplans

This Order's strategy for evaluating groundwater quality and protection consists of 1) a Groundwater Quality Assessment Report, 2) a Management Practices Evaluation Program, and 3) a Groundwater Quality Trend Monitoring Program. Each of these elements has its own specific objectives briefly described below, with more detail provided in the attached MRP.

1. Groundwater Quality Assessment Report

The Groundwater Quality Assessment Report (GAR) provides the foundational information necessary for design of the Management Practices Evaluation Program, the Groundwater Quality Trend Monitoring Program, and the Groundwater Quality Management Plan. To accomplish this purpose, the GAR must include the following:

- Assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation,
- Establish priorities for implementation of monitoring and studies within high vulnerability areas;
- Provide a basis for establishing workplans to assess groundwater quality trends;
- Provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and
- Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.

The GAR shall include the elements described in MRP section IV. The GAR shall be submitted to the Central Valley Water Board and Central Valley Salinity Coalition within one (1) year of receiving an NOA from the Executive Officer.

2. Management Practice Evaluation Program Workplan

Upon Executive Officer approval of the GAR, the third-party shall develop, either solely, or as a coordinated effort (see group option below), a Management Practice Evaluation Program Workplan. The workplan must meet the goals, objectives, and other requirements described in section IV of the attached MRP. The overall goal of the Management Practice Evaluation Program (MPEP) is to determine the effects, if any, irrigated agricultural practices have on first encountered groundwater under different conditions that could affect the discharge of waste from irrigated lands to groundwater (e.g., soil type, depth to groundwater, irrigation practice, crop type, nutrient management practice). A MPEP must address the conditions relevant to high vulnerability groundwater areas. The third-party may develop the workplan in accordance with one of the options described below.

a. Management Practices Evaluation Program Group Option

The third-party may fulfill its requirements as part of a Management Practices Evaluation Program Group. A Management Practices Evaluation Program (MPEP) Group refers to an entity that is formed to develop and carry out the management practices effectiveness evaluations required of this and other Orders applicable to the irrigated lands in the Central Valley.

At the time the GAR is submitted, the third-party must submit a copy of the agreement of the parties included in the MPEP Group. The agreement must include a description of the roles and responsibilities of each of the organizations in the MPEP Group; identification of the technical experts who will prepare and implement the workplans, along with their qualifications; the person(s) responsible for the timely completion of the workplans and reports required by this Order; and an organizational chart showing the reporting relationships and responsibilities of the participants in the group.

The third-party may use the group option if approved by the Executive Officer. The Executive Officer may disapprove the use of the group option, if 1) the group fails to meet required deadlines or implement the approved workplans, 2) the agreement submitted is not complete, or 3) the agreement submitted is deficient.

b. ***Third-party Only Management Practices Evaluation Program***
Under this option, the third-party MPEP Workplans shall be submitted to the Central Valley Water Board within one (1) year after written approval of the GAR by the Executive Officer.

3. Groundwater Quality Trend Monitoring Workplan
Upon Executive Officer approval of the GAR, the third-party shall develop a Groundwater Quality Trend Monitoring Workplan. The workplan must meet the goals, objectives, and other requirements described in section IV of the attached MRP. The overall objectives of groundwater trend monitoring are to determine current water quality conditions of groundwater relevant to irrigated agriculture and develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices. The workplan shall be submitted to the Central Valley Water Board within one (1) year after written approval of the GAR by the Executive Officer.

E. Surface Water Monitoring Plan

The Surface Water Monitoring Plan shall be submitted in accordance with the requirements described in section III.A of the MRP. The Surface Water Monitoring Plan shall be submitted to the Executive Officer for review and approval within 180 days of receiving the NOA. If the Executive Officer disapproves the Surface Water Monitoring Plan in whole or part, the Executive Officer may issue an MRP Order to the third-party, or amend the attached MRP Order, to include the surface water quality monitoring elements identified in Section III.A. of the MRP.

F. Sediment Discharge and Erosion Assessment Report

The Sediment Discharge and Erosion Assessment Report shall be submitted to the Central Valley Water Board within one (1) year of receiving an NOA from the Executive Officer. Within 30 days of written acceptance of the Sediment Discharge and Erosion Assessment Report, the third-party shall inform those Members with parcels in areas identified in the report of their obligation to prepare a Sediment and Erosion Control Plan. The Sediment Discharge and Erosion Assessment Report shall include the elements described in MRP section VI.

G. Surface Water Exceedance Reports

The third-party shall provide exceedance reports if surface water monitoring results show exceedances of adopted numeric water quality objectives or trigger limits, which are based on interpretations of narrative water quality objectives. Surface water exceedance reports shall be submitted in accordance with the requirements described in section V.D of the MRP.

H. Monitoring Report

The third-party shall submit the Monitoring Report to the Central Valley Water Board in accordance with the requirements in section V.C of the MRP.

I. Surface Water/Groundwater Quality Management Plan (SQMP/GQMP)

1. SQMP/GQMP General Requirements

SQMP/GQMPs submitted by the third-party shall conform to the requirements provided in the MRP, Appendix MRP-1. Existing SQMPs that were developed and approved under the Coalition Group Conditional Waiver (Conditional Waiver Order R5-2006-0053) continue to apply under this Order and shall be implemented as previously approved. Changes to any management plan may be implemented by the third-party only after approval by the Executive Officer. The Executive Officer may require changes to a management plan if the current management plan approach is not making adequate progress towards addressing the water quality problem or if the information reported by the third-party does not allow the Central Valley Water Board to determine the effectiveness of the management plan. Members shall comply with the revised management plans once they are approved by the Executive Officer. SQMPs triggered by data gathered under Conditional Waiver Order R5-2006-0053 that were not completed or approved by the Executive Officer prior to adoption of this Order shall be completed in accordance with MRP-1 of this Order.

For newly triggered SQMP/GQMPs, the third-party shall submit a SQMP/GQMP to the Central Valley Water Board within sixty (60) days. For any SQMP or GQMP that addresses salt or nitrates, the SQMP or GQMP shall also be submitted to the Chair of the CV-SALTS Executive Committee. This 60-day period begins the first business day after the third party’s receipt of the field or laboratory results that reported the triggering exceedance. The Central Valley Water Board will post the proposed SQMP/GQMP for a public review and comment period. Stakeholder comments will be considered by Central Valley Water Board staff to determine if additional revisions are appropriate. The third-party may, at its discretion, implement outreach or monitoring contained in a proposed management plan before approval. Members shall comply with the management plans once they are approved by the Executive Officer.

The third-party shall ensure continued implementation of SQMP/GQMPs until approved for completion by the Executive Officer pursuant to the provisions contained in the attached MRP, Appendix MRP-1, section III. The third-party shall submit a progress report in compliance with the provisions contained in the attached MRP, Appendix MRP-1, section I.F.

2. Conditions Requiring Preparation of SQMP/GQMP

Surface Water Quality Management Plan (SQMP)

A SQMP shall be developed by the third-party where: (1) an applicable water quality objective or applicable water quality trigger limit is exceeded (considering applicable averaging periods[27])

[27] Exceedances of water quality objectives or water quality triggers will be determined based on available data and application of the appropriate averaging period. The averaging period is typically defined in in the Basin Plan, as part of the water quality standard established by the USEPA, or as part of the criteria being used to interpret narrative objectives. If averaging periods are not defined in the Basin Plan, USEPA standard, or criteria, or

twice in a three year period for the same constituent at a monitoring location (trigger limits are described in section VII of the MRP) and irrigated agriculture may cause or contribute to the exceedances; (2) the Basin Plan requires development of a surface water quality management plan for a constituent or constituents discharged by irrigated agriculture, or (3) the Executive Officer determines that irrigated agriculture may be causing or contributing to a trend of degradation of surface water that may threaten applicable Basin Plan beneficial uses.

Groundwater Quality Management Plan (GQMP)

A GQMP shall be developed by the third-party where: (1) there is a confirmed exceedance[28] (considering applicable averaging periods) of a water quality objective or applicable water quality trigger limit (trigger limits are described in section VII of the MRP) in a groundwater well and irrigated agriculture may cause or contribute to the exceedance; (2) in high vulnerability groundwater areas to be determined as part of the Groundwater Assessment Report process (see MRP section IV); (3) the Basin Plan requires development of a groundwater quality management plan for a constituent or constituents discharged by irrigated agriculture; or (4) the Executive Officer determines that irrigated agriculture may be causing or contributing to a trend of degradation of groundwater that may threaten applicable Basin Plan beneficial uses.

If the extent of Member contribution to a water quality exceedance(s) or degradation trend is unknown, the third-party may propose activities to be conducted to determine the cause, or eliminate irrigated agriculture as a potential source instead of initiating a management plan. Requirements for source identification studies are set forth in the MRP, Appendix MRP-1, section I.G.

3. SQMP/GQMP Not Required

At the request of the third-party or upon recommendation by Central Valley Water Board staff, the Executive Officer may determine that the development of a SQMP/GQMP is not required. Such a determination may be issued if there is sufficient evidence indicating that Members discharging waste to the affected surface or groundwater are meeting the receiving water limitations given in section III of this Order (e.g., evidence indicates that irrigated agriculture does not cause or contribute to the water quality problem) or the Executive Officer determines that the exceedance is not likely to be remedied or addressed by a management plan.

4. Comprehensive Groundwater Quality Management Plan

In lieu of submitting separate groundwater quality management plans in the timeframe identified in section VIII.I.1, the third-party may submit a Comprehensive Groundwater Quality Management Plan along with its Groundwater Quality Assessment Report. With the exception of the timeframe identified in section VIII.I.1, all other provisions applicable to groundwater quality management plans in this Order and the associated MRP apply to the Comprehensive Groundwater Quality Management Plan. The Comprehensive Groundwater Quality Management Plan must be updated at the same time as the Management Plan Status Report (see attached MRP, Appendix MRP-1, section I.F) to address any constituents and areas that would have otherwise required submittal of a Groundwater Quality Management Plan.

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approved water quality trigger, the Central Valley Water Board will use the best available information to determine an appropriate averaging period.

[28] A "confirmed exceedance of a water quality objective in a groundwater well" means that the monitoring data are determined to be of the appropriate quality and quantity necessary to verify that an exceedance has occurred.

5. Comprehensive Surface Water Quality Management Plan

In lieu of submitting separate surface water quality management plans in the timeframe identified in section VIII.I.1, the third-party may submit a Comprehensive Surface Water Quality Management Plan together with its Surface Water Quality Monitoring Plan. With the exception of the timeframe identified in section VIII.I.1, all other provisions applicable to surface water quality management plans in this Order and the associated MRP apply to the Comprehensive Surface Water Quality Management Plan. The Comprehensive Surface Water Quality Management Plan must be updated at the same time as the Management Plan Status Report (see attached MRP, Appendix MRP-1, section I.F) to address any constituents and areas that would have otherwise required submittal of a Surface Water Quality Management Plan.

J. Technical Reports

Where monitoring required by this Order is not effective in allowing the board to determine the effects of irrigated agricultural waste discharge on state waters or the effectiveness of water quality management practices being implemented, the Executive Officer may require technical reports be provided to determine the effects of irrigated agricultural operations or implemented management practices on surface water or groundwater quality.

K. Notice of Termination

If the third-party wishes to terminate its role in carrying out the third-party responsibilities set forth in section VIII of this Order and other applicable provisions, the third-party shall submit a notice of termination letter to the Central Valley Water Board and all of its Members. Termination of the third-party will occur 30-days from submittal of the notice of termination letter, unless otherwise specified in the letter. With its notice of termination sent to its Members, the third-party shall inform its Members of their obligation to obtain coverage under other WDRs or a waiver of WDRs for their discharges, or inform such Members that they shall cease all discharges of waste to surface and groundwaters.

L. Total Maximum Daily Load (TMDL) Requirements

Approved TMDLs in the Basin Plan that apply to water bodies within the third-party's geographic area and have allocations for irrigated agriculture shall be implemented in accordance with the applicable Basin Plan provisions. Where required, the third-party shall coordinate with Central Valley Water Board staff to develop a monitoring design and strategy for TMDL implementation. Where applicable, SQMPs shall address TMDL requirements.

M. Basin Plan Amendment Workplan

In its Groundwater Quality Assessment Report, the third-party may identify high vulnerability areas that do not meet water quality objectives and where groundwater quality likely would not support a designated beneficial use even in the absence of the discharge of waste. In such cases, the third-party has the option of pursuing a basin plan amendment (or identifying an existing basin plan amendment process) to address the appropriateness of the beneficial use. Should the third-party pursue this option, the third-party shall submit a Basin Plan Amendment Workplan (BPAW) to the Central Valley Water Board within 120 days of the approval of the Groundwater Quality Assessment Report. The BPAW must include a demonstration that the groundwater proposed for de-designation meets any criteria set forth in the Basin Plan that the Board considers in making exceptions to beneficial use designations. The BPAW must be prepared in accordance with the requirements in section V.E of the MRP.

IX. Reporting Provisions

1. Members and the third-party must submit required reports and notices in accordance with the requirements in this Order and attached Monitoring and Reporting Program Order R5-2013-0120, unless otherwise requested by the Executive Officer.

2. All reports shall be accompanied by a cover letter containing the certification specified in section IX.3 below. The cover letter shall be signed by a person duly authorized under California law to bind the party submitting the report.

3. Each person signing a report required by this Order or other information requested by the Central Valley Water Board shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel or represented Members properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations."

4. All reports prepared and submitted to the Executive Officer in accordance with the terms of this Order will be made available for public inspection at the offices of the Central Valley Water Board, except for reports, or portions of such reports, subject to an exemption from public disclosure in accordance with California law and regulations, including the Public Records Act, California Water Code section 13267(b)(2), and the California Food and Agriculture Code. If the third-party or a Member of the third-party asserts that all or a portion of a report is subject to an exemption from public disclosure, it must clearly indicate on the cover of the report that it asserts that all or a portion of the report is exempt from public disclosure. The complete report must be submitted with those portions that are asserted to be exempt in redacted form, along with separately-bound unredacted pages (to be maintained separately by staff). The Member/third-party shall identify the basis for the exemption. If the Executive Officer cannot identify a reasonable basis for treating the information as exempt from disclosure, the Executive Officer will notify the Member/third-party that the information will be placed in the public file unless the Central Valley Water Board receives, within 10 calendar days, a satisfactory explanation supporting the claimed exemption. Data on waste discharges, water quality, meteorology, geology, and hydrogeology shall not be considered confidential. NOIs shall generally not be considered exempt from disclosure.

5. To the extent feasible, all reports submitted by Members shall be submitted electronically to irrlands@waterboards.ca.gov, unless the Member is unable to submit the report electronically. If unable to submit the report electronically, the grower shall mail or personally deliver the report to the Central Valley Water Board. All reports from the third-party shall be submitted electronically to its Central Valley Water Board-assigned staff liaison. Upon notification by the Central Valley Water Board, all reports shall be submitted directly into an online reporting system, to the extent feasible.

X. Record-keeping Requirements

The Member and the third-party shall maintain any reports or records required by this Order for five years. Records maintained by the third-party include reports and plans submitted by Members to the third-party for purposes of complying with this Order. Individual Member information used by the third-party to prepare required reports must be maintained electronically and associated with the Member submitting the information. The maintained reports or records, including electronic information, shall be made available to the Central Valley Water Board upon written request of the Executive Officer. This includes all monitoring information, calibration and maintenance records of sampling equipment, copies of reports required by this Order, and records of all data used to complete the reports. Records shall be maintained for a minimum of five years from the date of sample, measurement, report, or application. This five-year period shall be extended during the course of any unresolved litigation regarding the discharge or when requested in writing by the Executive Officer.

XI. Annual Fees

1. California Water Code section 13260(d)(1)(A) requires persons subject to waste discharge requirements to pay an annual fee established by the State Water Resources Control Board (State Water Board).

2. Members shall pay an annual fee to the State Water Board in compliance with the Waste Discharge Requirement fee schedule set forth at 23 CCR section 2200. The third-party is responsible for collecting these fees from Members and submitting them to the State Water Board on behalf of Members.

XII. Time Schedule for Compliance

When a SQMP or GQMP is required pursuant to the provisions in section VIII.I, the following time schedules shall apply as appropriate in order to allow Members sufficient time to achieve compliance with the surface and groundwater receiving water limitations described in section III of this Order. The Central Valley Water Board may modify these schedules based on evidence that meeting the compliance date is technically or economically infeasible, or when evidence shows that compliance by an earlier date is feasible (modifications will be made per the requirements in section VI of this Order). Any applicable time schedules for compliance established in the Basin Plan supersedes the schedules given below (e.g., time schedules for compliance with salinity standards that may be established in future Basin Plan amendments through the CV-SALTS process, or time schedules for compliance with water quality objectives subject to an approved TMDL).

Surface water: The time schedule identified in the SQMP for compliance with Surface Water Limitation III.A must be as short as practicable, but may not exceed 10 years from the date the SQMP is submitted for approval by the Executive Officer. The proposed time schedule in the SQMP must be supported with appropriate technical or economic justification as to why the proposed schedule is as short as practicable.

Groundwater: The time schedule identified in a GQMP for compliance with Groundwater Limitation III.B must be as short as practicable, but may not exceed 10 years from the date the GQMP is submitted for approval by the Executive Officer. The proposed time schedules in the GQMP must be supported with appropriate technical or economic justification as to why the proposed schedules are as short as practicable.

This Order becomes effective 19 September 2013 and remains in effect unless rescinded or revised by the Central Valley Water Board.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify the foregoing is a full and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region on 19 September 2013.

Original signed by

PAMELA C. CREEDON, Executive Officer

19 September 2013

Date

Figure 1 - Map of the Tulare Lake Basin Area

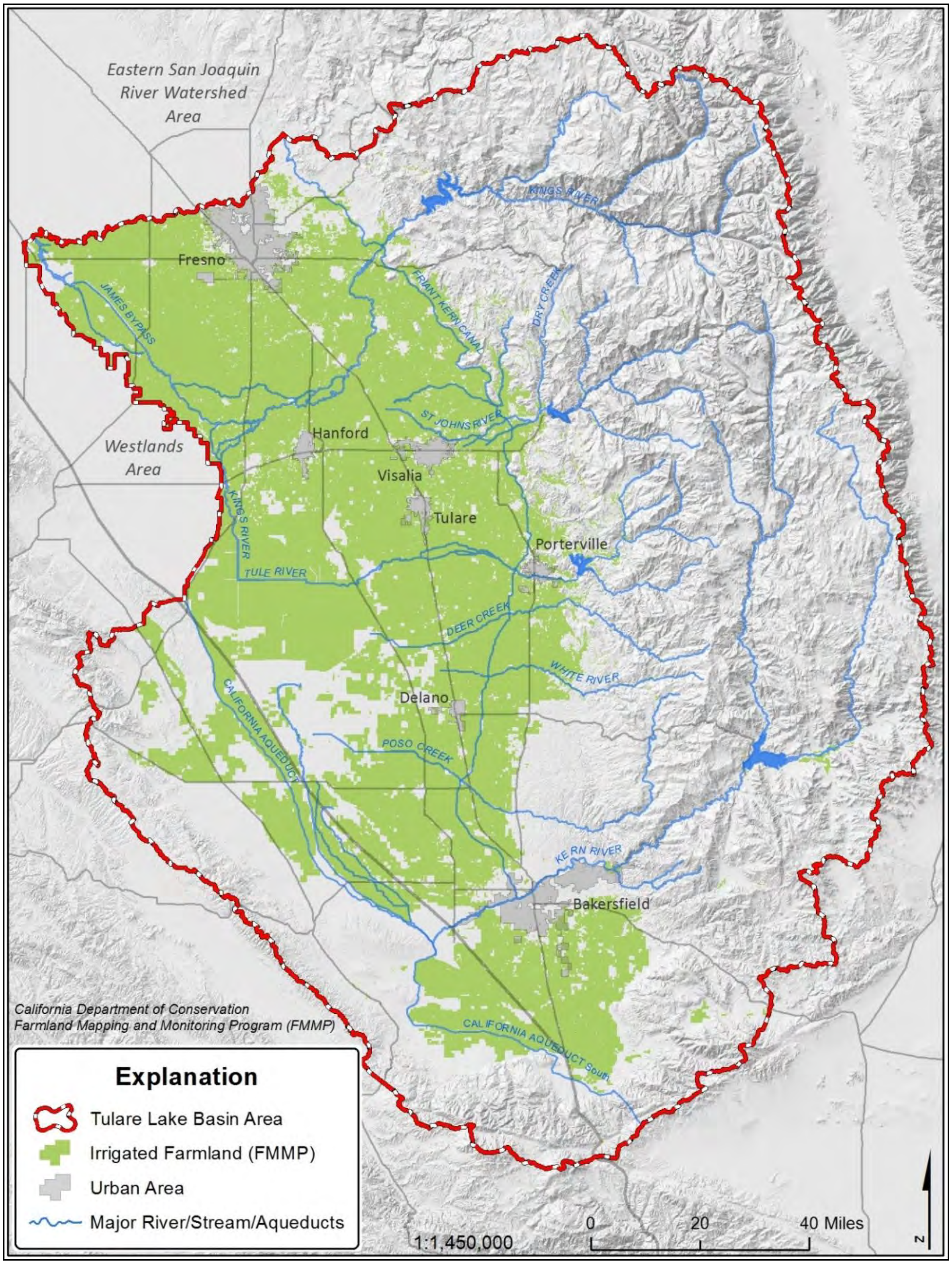

Table 1 – Member due dates for required reports

Report	Vulnerability	Farm Size	Due Date
Farm Evaluations	High	All	1 March 2015
	Low	Large (≥60 ac)	1 March 2016
		Small (<60 ac)	1 March 2018
Sediment and Erosion Control Plans	All farms identified in the Sediment Discharge and Erosion Assessment Report (SDEAR)	Large	180 days from approval of SDEAR
		Small	1 year from approval of SDEAR
Nitrogen Management Plans	High	Large	1 March 2015
		Small	1 March 2017
	Low	All	1 March 2017

Table 2 – Third-party due dates for required reports

Report	Due Date	
Surface Water Monitoring Plan	180 days after Notice of Applicability (NOA)	
Sediment Discharge and Erosion Assessment Report (SDEAR)	1 year from issuance of NOA	
Groundwater Quality Assessment Report (GAR)	1 year from issuance of NOA	
Management Practices Evaluation Workplan	Group option	2 years from GAR approval
	Third-party only option	1 year from GAR approval
Groundwater Quality Trend Monitoring Workplan	1 year from GAR approval	

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

Attachment A to Order R5-2013-0120
INFORMATION SHEET

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER
FOR
GROWERS WITHIN THE TULARE LAKE BASIN AREA
THAT ARE MEMBERS OF A THIRD-PARTY GROUP

TABLE OF CONTENTS

Overview

This attachment to Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party group, Order R5-2013-0120 (referred to as the “Order”) is intended to provide information regarding the rationale for the Order, general information on surface and groundwater monitoring that has been conducted, and a discussion of this Order’s elements that meet required state policy.

Introduction

There are numerous irrigated agricultural operations within the boundaries of the Central Valley Regional Water Quality Control Board (Central Valley Water Board) on over 7 million acres. Common to all types of these operations is the use of water to sustain crops. Depending on irrigation method, water use, geography, geology, climate, and the constituents (e.g., nutrients, pesticides, pathogens) present or used at a site, water discharged from the site may carry these constituents as waste off site and into groundwater or surface waters.

The Central Valley Water Board’s Irrigated Lands Regulatory Program (ILRP) was initiated in 2003 with the adoption of a conditional waiver of Waste Discharge Requirements for discharges from irrigated lands. The 2003 conditional waiver was renewed in 2006, and again in 2011. The conditional waiver’s requirements are designed to reduce wastes discharged from irrigated agricultural sites (e.g., tailwater, runoff from fields, subsurface drains) to Central Valley surface waters (Central Valley Water Board 2011).

In addition to providing conditions, or requirements, for discharge of waste from irrigated agricultural lands to surface waters, the Central Valley Water Board’s conditional waiver included direction to Central Valley Water Board staff to develop an environmental impact report for a long-term ILRP that would protect waters of the state (groundwater and surface water) from discharges of waste from irrigated lands. Although the requirements of the conditional waiver are aimed to protect surface water bodies, the directive to develop a long-term ILRP and environmental impact report is not as limited, as waters of the State include ground and surface waters within the State of California (California Water Code, Section 13050[e]).

The Central Valley Water Board completed an Existing Conditions Report (ECR) for Central Valley irrigated agricultural operations in December 2008. The ECR was developed to establish baseline conditions for estimating potential environmental and economic effects of long-term ILRP alternatives in a program environmental impact report (PEIR) and other associated analyses.

In fall 2008, the Central Valley Water Board convened the Long-Term ILRP Stakeholder Advisory Workgroup (Workgroup). The Workgroup included a range of stakeholder interests representing local government, industry, agricultural coalitions, and environmental/environmental justice groups throughout the Central Valley. The main goal of the Workgroup was to provide Central Valley Water Board staff with input on the development of the long-term ILRP. Central Valley Water Board staff and the Workgroup developed long-term program goals and objectives and a range of proposed alternatives for consideration in a PEIR and corresponding economic analysis. In August 2009 the Workgroup generally approved the goals, objectives, and range of proposed alternatives for the long-term ILRP. The Workgroup did not come to consensus on a preferred alternative.

The Central Valley Water Board's contractor, ICF International, developed the Program Environmental Impact Report (PEIR)[1] and Economics Report[2] for consideration by the board. The PEIR analyzed the range of proposed alternatives developed by the Workgroup. The Draft PEIR was released in July 2010, and the Final PEIR was certified by the board in April 2011 (referred to throughout as "PEIR"). In June 2011, the board directed Central Valley Water Board staff to begin developing waste discharge requirements (orders) that would implement the long-term ILRP to protect surface and groundwater quality. During 2011, the board reconvened the Stakeholder Advisory Workgroup to provide additional input in the development of the orders. Also, during the same time, the board worked with the Groundwater Monitoring Advisory Workgroup to develop an approach for groundwater monitoring in the ILRP.

The board's intent is to develop seven geographic and one commodity-specific general waste discharge requirements (general orders) within the Central Valley region for irrigated lands owners/operators that are part of a third-party group. In addition, the board intends to develop a general order for irrigated lands owners/operators that are not part of a third-party group. Towards this goal, on 7 December 2012 the board adopted Waste Discharge Requirements General Order for Growers within the Eastern San Joaquin River Watershed that are Members of the Third-Party Group, Order R5-2012-0116.

The geographic/commodity-based orders will allow for tailoring of implementation requirements based on the specific conditions within each geographic area. At the same time, the board intends to maintain consistency in the general regulatory approach across the orders through the use of templates for grower reporting, as well as in the focus on high vulnerability areas and areas with known water quality issues. The Order includes provisions to reduce the reporting requirements for small farming operations and areas of low vulnerability.

Goals and Objectives of the Irrigated Lands Regulatory Program

The goals and objectives of this Order, which implements the long term ILRP in the Tulare Lake Basin Area, are described below. These are the goals described in the PEIR for the ILRP.[3]

> *"Understanding that irrigated agriculture in the Central Valley provides valuable food and fiber products to communities worldwide, the overall goals of the ILRP are to (1) restore and/or maintain the highest reasonable quality of state waters considering all the demands being placed on the water; (2) minimize waste discharge from irrigated agricultural lands that could degrade the quality of state waters; (3) maintain the economic viability of agriculture in California's Central Valley; and (4) ensure that irrigated agricultural discharges do not impair access by Central Valley communities and residents to safe and reliable drinking water. In accordance with these goals, the objectives of the ILRP are to:*
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> - *Restore and/or maintain appropriate beneficial uses established in Central Valley Water Board water quality control plans by ensuring that all state waters meet applicable water quality objectives.*
> - *Encourage implementation of management practices that improve water quality in keeping with the first objective, without jeopardizing the economic viability for all sizes of irrigated agricultural*

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[1] ICF International. 2011. Irrigated Lands Regulatory Program, Program Environmental Impact Report. Draft and Final. March. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.
[2] ICF International. 2010. Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program) (Economics Report).
[3] PEIR, page 2-6

operations in the Central Valley or placing an undue burden on rural communities to provide safe drinking water.

- *Provide incentives for agricultural operations to minimize waste discharge to state waters from their operations.*
- *Coordinate with other Central Valley Water Board programs, such as the Grasslands Bypass Project WDRs for agricultural lands total maximum daily load development, CV-SALTS, and WDRs for dairies.*
- *Promote coordination with other regulatory and non-regulatory programs associated with agricultural operations (e.g., DPR, the California Department of Public Health [DPH] Drinking Water Program, the California Air Resources Board [ARB], the California Department of Food and Agriculture, Resource Conservation Districts [RCDs], the University of California Extension, the Natural Resources Conservation Service [NRCS], the USDA National Organic Program, CACs, State Water Board Groundwater Ambient Monitoring and Assessment Program, the U.S. Geological Survey [USGS], and local groundwater programs [SB 1938, Assembly Bill [AB] 3030, and Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness."*

Description of Waste Discharges from Irrigated Lands that may affect Water Quality

The definition of waste discharges from irrigated lands is provided in Appendix E as: "The discharge or release of waste to surface water or groundwater. Waste discharges to surface water include, but are not limited to, irrigation return flows, tailwater, drainage water, subsurface (tile) drains, stormwater runoff flowing from irrigated lands, aerial drift, and overspraying of pesticides. Waste can be discharged to groundwater through pathways including, but not limited to, percolation of irrigation or storm water through the subsurface, backflow of waste into wells (e.g., backflow during chemigation), discharges into unprotected wells and dry wells, and leaching of waste from tailwater ponds or sedimentation basins to groundwater. A discharge of waste subject to the Order is one that could directly or indirectly reach waters of the state, which includes both surface waters and groundwaters. Direct discharges may include, for example, discharges directly from piping, tile drains, wells, ditches or sheet flow to waters of the state, or percolation of wastes through the soil to groundwater. Indirect discharges may include aerial drift or discharges from one parcel to another parcel and then to waters of the state…"

As described in the definition, there exist multiple potential pathways for wastes from irrigated lands to waters of the state, where such waste discharge could affect the quality of waters of the state. Basic physical processes (e.g., contaminants going into solution in water and gravity) result in water containing waste to flow through soil or other conduits to underlying groundwater or result in water flowing over the land surface into surface water. In addition, material sprayed on the crop (such as pesticides) can drift in the wind and reach surface waters. Since farming takes place on landscapes connected to the surrounding environment (an open system), a farmer cannot prevent these physical processes from occurring. However, a farmer can take steps to limit the amount of wastes discharged and the subsequent effect on water quality.

If an operation believes it is not subject to the requirements of the Order, it may submit a report to the Central Valley Water Board describing the waste discharge (e.g., whether there is a potential to affect groundwater quality). Upon review of the report, the Central Valley Water Board may choose to waive the requirement to obtain WDRs, issue individual WDRs specific to the operation, or seek to enroll the operation under the Order.

Description of the Tulare Lake Basin Area

The Tulare Lake Basin Area encompasses approximately 2.89 million acres of irrigated agricultural lands which are distributed across portions of Fresno and Kern Counties, and the entirety of Tulare and Kings counties (Figure 1). Approximately 350,000 of these acres are regulated under the Central Valley Water

Board General Order for Existing Milk Cow Dairies. The Tulare Lake Basin Area comprises one of the most important agricultural centers in the United States, containing the top three counties in the state for agricultural sales, totaling over $15 billion in revenue (California Department of Food and Agriculture, 2011-2012). The Tulare Lake Basin Area also includes the top three counties in the state for pesticide applications, totaling 69 million pounds of active pesticide ingredients applied during 2010 (California Department of Pesticide Regulation, 2010 summary data).

Geographically, the Tulare Lake Basin Area is bounded by the Sierra Nevada on the east, the Tehachapi Mountains on the south, the Coast Ranges (and the Westlands coalition) on the west and the San Joaquin River on the north. The basin is normally a hydrologically closed basin except during periods of above average surface water flows, when flood control waters are diverted out of the basin through Fresno Slough and James Bypass into the San Joaquin River. Additional diversions both within the basin and out of the basin occur as water transfers and exchanges via the Cross Valley Canal to the California Aqueduct (U.S. Bureau of Reclamation, 2008).

The San Joaquin, Kings, Kaweah, Tule, and Kern rivers drain the west face of the Sierra Nevada mountain range and provide the bulk of the surface water supply native to the basin. These rivers have produced a broad, extensive network of alluvial fans which drained into topographically closed sinks, such as Tulare Lake, Kern Lake, and Buena Vista Lake. In addition to the native supply, imported surface water enters into the Tulare Lake Basin through the San Luis Canal/California Aqueduct System, Friant-Kern Canal, and Delta-Mendota Canal.

The natural hydrology of the Tulare Lake Basin Area has been extensively modified over the last 150 years. Channelization of the area's rivers and streams coupled with development of a vast system of irrigation canals and ditches allow for the transfer and mixing of surface waters from a variety of different sources (e.g., the water contained in Cross Creek [west of Visalia] may be from the Kings River, the Kaweah River, the Friant-Kern Canal [San Joaquin River water], Cottonwood Creek or a mixture of these waters).

The Tulare Lake Basin Area includes all or portions of 17 groundwater basins/sub-basins (Figure 2).; however, the majority of irrigated agricultural activities occur in the Central Valley, with minor or no activity in the smaller basins within the surrounding Sierra Nevada, Tehachapi Mountains, and Coast Ranges.

Sediments in the eastern part of the Central Valley are derived from crystalline granitic rocks of the Sierra Nevada. The sediments typically consist of highly permeable medium- to coarse-grained sands with low total organic carbon, and form broad alluvial fans where the streams enter the valley. These deposits generally are coarsest near the upper parts of the alluvial fans and finest near the valley trough (Page, 1986). The alluvial deposits of the western part of the valley are derived from the marine sedimentary deposits that comprise the Coast Ranges and tend to be of finer texture relative to those of the eastern part of the valley and have higher clay content. Lacustrine and marsh deposits exist beneath the Buena Vista, Kern and Tulare Lake beds and along the western flank of the valley. These deposits are composed primarily of silts and clays with sand interbeds. The most laterally continuous of these units have been designated from the youngest to oldest by the letters A through F. The most prominent of these clay units is the modified E Clay or Corcoran Clay Member of the Tulare Formation (Corcoran Clay) which extends throughout the majority of western and southern Tulare Lake Basin (absent along the eastern boundary and in the Bakersfield area). The Corcoran Clay generally separates unconfined groundwater conditions above the clay from confined conditions below the clay (Figure 3). This results in two zones with distinctly different groundwater chemistries (Page, 1968).

Groundwaters containing high total dissolved solids (TDS) concentrations are found primarily along the west side of the San Joaquin Valley and in the trough of the valley. High TDS content of west-side water is due to recharge of stream flow originating from marine sediments in the Coast Range, and percolation from irrigation and rainfall events passing through soils derived from marine sediments. High TDS content in the trough of the valley is the result of concentration of salts due to evaporation and poor drainage (DWR, California's Groundwater Update, 2003). In the central and west-side portions of the valley, where the Corcoran Clay confining layer exists, water quality is generally better beneath the clay than above it.

Primary sources of groundwater recharge in the Tulare Lake Basin Area include percolation of irrigation water; seepage from rivers, streams, and irrigations canals; rainfall infiltration; and in the area near Fresno, Visalia, and Bakersfield, engineered recharge primarily of runoff from the nearby Sierra Nevada (California Department of Water Resources, Bulletin 118, 2003 update; Wright and others, 2004). Discharge from the aquifer is primarily from ground-water pumping for irrigation and public water supply. Until recently, Fresno and Visalia were entirely dependent on groundwater for their supply, and Fresno was the second largest city in the U.S. reliant solely on groundwater (California Department of Water Resources, Bulletin 118, update 2003). Many public water supply systems within the Tulare Lake Basin Area remain totally dependent on groundwater for drinking water.

The top ten crops based on 2010 total harvested acreage in the Tulare Lake Basin are (listed in decreasing order): hay, grains (includes barley, wheat, rice and corn), grapes (table and wine), almonds, cotton, citrus, tomatoes, pasture, stone fruit (includes peaches, apricots, cherries, nectarines, plums, and pluots), and pistachios. This list includes the acreage in the Westlands coalition, so does not necessarily represent the top ten crops for the Tulare Lake Basin Area covered by this Order. There were over 100 crops grown in the Tulare Lake Basin Area watershed in 2010.

Southern San Joaquin Valley Water Quality Coalition (SSJVWQC) Organization

The SSJVWQC submitted a Notice of Intent in October 2003 and received a Notice of Applicability (NOA) from the Executive Officer in 2004. The NOA approved the SSJVWQC's request to operate as a lead entity under the previous Coalition Group Conditional Waiver within its boundaries. Similar to the Coalition Group Conditional Waiver, this Order has been written for a third-party to provide a lead role in conducting monitoring, educating member growers (Members), developing water quality management plans, and interacting with the Central Valley Water Board on behalf of Members. Due to a substantial number of new requirements, this Order requires that the third-party submit a new application to serve as a third-party representing growers under this Order if it chooses to continue representing Members. This Order will apply to any third-party within the Tulare Lake Basin Area that receives a NOA from the Executive Officer.

Buena Vista Water Quality Coalition Organization

The Buena Vista Water Quality Coalition submitted a Notice of Intent in June 2013 and received a Notice of Applicability (NOA) from the Executive Officer in June 2013. The NOA approved the Buena Vista Coalition's request to operate as a lead entity under the previous Coalition Group Conditional Waiver within its boundaries. Similar to the Coalition Group Conditional Waiver, this Order has been written for a third-party to provide a lead role in conducting monitoring, educating member growers (Members), developing water quality management plans, and interacting with the Central Valley Water Board on behalf of Members. Due to a substantial number of new requirements, this Order requires that the third-party submit a new application to serve as a third-party representing growers under this Order if it chooses to continue representing Members. This Order will apply to any third-party within the Tulare Lake Basin Area that receives a NOA from the Executive Officer.

Grower Enrollment Process

The enrollment process whereby growers obtain membership in the third-party group under this Order is designed to incentivize speedy enrollment by increasing both submittal requirements and fees due for those who wait to obtain regulatory coverage. Members in good standing when the Order is adopted, as well as growers needing membership, will have a 180-day period (after the NOA is issued by the Executive Officer for the third-party) to complete enrollment before additional requirements are initiated. Members in good standing will submit a one-page Notice of Confirmation (NOC) to the third-party, confirming that they would like to continue membership in the third-party and that they are familiar with the new Order's requirements. Other growers will submit a membership application to the third-party and will be notified by the third-party when their membership is approved. This will streamline the initial enrollment process for the bulk of the irrigated agricultural operations within the Tulare Lake Basin Area.

Growers that do not enroll within the 180-day enrollment period, or are prompted to apply due to Central Valley Water Board enforcement or inspection, will be required to submit (1) a Notice of Intent (NOI) to comply with the terms and conditions of the Order to the Central Valley Water Board, (2) an administrative processing fee for the increased workload associated with the grower outreach (as applicable), and (3) a Membership application to the third-party group. These additional steps of submitting an NOI and fee directly to the board after the initial enrollment deadline are intended to provide an incentive for growers to enroll promptly.

The third-party will provide an annual Membership List to the Central Valley Water Board that will include everyone who enrolled. The Membership List will specify Members in good standing as well as revoked memberships or pending revocations. Central Valley Water Board staff will conduct enforcement activities as needed using the list of revoked/pending revocations.

Groundwater Quality Vulnerability

The concept of higher and lower vulnerability areas was integrated into the Order to allow the Central Valley Water Board to tailor requirements to applicable waste discharge conditions. Resources can be focused on areas that need enhanced water quality protection, because the third-party has the option to identify low vulnerability areas where reduced program requirements would apply.

Vulnerability may be based on, but is not limited to, the physical conditions of the area (soil type, depth to groundwater, beneficial uses, etc.), water quality monitoring data, and the practices used in irrigated agriculture (pesticide permit and use conditions, label requirements, application method, etc.). Additional information such as models, studies, and information collected may also be considered in designating vulnerability areas.

High vulnerability areas for groundwater are those areas that meet the requirements for preparing a Groundwater Quality Management Plan or areas identified in the Groundwater Quality Assessment Report (GAR), where available information indicates irrigated lands could cause or contribute to an exceedance of water quality objectives or to degradation of groundwater quality that may threaten applicable beneficial uses. The GAR may rely on water quality data to identify high vulnerability areas or may rely on assessments of hydrogeological conditions and other factors (e.g., areas with coarse-grained sediments) to identify high vulnerability areas. The third-party is also expected to review readily available studies and assessments of groundwater quality to identify those areas that may be impacted by irrigated agricultural operations. Examples of assessments that the third-party should review include: the Department of Pesticide Regulation (DPR) Ground Water Protection Areas and the State Water Resources Control Board (State Water Board) Hydrogeologically Vulnerable Areas.

In general, low vulnerability areas for groundwater are areas that do not exhibit characteristics of high vulnerability groundwater areas (as defined in Attachment B, Monitoring and Reporting Program [MRP] Order R5-2013-0120).

Vulnerability designations will be proposed by the third-party, based on the high and low vulnerability definitions provided in Attachment E of the Order. Vulnerability designations will be refined and updated periodically per the GAR and Monitoring Report processes (described in the MRP). The Executive Officer will make the final determination regarding the irrigated lands waste discharge vulnerability areas.

Surface Water and Groundwater Monitoring

Surface Water Quality Monitoring

Irrigated Lands Regulatory Program (ILRP) – Surface Water Quality Monitoring

The SSJVWQC has been operating under a Monitoring and Reporting Program Plan (MRP Plan) prepared according to the Monitoring and Reporting Program Order R5-2008-0005 (previous MRP Order) for Coalition Groups under the amended Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Order R5-2006-0053. The MRP Plan, together with the SSJVWQCs approved Management Plans (described below), provide Order specific information/details necessary for the development of a work plan for the monitoring and reporting program, including: environmental monitoring, quality assurance and quality control, outreach, and tracking and reporting on progress.

The previous MRP Order (R5-2008-0005), the SSJVWQC required three types of water quality monitoring: Core, Assessment, and Special Project. Core monitoring was designed to evaluate general water quality trends over time at the Core sites and included general physical parameters, nutrients, and pathogens. Assessment monitoring rotated through Assessment sites and included analyses for a large suite of constituents. Core monitoring sites underwent Assessment monitoring every three years. Special Project monitoring occurred when the requirement for a management plan was triggered and additional data were needed to identify sources of the exceedances, as well as to assess water quality improvement due to implementation of management practices.

The basic questions to be answered by the updated surface water quality monitoring program are similar to those established under the previous MRP Order (R5-2008-0005):

1) Are receiving waters to which irrigated lands discharge meeting applicable water quality objectives and Basin Plan provisions?
2) Are irrigated agricultural operations causing or contributing to identified water quality problems?[4] If so, what are the specific factors or practices causing or contributing to the identified problems?
3) Are water quality conditions changing over time (e.g., degrading or improving as new management practices are implemented)?
4) Are irrigated agricultural operations of Members in compliance with the provisions of the Order?
5) Are implemented management practices effective in meeting applicable receiving water limitations?
6) Are the applicable surface water quality management plans effective in addressing identified water quality problems?

The questions are addressed in the current program through the following monitoring and information gathering approaches:

1) The “Core”, “Assessment”, “Ephemeral”, and “Representative” monitoring sites comprehensively cover the sections of the Tulare Lake Basin Area with irrigated agricultural operations. The requirement to evaluate materials applied to crops or constituents mobilized by irrigated agricultural operations will result in monitoring of those constituents in receiving waters. The monitoring sites selected by the third-party must be fully representative of the effects of irrigated agricultural waste discharges on all receiving waters within the Tulare Lake Basin (in consideration of potential discharge constituents, hydrogeological conditions, and other relevant factors). So as, when taken together, all Tulare Lake Basin surface waters with the potential to receive irrigated agricultural

[4] “Water quality problem” is defined in Attachment E.

wastes must be monitored or represented by surface water monitoring sites. The Order requires that any monitoring and follow-up actions (e.g., implementation of practices) triggered by results from a monitoring site will apply to irrigated agricultural operations in the represented upstream watershed, as well as all irrigated agricultural operations represented by that monitoring site. Through representative site selection and appropriate water quality monitoring, potential impacts to all surface water bodies accepting Member waste discharges are monitored to determine compliance with the Order's conditions;

2) The monitoring and evaluation approach required as part of surface water quality monitoring and management plan development and implementation will address this question (see below and the requirements associated with surface water quality management plans);

3) Both "Special Project" monitoring associated with management plans and the monitoring conducted at "Core" monitoring sites should be sufficient to allow for the evaluation of trends. The requirements to gather information on management practices will provide additional information to help estimate whether any changes in trends may be associated with the implementation of practices;

4) As described in point 1 above, the monitoring sites selected must be fully representative of the effects of irrigated agricultural waste discharges on surface waters within the Tulare Lake Basin. Therefore, the surface water monitoring required will allow for a determination as to whether discharges from irrigated lands are protective of beneficial uses and meeting water quality objectives. Other provisions in the MRP will result in the gathering of information that will allow the Central Valley Water Board to evaluate overall compliance with the Order;

5) Evaluation of the monitoring data collected under the Surface Water Monitoring Plan, in addition to any Special Project monitoring required by the Executive Officer, will allow the Central Valley Water Board to determine whether management practices representative of those implemented by irrigated agriculture are effective. In addition, information developed through studies outside of these requirements can be used to evaluate effectiveness; and

6) The monitoring associated with management plans will be tailored to the specific constituents of concern and the time period when they are impacting water quality. Under these plans additional monitoring is required to track effectiveness of the plan and the effectiveness of new practices implemented by Members in achieving compliance with the Order's receiving water limitations. This monitoring must be representative of the irrigated agricultural waste discharges that are potential sources of the water quality problem. Therefore, the water quality data gathered, together with management practice information, will be sufficient to determine whether the management plans are effective.

The surface water monitoring required by this Order's Monitoring and Reporting Program R5-2013-0120 (MRP) has been developed using the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Order R5-2006-0053), its associated Monitoring and Reporting Program Order R5-2008-0005, and the SSJVWQC's November 2009 conditionally approved MRP Plan as a foundation. However, a number of changes were made to address Tulare Lake Basin Area specific conditions and to improve the cost-effectiveness of the surface water monitoring effort while ensuring that the data collected are the most appropriate for answering the monitoring questions.

The primary changes were to: 1) eliminate the set frequency for monitoring; 2) eliminate the set parameter list for metals and pesticides; 3) continue monitoring of exceeded Assessment parameters during Core monitoring; and 4) add Ephemeral monitoring to better conform to the unique conditions within the Tulare Lake Basin Area.

The rationale for the above changes is as follows:

1) The previous requirement to monitor monthly resulted in monitoring during months in which no problems would be expected and infrequent monitoring during peak periods when potential problems could occur. The third-party will be required to evaluate pesticide use patterns and peak times when pesticides/metals from irrigated agriculture operations may cause problems in surface water. Based on that evaluation, the third-party will propose a frequency and time period to conduct monitoring that will adequately characterize surface waters receiving irrigated agricultural waste discharges;
2) The set list of parameters resulted in monitoring of some pesticides and metals that are unlikely to result in water quality problems. Also, in some cases pesticides that could be discharged and cause or contribute to a water quality problem were not monitored. The third-party will be required to evaluate use patterns and properties (e.g., physical-chemical characteristics) and propose a list of metals to monitor. Central Valley Water Board staff will work with DPR to develop a list of pesticides for monitoring by the third-party;
3) The previous requirement for Core monitoring did not include provisions for continued monitoring of Assessment parameters (pesticides and metals) that exceeded a water quality objective or trigger limit during the preceding Assessment monitoring period. This lack of information during Core monitoring limits the ability to evaluate water quality trends over time, which is needed to assess the effectiveness of management practices that may reduce or eliminate discharges contributing to the exceedance. In addition, continued monitoring of exceeding Assessment parameters during Core monitoring may be needed to trigger a Management Plan if discharges of the exceeding constituent are only prevalent within a single month. The previous requirements would not re-analyze the exceeding constituent until the following Assessment period, which is outside of the three-year timeframe for triggering a Management Plan; and
4) The addition of Ephemeral monitoring will address the unique nature of the Tulare Lake Basin Area's surface water systems which include heavily modified natural waterways, a large number of controlled constructed water conveyance features (canals), and the general ephemeral nature of the majority of the regions streams.

This Order's MRP requires the development of a Surface Water Monitoring Plan which will utilize four different but interrelated types of surface water monitoring sites: 1) fixed, long-term Core sites (as in the previous program), 2) Assessment sites (previous program), 3) Ephemeral sites (new), 4) Special Project sites (previous program), and the use of Representative monitoring (previous program). The addition of Ephemeral monitoring and the continuation of the requirement to develop new Assessment sites are based upon unique differences that exist between the various types of surface waterways present in the Tulare Lake Basin Area.

Types of waterways include:

1) Perennial streams (flows continuously throughout the year) which include portions of the Kings, Kaweah, Tule, and Kern rivers;
2) Intermittent streams (streams that flow only certain times of the year) such as Packwood Creek or Deer Creek or the lower portions of the Kaweah and Tule River systems (these natural or modified natural waterways are typically used during a portion of each year as conveyance structures for irrigation flows [primarily derived from the Friant-Kern Canal] or storm water flows/groundwater recharge flows);
3) Ephemeral streams (a stream which carries water only during and immediately after periods of precipitation or snow melt); and
4) Constructed conveyance structures (e.g., Friant-Kern Canal, Homeland Canal, Lakeside Ditch, and Westside Canal) which are used to move waters of the state throughout the region (not intended to

apply to on farm conveyance structures) for irrigation purposes and have the potential to be impacted by agricultural operations (spray drift, tailwater, tile drainage, or storm water flows).

Core Monitoring

Core monitoring sites will continue to be used to track trends in water quality over time. The three-year period of monitoring for Core sites remains the same as the previous monitoring schedule, with each Core site being sampled on a rotating basis consisting of one year of Assessment monitoring parameters followed by two years of Core monitoring parameters, with the cycle then repeated. In addition to the required Core monitoring parameters provided in the Monitoring and Reporting Program, Core monitoring sites will also be monitored for any parameters that exceeded a water quality objective or trigger limit during the preceding Assessment monitoring period through the first year of Core monitoring. The frequency of monitoring (monthly, irrigation season/storm season or other) will now be proposed by the third-party for each Core site (for both Core and Assessment parameters). The proposed frequency is to be based upon site conditions (presence or absence of surface water or change in the source of water [natural stream flow vursus irrigation waters introduced into the channel from off stream reservoirs or canals], crop types [permanent crops, row crops, etc.] and crop requirements [timing of irrigation, timing of nutrient and pesticide applications]). This approach will ensure that each Core site will undergo periodic comprehensive Assessment monitoring necessary to allow Central Valley Water Board to track and identify any significant changes, while still gathering trend information and not imposing an undue cost burden.

Assessment Monitoring

Assessment monitoring will be conducted for the period of one year at all newly established sites. The monitoring will be repeated on a regular basis with the period of rotation to be proposed by the third-party. Rotation will be continuous so that any given water body will be reassessed on a regular basis. This strategy will allow for the characterization of a large number of water bodies throughout the third-party area over time. Regardless of the rotation frequency, the third-party must choose sites that are representative to ensure characterization of all similar surface water bodies receiving irrigated agricultural wastes within the third-party area. Representative Assessment sites will be selected considering similarities in hydrology, crop types, pesticide use, and other factors that affect the discharge of wastes from irrigated lands to surface waters.

Ephemeral Monitoring

A large number of ephemeral streams that may be impacted by agricultural operations (e.g., spray drift, tailwater flows, and/or storm water runoff) are present in the western, eastern and southern portions of the Tulare Lake Basin Area. Because ephemeral waterways are typically dry for extended periods of time (in some cases for multiple years), ephemeral monitoring will be conducted monthly, whenever surface water is present. Due to the large number of ephemeral waterways, monitoring may be most effectively accomplished using representative monitoring sites. The number and locations of sites chosen for representative ephemeral monitoring will be proposed by the third-party group.

Special Project Monitoring

Special Project Monitoring sites will be established as needed to implement a Surface Water Quality Management Plan (SQMP), to evaluate commodity or management practice-specific effects on identified water quality problems,[5] to evaluate sources of identified water quality problems, and to provide feedback on whether the SQMP actions are achieving the Order’s receiving water limitations.

Representative Monitoring

A representative monitoring strategy may be used by the third party to create an effective monitoring plan that allows monitoring of all surface waters of the State within the boundaries of the third party area. Although representative monitoring may be most effective in addressing monitoring requirements on

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[5] “Water quality problem” is defined in Attachment E.

ephemeral streams, it may also be useful in designing a surface water plan that incorporates new sites for Assessment and Core monitoring.

Surface Water Quality Management Plans

Since 2004, the SSJVWQC has collected surface water quality monitoring data at 41 monitoring sites. Under Conditional Waiver Order R5-2006-0053, twenty-four SQMPs were required for waterways where there was an exceedance of a water quality objective or trigger limit[6] more than one time in a three-year period. There are currently SQMPs required for the following water quality characteristics, constituents, or toxicity: pH, electrical conductivity, dissolved solids, dissolved oxygen, E. coli, fecal coliform, boron, molybdenum, chlorpyrifos, DDE, toxaphene, Ceriodaphnia dubia, Pimephales promelas, Selenastrum capricornutum, and Hyalella azteca. Some of the SSJVWQC's Management Plans have been approved, and some are under Central Valley Water Board staff review. This Order requires that currently approved Management Plans continue to be implemented, and any additional required Management Plans be completed, implemented, and updated once approved.

Similar to the previous Order (Coalition Group Conditional Waiver), this Order requires the third-party to develop SQMPs for watersheds where there is an exceedance of a water quality objective or trigger limit more than one time in a three-year period. SQMPs may also be required where there is a trend of degradation that threatens a beneficial use. SQMPs are the key mechanism under this Order to help ensure that waste discharges from irrigated lands are meeting Surface Water Discharge Limitation III.A.1. The limitations apply immediately unless the Member is implementing a SQMP in accordance with an approved time schedule. The SQMP will include a schedule and milestones of the implementation of management practices (see Appendix MRP-1).The schedule must identify the time needed to identify new management practices necessary to meet the receiving water limitation, as well as a timetable for implementation of identified management practices. The SQMP will include a schedule for implementing practices that are known to be effective protecting surface water quality. The SQMP must also identify an approach for determining the effectiveness of the implemented management practices in protecting surface water quality.

The main elements of SQMPs are to A) investigate potential irrigated agriculture sources of waste discharge to surface water; B) review physical setting information for the plan area such as existing water quality data; C) considering elements A and B, develop a strategy with schedule and milestones to implement practices to ensure waste discharges from irrigated agriculture are meeting Surface Water Limitation III.A.1; D) develop a monitoring strategy to provide feedback on SQMP progress; E) develop methods to evaluate data collected under the SQMP; and F) provide annual reports to the Central Valley Water Board on progress.

Elements A – F are necessary to establish a process by which the third-party and Central Valley Water Board are able to investigate waste sources and the important physical factors in the plan area that may impact management decisions (elements A and B), implement a process to ensure effective practices are adopted by Members (element C), ensure that adequate feedback monitoring is conducted to allow for evaluation of SQMP effectiveness (elements D and E), and facilitate efficient Central Valley Water Board review of data collected on the progress of the SQMP (element F).

The SQMPs required by this Order require the third-party to include the above elements. SQMPs will be reviewed and approved by the Executive Officer. Also, because SQMPs may cover broad areas potentially impacting multiple surface water users in the plan area, these plans will be circulated for public review. Prior to plan approval, the Executive Officer will consider public comments on proposed SQMPs.

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[6] Trigger limits are discussed below under "Water Quality Objectives."

The burden of the SQMP, including costs, is reasonable. The Central Valley Water Board must be informed of the efforts being undertaken by irrigated agricultural operations to address identified surface water quality problems. In addition, a regional SQMP is a reasonable first step to address identified surface water quality problems, since the monitoring and planning costs are significantly lower, when undertaken regionally by the third-party, than requiring individuals to undertake similar monitoring and planning efforts. However, if the regional SQMP does not result in the necessary improvements to water quality, the burden, including costs, of requiring individuals in the impacted area to conduct monitoring, describe their plans for addressing the identified problems, and evaluate their practices is a reasonable subsequent step. The benefits and necessity of such individual reporting, when regional efforts fail, include, but are not limited to: 1) the need of the Central Valley Water Board to evaluate the compliance of regulated growers with applicable orders; 2) the need of the Central Valley Water Board to understand the effectiveness of practices being implemented by regulated growers; and 3) the benefits to all users of that surface water of improved water quality.

Groundwater Quality

Groundwater Monitoring Advisory Workgroup

The Groundwater Monitoring Advisory Workgroup (GMAW) consists of groundwater experts representing state agencies, the United States Environmental Protection Agency (USEPA), the United States Geological Survey (USGS), academia, and private consultants. The following questions were identified by the GMAW and Central Valley Water Board staff as critical questions to be answered by groundwater monitoring conducted to comply with the ILRP.

1) What are irrigated agriculture's impacts to the beneficial uses of groundwater and where has groundwater been degraded or polluted by irrigated agricultural operations (horizontal and vertical extent)?
2) Which irrigated agricultural management practices are protective of groundwater quality and to what extent is that determination affected by site conditions (e.g., depth to groundwater, soil type, and recharge)?
3) To what extent can irrigated agriculture's impact on groundwater quality be differentiated from other potential sources of impact (e.g., nutrients from septic tanks or dairies)?
4) What are the trends in groundwater quality beneath irrigated agricultural areas (getting better or worse) and how can we differentiate between ongoing impact, residual impact (vadose zone) or legacy contamination?
5) What properties (soil type, depth to groundwater, infiltration/recharge rate, denitrification/ nitrification, fertilizer and pesticide application rates, preferential pathways through the vadose zone [including well seals, abandoned or standby wells], contaminant partitioning and mobility [solubility constants]) are the most important factors resulting in degradation of groundwater quality due to irrigated agricultural operations?
6) What are the transport mechanisms by which irrigated agricultural operations impact deeper groundwater systems? At what rate is this impact occurring and are there measures that can be taken to limit or prevent further degradation of deeper groundwater while we're identifying management practices that are protective of groundwater?
7) How can we confirm that management practices implemented to improve groundwater quality are effective?

The workgroup members reached consensus that the most important constituents of concern related to agriculture's impacts to the beneficial uses of groundwater are nitrate (NO_3-N) and salinity. In addition to addressing the widespread nitrate problems, the presence of nitrates in groundwater at elevated levels would serve as an indicator of other potential problems associated with irrigated agricultural practices. Central Valley Water Board staff utilized the recommended salinity and nitrate parameters and added general water quality parameters contained within a majority of the groundwater monitoring programs administered by the Central Valley Water Board (commonly measured in the field) and some general minerals that may be mobilized by agricultural operations (general minerals to be analyzed once every five years in Trend wells). The general water quality parameters will help in the interpretation of results and ensure that representative samples are collected. The Central Valley Water Board considered the above questions in developing the Order's groundwater quality monitoring and management practices assessment, and evaluation requirements.

Groundwater Quality Monitoring and Management Practice Assessment, and Evaluation Requirements

The groundwater quality monitoring, assessment, and evaluation requirements have been developed in consideration of the critical questions developed by the Groundwater Monitoring Advisory Workgroup (listed above). The third-party must collect sufficient data to describe irrigated agricultural impacts on groundwater quality and to determine whether existing or newly implemented management practices comply with the groundwater receiving water limitations of the Order. The strategy for evaluating groundwater quality and protection consists of: 1) a Groundwater Quality Assessment Report (GAR), 2) a Management Practices Evaluation Program, and 3) a Groundwater Quality Trend Monitoring Program.

The general purpose of the GAR is to analyze existing monitoring data and provide the foundation for designing the Management Practices Evaluation Program and the Groundwater Quality Trend Monitoring Program, as well as identifying high vulnerability groundwater areas where a groundwater quality management plan must be developed and implemented.

A Management Practices Evaluation Program (MPEP) is to be developed where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities (high vulnerability areas). The purpose of the MPEP is to identify whether existing site-specific and/or commodity-specific agricultural management practices are protective of groundwater quality in the high vulnerability areas and to assess the effectiveness of any newly implemented management practices instituted to improve groundwater quality. Given the wide range of management practices/commodities within the third-party's boundaries, it is anticipated that the third-party will rank or prioritize it's high vulnerability areas and commodities, and present a phased approach to implementing the MPEP. The MPEP must be designed to answer GMAW questions 2, 5, 6, and 7. Where applicable, management practices identified as protective of groundwater quality through the MPEP (or equivalent practices) must be implemented by Members, whether the Member is in a high or low vulnerability area (see section IV.B.21 of the Order).

Since the focus of the MPEP is answering the questions related to management practices, the method or tools to be used are not prescribed by the Central Valley Water Board. The third-party is required to develop a workplan that describes the tools or methods to be used to associate management practice activities on the land surface with the effect of those activities on underlying groundwater quality. The Central Valley Water Board anticipates that the MPEP workplan will likely propose using a variety of tools, such as vadose zone monitoring, modeling, and groundwater monitoring. The third-party has the option of developing the workplan as part of a group effort that may include other agricultural water quality coalitions and commodity groups. Such a joint effort may avoid duplication of effort and allow collective resources to be more effectively focused on the highest priority studies, while ensuring the goals of the MPEP are met. Existing monitoring wells can be utilized where available for the MPEP.

The trend monitoring program is designed to determine current water quality conditions of groundwater in the third-party area, and to develop long-term groundwater quality information that can be used to evaluate the regional effects (i.e., not site-specific effects) of irrigated agriculture and its practices. Trend monitoring has been developed to answer GMAW questions 1 and 4. At a minimum, trend monitoring must include annual monitoring for electrical conductivity, pH, dissolved oxygen, temperature, nitrate as nitrogen (N), and once every five year monitoring for total dissolved solids, carbonate, bicarbonate, chloride, sulfate, boron, calcium, sodium, magnesium, and potassium. Existing shallow wells, such as domestic supply wells, will be used for the trend groundwater monitoring program. The use of existing wells is less costly than installing wells specifically designed for groundwater monitoring, while still yielding data which can be compared with historical and future data to evaluate long-term groundwater trends.

As the management practices identified as protective of groundwater quality through the MPEP are implemented, the trend monitoring, together with other data included in updates to the GAR, should show improvements in water quality. The trend monitoring and GAR updates will, therefore, provide a regional view as to whether the collective efforts of Members are resulting in water quality improvements. If groundwater quality trends indicate degradation in low vulnerability areas, then a Groundwater Quality Management Plan must be developed and implemented. Negative trends of groundwater quality in high vulnerability areas over time would be an indicator that the existing Groundwater Quality Management Plan is not effective or is not being effectively implemented.

The third party may also look to and explore using existing monitoring networks such as those being conducted in accordance with local groundwater management plans (e.g., AB 3030, SB 1938, Integrated Regional Water Management Plans).

GMAW question 3, which seeks to differentiate sources of existing impact, cannot be easily answered by traditional groundwater monitoring. The MPEP and trend monitoring will help to answer this question, but other methods such as isotope tracing and groundwater age determination may also be necessary to fully differentiate sources. The MRP does not require these advanced source methods because they are not necessary to determine compliance with the Order. The MPEP will be used to help determine whether waste discharge at represented sites is of high enough quality to meet the groundwater limitations of the Order.

Through the MPEP, the potential impacts of irrigated agriculture waste discharges to groundwater will be assessed for different types of practices and site conditions, representative of discharge conditions throughout the Tulare Lake Basin Area. In this way, the board will evaluate whether waste discharges from irrigated agricultural operations are protective of groundwater quality throughout the Tulare Lake Basin Area. Where the MPEP finds that additional “protective” practices must be implemented in order to ensure that Member waste discharges are in compliance with the Order’s receiving water limitations, the Order requires Members to implement such practices, or equivalent practices. This representative MPEP process will ensure that the effects of waste discharges are evaluated and where necessary, additional protective practices are implemented.

Data Summary, Pesticides

Monitoring data collected for two studies conducted by the State Water Resources Control Board (State Water Board) and the United States Geological Survey (USGS) in 2006 showed detections of pesticides used by agriculture in groundwater within the Tulare Lake Basin Area (Burton, and Belitz, , 2006), and (Shelton, et al., 2006). Pesticides and pesticide degradates were detected in greater than 50 percent of wells (46 wells of 83 wells sampled) in the southeastern San Joaquin Valley (study area entirely contained within the Tulare Lake Basin Area) in 2006, and 60 percent of wells (30 wells of 50 wells samples) in the Kern County Subbasin Study Unit in 2006. Most frequently detected pesticides in the studies include deethylatrazine (degradate of triazine herbicides, e.g., atrazine), simazine, atrazine, 3,4-Dichloroaniline (degradate of Diuron herbicide), DBCP, and prometron (triazine herbicide). Most pesticide detections were below health-based thresholds and applicable water quality objectives. Analyses were not run for all pesticides used in the study areas.

The California Department of Pesticide Regulation (DPR), as part of its regulatory requirements under the Pesticide Contamination Prevention Act (PCPA) enacted in 1985, is required to maintain a statewide database of wells sampled for pesticide active ingredients and, in consultation with the California

Department of Public Health (DPH) and the State Water Board, provide an annual report of the data contained in the database and the actions taken to prevent pesticides contamination to the Legislature and other state agencies. DPR also initiated the Ground Water Protection Program that focuses on evaluating the potential for pesticides to move through soil to groundwater, improving contaminant transport modeling tools, and outreach/training programs for pesticide users. There are approximately 981,775 acres of land classified as DPR Groundwater Protection Areas within the Tulare Lake Basin Area (See Figure 4). These data will be evaluated by the third-party as part of its Groundwater Quality Assessment Report.

DPR has developed a groundwater monitoring system consisting of 75 domestic water wells located in Tulare and Fresno counties in areas that have been identified as being susceptible to the movement of pesticides to groundwater (based on soil type and average depth to groundwater). The wells are divided between coarse-grained sections (leaching areas) and hardpan sections (runoff areas) and are allotted in the following manner: 33 wells in Fresno County coarse soil sections, 18 wells in Fresno County hardpan soil sections, 3 wells in Tulare County coarse soil sections, and 21 wells in Tulare County hardpan soil sections. All or a portion of these wells have been sampled once to twice yearly since 1999. The most recent sampling for which results are available (68 wells sampled in March and April of 2011) detected simazine in 70% of wells sampled and its degradation products, ACET and DACT, in nearly all the wells. All concentrations were at low levels (less than one part per billion) and did not exceed California Department of Public Health maximum contaminant levels. Diuron was found in 22% of the wells sampled at concentrations less than one part per billion and bromacil was present in 21% of wells with two wells exceeding one part per billion (DPR, 2012). Like simazine, diuron and bromacil are pre-emergence herbicides.

DPR's current groundwater quality monitoring program should be sufficient to identify any emerging pesticides of concern and to track water quality trends of identified pesticides of concern. However, the presence of pesticides in groundwater indicates a discharge of waste subject to Central Valley Water Board regulation. Therefore, should the Central Valley Water Board or DPR identify groundwater quality information needs related to pesticides in groundwater, the Central Valley Water Board may require the third-party to conduct studies or implement a monitoring plan to address those information needs. Where additional information collected indicates a groundwater quality problem, a coordinated effort with DPR to address the identified problem will be initiated and the Central valley Water Board may require the third party to develop a groundwater quality management plan (GQMP).

Data Summary Nitrates

Nitrate derived from both agricultural and non-agricultural sources has resulted in degradation of groundwater beneath large areas within California's Central Valley. In attempting to evaluate this issue, the State Water Board, Division of Clean Water Program, Groundwater Special Studies Unit, produced a *"Draft Groundwater Information Sheet, Nitrate/Nitrite"* in October 2002. The draft information sheet was produced to provide general information regarding nitrate in groundwater and it used the California Department of Health Services (DHS) data for public supply wells to identify wells that exceeded the MCL for nitrate. Approximately 16,000 public supply wells were sampled; of these, 616 wells were identified as having nitrate concentrations above the MCL. Nitrate impacts in the Tulare Lake Basin Area (from south to north) appear as a discontinuous band of high nitrate groundwater extending northwestward from southern Kern County along the eastern side of the valley to the southern end of Madera County.

A Revised Groundwater Information Sheet for Nitrate/Nitrite was issued by the State Water Board in February 2008. The revised information sheet utilized California Department of Public Health data from 1994 forward to evaluate nitrate impacts in approximately 15,000 active and standby public drinking water wells throughout California. Eight hundred and fifty two (852) wells were identified as having nitrate concentrations above the MCL value. The band of impacted groundwater observed in the 2002 study is shown to have broadened and forms a more continuous arc from Bakersfield northward into southern Madera County.

In 2003, the United States Geological Survey (USGS) prepared a report entitled *Framework for a Ground-Water Quality Monitoring and Assessment Program for California* (GAMA). The report cites Assembly Bill 599, ("Ground-Water Quality Monitoring Act of 2001") as identifying the need for developing and maintaining a monitoring program to assess the quality of California's groundwater. The major groundwater supply basins are a specific focus of the GAMA program.

The GAMA program was divided into four projects: Priority Basin Project, Domestic Well Project, Special Studies Project, and GeoTracker GAMA Project. The Priority Basin Project was designed to provide a spatially unbiased assessment of raw groundwater quality within specific groundwater basins/sub-basins, as well as to provide a statistically consistent basis for comparing water quality between basins throughout California. Samples were collected from water supply wells in each basin/sub-basin using a randomized grid-based method to provide statistical representation of the study unit (grid wells). Additional wells were selected to evaluate changes in water chemistry along selected lateral or vertical groundwater flow paths in the aquifer (flow-path wells).

The results of the chemical analyses for nitrate in groundwater collected by the Priority Basin Project for the Tulare Lake Basin Area are as follows:

1. Kern County Sub-basin - 2 out of 17 samples had a nitrate concentration that exceeded the nitrate MCL value (sample set included 14 wells and 3 flow-path wells) and
2. Southeast San Joaquin Valley - 6 out of 44 samples had a nitrate concentration that exceeded the nitrate MCL value (28 wells and 16 flow-path wells). All six detections that exceeded the nitrate MCL value occurred in flow-path wells.

Figure 5 shows the nitrate concentrations obtained from the GAMA domestic well sampling program conducted in Tulare County. One hundred and eighty one (181) domestic wells were sampled; seventy five (75) of which exceeded the nitrate MCL value (41%).

The results of the National Water-Quality Assessment Program (NAWQA) and GAMA domestic well programs were combined by Bartholomay and others (2007) to produce a map of California depicting nitrate concentrations in groundwater within the Central Valley Aquifer.

In 2009, Ekdahl and others used GeoTracker GAMA to Investigate Nitrate Concentrations in California (Figure 6). The GeoTracker GAMA system is an online database that uses Google Maps and data bases generated by State and Regional Water Boards (SWRCB/RWQCB), California Department of Public Health (CDPH), Department of Pesticide Regulation (DPR), Department of Water Resources (DWR), United States Geological Survey (USGS), and Lawrence Livermore National Laboratory (LLNL). The GeoTracker GAMA system provides data for over 100,000 sampling locations and analytical results for a variety of constituents including nitrate.

A variety of investigators have looked at the San Joaquin Valley groundwater nitrate concentrations over time (Burow et al, 1998, 2007, and 2008; Rupert, 2008; and Rosen and Lapham, 2008). In 1995, NAWQA (Burow, et al 1998) resampled 30 domestic supply wells in the eastern San Joaquin Valley that had previously been sampled by the U.S. Geological Survey between 1986 and 1987. The median nitrate concentration for 23 of the 30 wells in 1986–87 was 2.4 mg/L, (seven wells had no nitrate sample data) and in 1995 the median concentration for the full 30 wells was 4.6 mg/L. Nitrate exceeded the MCL value in two wells in 1986-87 and in five wells in 1995.

In 2002, twenty nine of the original 30 domestic wells within the regional aquifer were resampled for the third time (Burow, et al, 2008). The median nitrate concentration for the resampled wells had risen from 2.3 mg/L in 1986-87 to 5.4 mg/L in 2003. Burow and others (2008) concluded that, *"The results of the analysis of regional- and local-scale nitrate concentration data indicate that widespread high concentrations of nitrate in the shallow part of the San Joaquin Aquifer system are likely to move to deeper parts of the ground-water flow system."*

The trend of nitrate concentrations in the shallow groundwater portion of the Eastern San Joaquin Study Area has also been investigated by means of focused studies utilizing monitoring wells in three geographical areas: near Fresno, near Modesto, and near the Merced River (Burow and Green, 2008). Nitrogen fertilizer data were coupled with the results of groundwater sampling to show that nitrate concentrations increased over time; corresponded to fertilizer application rates in all three focus study areas. Burow and Green (2008) reported that, *"Analysis using county-level nitrogen applications and a wide range of chemical data from sampling vertical monitoring well transects showed that reconstructed nitrate concentrations are consistent with 50% of the applied nitrogen reaching the water table."*

Burow and others (2007) produced a report that expanded upon the data evaluation for the focused study areas of the Eastern San Joaquin Study Area. This study reported that the nitrate concentrations in monitoring wells completed in the shallowest part of the aquifer increased in concentration from 8 to 23 mg/L as NO_3 during the period of time from 1994-1995 to 2003. Nitrate concentrations varied considerably with groundwater depth ranging from 2mg/L in the deepest monitoring wells to 30 to 40 mg/L in the shallow wells. This change in concentration verses depth is due in part to the age of the groundwater. Based upon chlorinated fluorocarbons concentrations (CFC), groundwater less than 10 meters (m) below the water table is approximately 15 years old. The mean age of groundwater deeper than 60m below the water table is approximately 45 years old (Burow et al, 2007). Burow and others concluded that,

> "Nitrate concentrations were highest and most variable in the shallow monitoring wells in the regional areal monitoring networks; the variability in nitrate concentrations and median values decreased with depth. Because of intensive pumping and irrigation recharge, the dominant groundwater flow paths in the aquifer system are vertically downward. High concentrations in the shallow part of the aquifer could be expected to move downward over time, which would result in increasing concentrations in the deeper domestic and public-supply wells in the future as water with high nitrate concentrations moves deeper in the groundwater system."

In March of 2012, Harter and others released a report entitled *Addressing Nitrate in California's Drinking Water* which was prepared for the State Water Board. The document focused on the Tulare Lake Basin and the Salinas Valley evaluating the nitrate concentrations for 100,000 groundwater samples from nearly 20,000 wells across the two regions. The report concluded that, "*Of the 20,000 wells, 2,500 are frequently sampled public water supply wells (over 60,000 samples). In these public supply wells, about 1 in 10 raw water samples exceed the nitrate MCL"*. The predominant source of the nitrate in groundwater was deemed to be agricultural fertilizers and animal waste applied to croplands.

The Harter and others (2012) report also provided an evaluation of household self-supplied and local small water supply systems in the Tulare Lake Basin and the Salinas Valley that are impacted by nitrate concentrations. The report found that,

> "Severely disadvantaged communities (SDACs) are particularly vulnerable to financial costs. Of 51 community public water systems (serving about 714,000 people) in the study area with a raw source exceeding the nitrate MCL, most systems (40, serving about 379,000 people) are in a DAC. Thirteen of the 40 exceeding systems are in

> unincorporated areas (serving about 167,000 people), and 27 are in incorporated communities (serving about 212,000 people)."

In February 2012, the State Water Board issued a draft report to the legislature: *Communities That Rely on Contaminated Groundwater*. This document reported that in Tulare County there are 41 communities that rely on contaminated groundwater, serving approximately 205,000 people, of which 99 percent are solely reliant on groundwater.

Hydrogeologically Vulnerable Areas

In 2000, the State Water Board created a map showing locations where published hydrogeologic information indicated conditions that may be more vulnerable to groundwater contamination. They termed these areas "Hydrogeologically Vulnerable Areas". The map identifies areas where geologic conditions allow recharge to underlying water supply aquifers at rates or volumes substantially higher than in lower permeability or confined areas of the same groundwater basin. The map does not include hydrogeologically vulnerable areas (HVAs) where local groundwater supplies occur mainly in the fractured igneous and metamorphic rocks which underlie the widespread mountain and foothill regions of the Sierra Nevada, or in permeable lava flows which may provide primary recharge for extensive but sparsely populated groundwater basins. See Figure 4 for a map of the HVA areas within the third-party region.

Groundwater Quality Management Plans (GQMPs)

Under this Order, groundwater quality management plans will be required where there are exceedances of water quality objectives, where there is a trend of degradation[7] that threatens a beneficial use, as well as for "high vulnerability groundwater areas" (to be designated by the third-party in the Groundwater Assessment Report based on definitions provided in Attachment E). Instead of development of separate GQMPs, the Order allows for the submittal of a comprehensive GQMP along with the Groundwater Assessment Report. GQMPs will only be required if irrigated lands may cause or contribute to the groundwater quality problem. GQMPs are the key mechanism under this Order to help ensure that waste discharges from irrigated lands are meeting Groundwater Receiving Water Limitation III.B. The limitations apply immediately unless the Member is implementing the GQMP in accordance with the approved time schedule. The GQMP will include a schedule and milestones for the implementation of management practices (see Appendix MRP-1). The schedule must identify the time needed to identify new management practices necessary to meet the receiving water limitations, as well as a timetable for implementation of identified management practices. The MPEP will be the process used to identify the effectiveness of management practices, where there is uncertainty regarding practice effectiveness under different site conditions. However, the GQMP will also be expected to include a schedule for implementing practices that are known to be effective in partially or fully protecting groundwater quality. For example, the ratio of total nitrogen available to crop consumption of nitrogen that is protective of water quality may not be known for different site conditions and crops. However, accounting for the amount of nitrate in irrigation supply water is known to be an effective practice at reducing the amount of excess nitrogen applied.

The main elements of GQMPs are to A) investigate potential irrigated agricultural sources of waste discharge to groundwater, B) review physical setting information for the plan area such as geologic factors and existing water quality data, C) considering elements A and B, develop a strategy with schedules and milestones to implement practices to ensure discharge from irrigated lands are meeting Groundwater Receiving Water Limitation III.B, D) develop a monitoring strategy to provide feedback on GQMP progress, E) develop methods to evaluate data collected under the GQMP, and F) provide reports to the Central Valley Water Board on progress.

[7] A trend in degradation could be identified through the required trend monitoring or through the periodic updates of the Groundwater Quality Assessment Report.

Elements A – F are necessary to establish a process by which the third-party and Central Valley Water Board are able to investigate waste sources and the important physical factors in the plan area that may impact management decisions (elements A and B), implement a process to ensure effective practices are adopted by Members (element C), ensure that adequate feedback monitoring is conducted to allow for evaluation of GQMP effectiveness (elements D and E), and facilitate efficient Central Valley Water Board review of data collected on the progress of the GQMP (element F).

This Order requires the third-party to develop GQMPs that include the above elements. GQMPs will be reviewed and approved by the Executive Officer. Also, because GQMPs may cover broad areas potentially impacting multiple groundwater users in the plan area, these plans will be circulated for public review. Prior to plan approval, the Executive Officer will consider public comments on proposed GQMPs.

In accordance with Water Code section 13267, the burden of the GQMP, including costs, is reasonable. The Central Valley Water Board must be informed of the efforts being undertaken by Members to address identified groundwater quality problems. In addition, a regional GQMP is a reasonable first step to address identified groundwater quality problems, since the monitoring and planning costs are significantly lower when undertaken regionally by the third-party than requiring individual Members to undertake similar monitoring and planning efforts. However, if the regional GQMP does not result in the necessary improvements to water quality, the burden, including costs, of requiring individual Members in the impacted area to conduct monitoring, describe their plans for addressing the identified problems, and evaluate their practices is a reasonable subsequent step. The benefits and necessity of such individual reporting, when regional efforts fail, include, but are not limited to: 1) the need of the Central Valley Water Board to evaluate the compliance of regulated Members with applicable orders; 2) the need of the Central Valley Water Board to understand the effectiveness of practices being implemented by Members; and 3) the benefits of improved groundwater quality to all users.

Templates for Farm Evaluation, Nitrogen Management Plan, Nitrogen Management Plan Summary Report, and Sediment and Erosion Control Plans

The Central Valley Water Board intends to provide templates (Farm Evaluation; Nitrogen Management Plan; Nitrogen Management Plan Summary Report; and Sediment and Erosion Control Plan) to all Members that must be used to comply with the applicable reporting requirements of this Order. In issuing Order R5-2012-0116, the Central Valley Water Board allowed agricultural water quality coalitions and commodity groups to jointly propose templates to be used to satisfy the requirements of Order R5-2012-0116. The Central Valley Water Board understands that the Southern San Joaquin Valley Water Quality Coalition and commodity groups in the Tulare Lake Basin are working with the East San Joaquin Water Quality Coalition to develop templates. The purposes of the templates are to collect information consistently across irrigated agricultural areas and commodities and to minimize the costs for growers to provide that information. Consistent information collection will facilitate analysis within a geographic area and across the Central Valley. Those purposes may not be met if the Central Valley Water Board includes provisions that allows for submittal of proposed templates under each third-party order issued as part of the long-term irrigated lands regulatory program. However, the Central Valley Water Board recognizes that templates may require minor modifications for different geographic areas. Therefore, although the third-party will not have an opportunity to develop new templates under this Order, the third-party will have an opportunity to provide comments on the templates' applicability to their geographic area.

Farm Evaluations

The Order requires that all Members complete a farm evaluation describing management practices implemented to protect surface and groundwater quality. The evaluation will also include information such as location of the farm, surface water discharge points, location of in service wells and abandoned wells and whether wellhead protection practices have been implemented.

The Order establishes prioritization for Member completion and updating of the evaluations based on farm size and whether the operation is within a high or low vulnerability area. Farm evaluations must be maintained at the Member's farming operations headquarters or primary place of business and submitted to the third-party for summary reporting to the Central Valley Water Board.

The farm evaluation is intended to provide the third-party and the Central Valley Water Board with information regarding individual Member implementation of the Order's requirements. Without this information, the Central Valley Water Board would rely solely on regional and representative surface and groundwater monitoring to determine compliance with water quality objectives. The representative monitoring cannot determine whether all Members are implementing protective practices, such as wellhead protection measures for groundwater. For groundwater protection practices, it may take years in many areas (even decades in some areas) before broad trends in groundwater may be measured and associated with implementation of this Order. Farm evaluations will provide assurance that Members are implementing management practices to protect groundwater quality while Groundwater Quality Trend Monitoring data and Management Practice Evaluation Program (MPEP) information are collected.

The reporting of practices identified in the farm evaluation will allow the third-party and Central Valley Water Board to effectively implement the MPEP. Evaluating management practices at representative sites (in lieu of farm specific monitoring) only works if the results of the monitored sites can be extrapolated to non-monitored sites. One of the key ways to extrapolate those results will be to have an understanding of which farming operations have practices similar to the site that is monitored. The reporting of practices will also allow the Central Valley Water Board to determine whether the GQMP is being implemented by Members according to the approved schedule.

In addition, reporting of practices will allow the third-party and Central Valley Water Board to evaluate changes in surface water quality relative to changes in practices. The SQMP will include a schedule and milestones for the implementation of practices to address identified surface water quality problems. The reporting of practices will allow the Central Valley Water Board to determine whether the SQMP is being implemented by Members according to the approved schedule. Absent information on practices being implemented by Members, the Central Valley Water Board would not be able to determine whether individual Members are complying with the Order.

The focus of the reporting is on parcels in high vulnerability areas. The Central Valley Water Board needs to have an understanding of whether Members are improving practices in those areas where surface or groundwater quality are most impacted (or potentially impacted). Reporting frequency is annual for all sizes of farming operations in high vulnerability areas. The reporting frequency is every five years for all farming operations in low vulnerability areas. The Executive Officer is given the discretion to reduce the reporting frequency for Members in high vulnerability areas, if there are minimal year to year changes in the practices reported This discretion is provided, since the reporting burden would be difficult to justify given the costs if there were minimal year to year changes in the information provided.

While the focus of the reporting is on high vulnerability areas, the MPEP requirement affects management practices implemented in both high and low vulnerability areas. Management practices identified as protective of groundwater quality through the MPEP (or equivalent practices) must be implemented by Members, where applicable, whether the Member is in a high or low vulnerability area (see section IV.B.21 of the Order).

Nitrogen Management Plans

Nitrate derived from both agricultural and non-agricultural sources has resulted in degradation and/or pollution of groundwater beneath agricultural areas in California's Central Valley.[8] As noted in the discussion on nitrate in groundwater above, there are a number of wells within the Tulare Lake Basin Area with nitrate concentrations that are higher than drinking water quality objectives. To address these concerns, the Order requires that Members implement practices that minimize excess nitrogen application relative to crop consumption. Proper nutrient management will work to reduce excess plant nutrients, such as nitrogen, from reaching state waters. Nitrogen management must take site-specific conditions into consideration in identifying steps that will be taken and practices that will be implemented to minimize nitrate movement through surface runoff and leaching past the root zone.

This Order requires the development of a nitrogen management plan template to assist Members with nitrogen management. The template must be approved by the Executive Officer, and will either be proposed by the third-party according to the criteria listed in the Order, or will be developed by the Central Valley Water Board staff in consultation with the third party based on those same criteria. The template should consider, to the extent appropriate, the major criteria established in Code 590 of the NRCS Nutrient Management document, including soil and plant tissue testing, nitrogen application rates, nitrogen application timing, consideration of organic nitrogen fertilizer, consideration of irrigation water nitrogen levels to minimize surface and groundwater pollution and meet crop nitrogen requirements and crop yield potential.

All Members will be required to complete a nitrogen management plan according to the schedule in the Order. Growers in low vulnerability areas are required to prepare nitrogen management plans, but do not need to certify the plans or provide summary reports to the third-party. Should the groundwater vulnerability designation change from "low" to "high" vulnerability, those Members in the previously designated low vulnerability area would then need to have their nitrogen management plan certified and submit summary reports in accordance with a schedule issued by the Executive Officer.

Members with small farming operations are given an additional two years to complete their first nitrogen management plan. The plan must be maintained at the Member's farming operations headquarters or primary place of business.

For Members located within a high vulnerability groundwater area, for which nitrate is identified as a constituent of concern, the plan must be certified in one of the following ways:

- Self-certified by the Member who attends a California Department of Food and Agriculture or other Executive Officer approved training program for nitrogen plan certification. The Member must retain written documentation of their attendance in the training program; or
- Self-certified by the Member that the plan adheres to a site-specific recommendation from the Natural Resources Conservation Service (NRCS) or the University of California Cooperative Extension. The Member must retain written documentation of the recommendation provided; or
- Certified by a nitrogen management plan specialist as defined in Attachment E of this Order. Such specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors[9] certified by the American Society of Agronomy, or Technical Service Providers certified in nutrient management in California by the National Resource Conservation Service (NRCS); or

[8] ICF International. 2011. *Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Final and Draft. March. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA. Appendix A, page 46.

[9] Should the California Department of Food and Agriculture and the California Certified Crop Adviser's establish a specific nitrogen management certification, any Certified Crop Adviser who certifies a nitrogen management plan must have a nitrogen management certification.

- Certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the nitrogen management plan meets the objectives and requirements of this Order.

The Order requires nitrogen management reporting (nitrogen management plan summary reports) for Members in high vulnerability groundwater areas. The nitrogen management plan summary report provides information based on what was actually done the previous crop year, while the plan indicates what is planned for the upcoming crop year. Therefore, the first summary report is due the year following the implementation of the first nitrogen management plan. This reporting will provide the third-party and the Central Valley Water Board with information regarding individual Member implementation of the Order's requirements. Without this information, the Central Valley Water Board would rely primarily on groundwater monitoring to determine compliance with water quality objectives. Groundwater monitoring alone would not provide a real-time indication as to whether individual Members are managing nutrients to protect groundwater. Improved nitrogen management may take place relatively quickly, although it may take many years before broad trends in nitrate reduction in groundwater may be measured. Nitrogen management reporting will provide assurance that Members are managing nutrients to protect groundwater quality while trend data are collected.

Spatial Resolution of Nitrogen Management Plan and Farm Evaluation Information

The Order requires reporting to the Central Valley Water Board of nitrogen management information and management practices identified through the farm evaluation. These data are required to be associated with the township (36 square mile area) where the farm is located. The spatial resolution by township provides a common unit that should facilitate analysis of data and comparisons between different areas.

The nitrogen management data collected by the third-party from individual Members will be aggregated by the township where the enrolled parcel is located and will not be associated with the Member or their enrolled parcel. For example, the third-party may have information submitted for 180 different parcels in a given township. At a minimum, the board would receive a statistical summary of those 180 data records describing the range, percentiles (10th, 25th, 50th, 75th, 90th), and any outliers for similar soil conditions and similar crops in that township. A box and whisker plot or equivalent tabular or graphical presentation of the data approved by the Executive Officer may be used. Based on this analysis, the Central Valley Water Board intends to work with the third-party to ensure that those Members who are not meeting the nitrogen management performance standards identified in the Order improve their practices. As part of its annual review of the monitoring report submitted by the third-party, the board will evaluate the effectiveness of third-party outreach efforts and trends associated with nitrogen management. The board intends to request information from the third-party for those Members who, based on the board's evaluation of available information, do not appear to be meeting nitrogen management performance standards. The reporting of nitrogen management data may be adjusted based on the outcomes of the efforts of the State Water Resources Control Board's Expert Panel and the California Department of Food and Agriculture's Nitrogen Tracking and Reporting System Task Force (see Finding 51 and the State Water Board's Report to the Legislature[10]).

In order to determine whether growers in a given township are improving their practices, the third-party will need to assess the data and evaluate trends. The third-party's assessment and evaluation, along with the data used to make the evaluation, will be provided in the third-party's annual monitoring report. Since a report on management practice information and nitrogen management summary reports will be provided annually, the Central Valley Water Board will be able to determine what the trends are, if any. If the data suggest that growers are not improving their practices, the Executive Officer can require the third-party to submit the management practice or nitrogen management plan summary information for individual Members.

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[10] State Water Board Resources Control Board. 2013. Report to the Legislature, Recommendations Addressing Nitrate in Groundwater <http://www.swrcb.ca.gov/water_issues/programs/nitrate_project/docs/nitrate_rpt.pdf>
September 2013

Sediment and Erosion Control Plans

The Order requires that Members with the potential to cause erosion and discharge sediment that may degrade surface waters prepare a sediment and erosion control plan. Control of sediment discharge will work to achieve water quality objectives associated with sediment and also water quality objectives associated with sediment bound materials such as pesticides. To ensure that water quality is being protected, this Order requires that sediment and erosion control plans be prepared in one of the following ways:

- The sediment and erosion control plan must adhere to the site-specific recommendation from the Natural Resources Conservation Service (NRCS), NRCS technical service provider, the University of California Cooperative Extension, the local Resource Conservation District; or conform to a local county ordinance applicable to erosion and sediment control on agricultural lands. The Member must retain written documentation of the recommendation provided and certify that they are implementing the recommendation; or
- The plan must be prepared and self-certified by the Member, who has completed a training program that the Executive Officer concurs provides necessary training for sediment and erosion control plan development; or
- The plan must be written, amended, and certified by a qualified sediment and erosion control plan developer possessing one of the registrations shown in Table 1 below; or
- The plan must be prepared and certified in an alternative manner approved by the Executive Officer. Such approval will be provided based on the Executive Officer's determination that the alternative method for preparing the plan meets the objectives and requirements of this Order.

Table 1 - Qualified Sediment and Erosion Control Plan Developers

Title/Certification	Certifier
Professional Civil Engineer	State of California
Professional Geologist or Engineering Geologist	State of California
Landscape Architect	State of California
Professional Hydrologist	American Institute of Hydrology
Certified Professional in Erosion and Sediment Control™ (CPESC)	Enviro Cert International Inc.
Certified Professional in Storm Water Quality™ (CPSWQ)	Enviro Cert International Inc.
Certified Soil Scientist	American Society of Agronomy

The sediment and erosion control plan will: (1) help identify the sources of sediment that affect the quality of storm water and irrigation water discharges; and (2) describe and ensure the implementation of water quality management practices to reduce or eliminate sediment and other pollutants bound to sediment in storm water and irrigation water discharges. The plan must be appropriate for the Member's operations and will be developed and implemented to address site specific conditions. Each farming operation is unique and requires specific description and selection of water quality management practices needed to address waste discharges of sediment. The plan must be maintained at the farming operations headquarters or primary place of business.

The Order establishes prioritization for Member completion of the plan based on farm size. Small farming operations will have additional time to complete the plan.

To assist Members in determining whether they need to prepare a sediment and erosion control plan, the third-party must prepare a sediment and erosion control assessment report that identifies the areas susceptible to erosion and the discharge of sediment that could impact receiving waters. In addition, the Executive Officer may identify areas requiring such plans based on evidence of ongoing erosion or sediment control problems.

Small Farming Operations

In counties within Tulare Lake Basin Area, small farming operations are operated by approximately 58 percent of the growers, but account for approximately 4.6% of the total irrigated lands.[11] During the development of the Order, concerns were raised regarding the ability of small farms to comply with the requirements of the Order. Although there were recommendations to exempt small farms from this Order, no evidence was provided to demonstrate that small farms could not affect water quality and, therefore, justify an exemption from being governed by waste discharge requirements. In addition, there was no evidence presented to suggest that, on a per acre basis, small farming operations would have a reduced impact on water quality then larger farmers.

However, the Central Valley Water Board recognizes that small farming operations have more limited resources and access to technical experts. The additional time provided for small farming operations to initially prepare applicable farm evaluations, nitrogen management plans, and sediment and erosion control plans should allow small farmers to more feasibly access available technical resources, such as their third-party, the Natural Resources Conservation Service, University of California Cooperative Extension, and local resource conservation districts.

These changes should not impact the Central Valley Water Board's ability to determine progress for the watershed as a whole, since most of the irrigated acreage in the watershed is managed by large farming operations. However, small farming operations may prove to have significant localized impacts, so this Order does not preclude the Executive Officer from obtaining information from small farming operations to address such impacts.

To accommodate differing requirements for small farming operations, the Central Valley Water Board needs to know who is farming a given parcel. Although the landowner can be the Member of the third-party, the landowner must still identify the lessee, if the landowner is not also the farmer. This requirement is necessary to avoid a situation in which multiple parcels of less than 60 acres are farmed by the same farming operation, but are incorrectly identified as associated with "small farming operations" based on the individual landowners being the Members rather than the farm operator.

Technical Reports

The surface water and trend groundwater quality monitoring under the Order is representative in nature instead of individual field discharge monitoring. The benefits of representative monitoring include the ability to determine whether water bodies accepting discharges from numerous irrigated lands are meeting water quality objectives (e.g., through selection of representative sampling locations and representative MPEP studies). Representative monitoring also allows the Central Valley Water Board to determine whether practices are protective of water quality. There are limitations to representative monitoring when trying to determine possible sources of water quality problems.

Therefore, through the Management Practices Evaluation Program and the Surface Water Quality Management Plans and Groundwater Quality Management Plans, the third-party must evaluate the effectiveness of management practices in protecting water quality. In addition, Members must report the practices they are implementing to protect water quality. Through the evaluations and studies conducted by the third-party, the reporting of practices by the Members, and the board's compliance and enforcement activities, the board will be able to determine whether a Member is complying with the Order.

An effective method of determining compliance with water quality objectives is water quality monitoring at the individual level. Individual monitoring may also be used to help determine sources of water quality problems. Individual monitoring of waste discharges is required under many other Water Board

[11] Data are for Portions of Fresno, Kings, and Kern counties and all of Tulare County; United States Department of Agriculture. 2007. *Census of Agriculture*.

programs. Examples of such programs include regulation of wastewater treatment plants and the Central Valley Water Board's Dairy Program.[12] The costs of individual monitoring would be much higher than regional and representative surface and groundwater quality monitoring required under the Order. This is because representative monitoring site selection may be based on a group or category of represented waste discharges, assessing compliance for represented Members, reducing the number of samples needed to evaluate compliance with the requirements of this Order. The third-party is tasked with ensuring that selected monitoring sites are representative of waste discharges from all irrigated agricultural operations within the Order's boundaries.

This Order requires the third-party to provide technical reports. These reports may include special studies at the direction of the Executive Officer. The Executive Officer may require special studies where representative monitoring is ineffective in determining potential sources of water quality problems or to identify whether management practices are effective. Special studies help ensure that the potential information gaps described above under the Order's representative monitoring requirements may be filled through targeted technical reports, instead of more costly individual monitoring programs.

Approach to Implementation and Compliance and Enforcement

The board has been implementing the Irrigated Lands Regulatory Program since 2003. The implementation of the program has included compliance and enforcement activities to ensure growers have the proper regulatory coverage and are in compliance with the applicable board orders. The following section describes the state-wide policy followed by the board, as well as how the board intends to implement and enforce the Order.

The State Water Board's Water Quality Enforcement Policy (Enforcement Policy) defines an enforcement process that addresses water quality in an efficient, effective, and consistent manner[13]. A variety of enforcement tools are available in response to noncompliance. The Enforcement Policy endorses the progressive enforcement approach which includes an escalating series of actions from informal to formal enforcement. Informal enforcement actions are any enforcement taken by staff that is not defined in statute or regulation, such as oral, written, or electronic communication concerning violations. The purpose of informal enforcement is to quickly bring an actual, threatened, or potential violation to the discharger's attention and to give the discharger an opportunity to return to compliance as soon as possible. Formal enforcement includes statutorily based actions that may be taken in place of, or in addition to, informal enforcement. Formal enforcement is recommended as a first response to more significant violations, such as the highest priority violations, chronic violations, and/or threatened violations. There are multiple options for formal enforcement, including Administrative Civil Liabilities (ACLs) imposed by a Regional Water Board or the State Water Board. A 30-day public comment period is required prior to the settlement or imposition of any ACL and prior to settlement of any judicial civil liabilities.

Compliance/Enforcement Related to Grower Participation

To facilitate grower participation in the Irrigated Lands Regulatory Program (ILRP) under the Conditional Waiver, the Central Valley Water Board staff engaged in outreach and followed the progressive enforcement series of actions. For example, staff had sent outreach postcards informing non-participating landowners who potentially require coverage under the ILRP. Water Code Section 13267 Orders for technical reports had been issued to landowners who first received an outreach postcard and did not respond. Landowners were required to respond to postcards or 13267 Orders by obtaining the

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[12] The dairy program requires individual monitoring of surface water discharges and allows for a "representative" groundwater monitoring in lieu of individual groundwater monitoring.
[13] State Water Resources Control Board. 2010. Water Quality Enforcement Policy. <http://www.swrcb.ca.gov/water_issues/programs/enforcement/docs/enf_policy_final111709.pdf>

required regulatory coverage, or claiming an exemption from the ILRP requirements. The Central Valley Water Board staff routinely conducted inspections to verify landowner exemption claims; occasionally the outcome of inspections led to an enforcement action for failure to obtain appropriate regulatory coverage.

Upon the adoption of the Eastern San Joaquin River Watershed Order in December 2012, staff sent letters to thousands of landowners who may now require regulatory coverage, since like this Order the Eastern San Joaquin River Watershed Order addresses discharge to both groundwater and surface water. Parcels that potentially need regulatory coverage are identified from readily available information sources, such as county tax assessor records; aerial photography; and the California Department of Conservation's Farmland Mapping and Monitoring Program. The staff also conducts inspections in the field to verify that parcels have an irrigated agricultural operation. The Executive Officer sends Water Code Section 13260 Directives when inspections verify that parcels require coverage under the ILRP, when growers who used to be third-party members are no longer listed on the annual membership lists, or when growers who received Executive Officer approval to join a third-party have not done so. The 13260 Directives require growers to enroll or re-instate their membership with a third-party, obtain coverage for their discharges under other applicable general waste requirements, or submit a Report of Waste Discharge to the Central Valley Water Board. As the highest level of informal enforcement, Notices of Violation (NOV's) are sent to growers who fail to respond to Orders and Directives, and direct the recipients obtain the proper regulatory coverage for their waste discharges. The board intends to issue Administrative Civil Liability Complaints to those growers who do not respond to the NOV. In addition, the board may enroll those growers under the general WDRs for dischargers not participating in a third-party group (R5-2013-0100), after such growers are provided an opportunity for a hearing.

Compliance/Enforcement Related to Water Quality Violations

The board intends to respond promptly to complaints and conduct field inspections on a routine basis to identify potential water quality violations. Complaints will generally result from local residents contacting the board based on their observations of sediment plumes, fish kills, or odor problems. The board will generally contact and coordinate with the third-party, the California Department of Fish and Wildlife, and the local county agricultural commissioner depending on the nature of the problem.

In addition, the board staff will conduct field inspections of individual grower's operations to determine whether practices protective of groundwater are in place. Such practices include backflow prevention devices; well head protection; and those practices found protective through the Management Practices Evaluation Program. The field inspections will also include a review of whether implemented practices are protective of surface water, and may include sampling of runoff. The informal and formal enforcement process described above will be used should any violations of the Order be identified through field inspections.

Compliance/Enforcement Related to Information Collected

As a part of field inspections, and with the consent of the Member, owner or authorized representative as required by applicable laws, staff may also review information and farm plans prepared by Members,. The Executive Officer will request information, as necessary, from Members and the third-party to audit the quality and accuracy of information being submitted. The Executive Officer will regularly report to the board on the results of any audits of the information reported by the third-party, the outcome of any field verification inspections of information submitted by the Members, and make recommendations regarding changes to the reporting requirements and the information submittal process, if needed.

The findings of this Order provide a further description of the enforcement priorities and process for addressing violations.

Reports and Plans

This Order is structured such that the Executive Officer is to make determinations regarding the adequacy of reports and information provided by the Dischargers and allows the Executive Officer to approve such reports. All plans and reports required for approval by the Executive Officer will be posted on the Central Valley Water Board's website upon approval. In addition, this Order identifies specific reports and Executive Officer's decisions that must be posted for public comment and review. It is the right of any interested person to request the Central Valley Water Board to review any of the aforementioned Executive Officer decisions.

Water Quality Objectives

Surface water and groundwater receiving water limitations in section III of the Order specify that waste discharge from irrigated lands may not cause or contribute to an exceedance of water quality objectives in surface water or underlying groundwater, unreasonably affect applicable beneficial uses, or cause a condition of pollution or nuisance.

Water quality objectives that apply to surface water are described in the *Water Quality Control Plan for the Tulare Lake Basin* (Basin Plan). Applicable water quality objectives include, but are not limited to, (1) the numeric objectives, including the bacteria objective, the chemical constituents objective (includes listed chemicals and state drinking water standards, i.e., maximum contaminant levels (MCLs) promulgated in Title 22 California Code of Regulations (CCR) Division 4, Chapter 15 sections 64431 and 64444 that are applicable through the Basin Plan to waters designated as municipal and domestic supply), dissolved oxygen objectives, pH objectives, the salinity objectives, and the turbidity objectives; and (2) the narrative objectives, including the biostimulatory substances objective, the chemical constituents objective, and the toxicity objective. The Basin Plan also contains numeric water quality objectives that apply to specifically identified water bodies, such as specific temperature objectives. Federal water quality criteria that apply to surface water are contained in federal regulations referred to as the California Toxics Rule and the National Toxics Rule. See 40 CFR sections 131.36 and 131.38.

Water quality objectives that apply to groundwater include, but are not limited to, (1) numeric objectives, including the bacteria objective and the chemical constituents objective (includes state MCLs promulgated in Title 22 CCR Division 4, Chapter 15 section 64431 and 64444 and are applicable through the Basin Plan to municipal and domestic supply), and (2) narrative objectives including the chemical constituents, taste and odor, and toxicity objectives.

The requirements that waste discharge not unreasonably affect beneficial uses or cause a condition of pollution or nuisance are prescribed pursuant to sections 13263 and 13241 of the California Water Code. Section 13263 of the California Water Code requires Regional Water Boards, when establishing waste discharge requirements, to consider the need to prevent nuisance and the provisions in section 13241 of the California Water Code. Section 13241 requires Regional Water Boards to consider several factors when establishing water quality objectives including prevention of nuisance and reasonable protection of beneficial uses.

Implementation of Water Quality Objectives

The Basin Plan includes numeric and narrative water quality objectives. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*." The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. The narrative chemical constituent objective states that waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. At a minimum, *"…water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)*" in Title 22 of the California Code of Regulations (CCR). The

Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs. The narrative tastes and odors objective states: "*Water shall not contain taste- or odor-producing substances in concentrations that cause nuisance, adversely affect beneficial uses, or impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin or to domestic or municipal water supplies*."

Page IV-21 of the Tulare Lake Basin Plan, contains an implementation policy, "Application of Water Quality Objectives", that specifies that the Central Valley Water Board "*will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives*." With respect to narrative objectives, the Regional Water Board must establish limitations using one or more of three specified sources, including: (1) USEPA's published water quality criteria, (2) a proposed state criterion (i.e., water quality objective) or an explicit state policy interpreting its narrative water quality criteria (i.e., the Regional Water Board's "Policy for Application of Water Quality Objectives"), or (3) an indicator parameter. For purposes of this Order, all three sources will be used as part of the process described below.

Implementation of numeric and narrative water quality objectives under the Order involves an iterative process. The Order's MRP establishes management plan trigger limits that are equivalent to the applicable Basin Plan numeric water quality objectives. For constituents that are not assigned Basin Plan numeric water quality objectives, Central Valley Water Board staff will develop trigger limits in consultation with the Department of Pesticide Regulation (for pesticides) and other agencies as appropriate. Central Valley Water Board staff will provide interested parties, including the third-party representing Members, with an opportunity to review and comment on the trigger limits. The Executive Officer will then provide the trigger limits to the third-party. Those trigger limits will be considered the numeric interpretation of the applicable narrative objectives. In locations where trigger limits are exceeded, water quality management plans must be developed that will form the basis for reporting which steps have been taken by growers to achieve compliance with numeric and narrative water quality objectives.

Non-Point Source (NPS) Program

This Order regulates waste discharges from irrigated agricultural lands to state waters as an NPS program. Accordingly, the waste discharge requirements must implement the provisions of the State Water Board's *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Policy). Under the NPS Policy, the Regional Water Board must find that the program will promote attainment of water quality objectives. The nonpoint-source program also must meet the requirements of five key structural elements. These elements include (1) the purpose of the program must be stated and the program must address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements; (2) describe the practices to be implemented and processes to be used to select and verify proper implementation of practices; (3) where it is necessary to allow time to achieve water quality requirements, include a specific time schedule, and corresponding quantifiable milestones designed to measure progress toward reaching specified requirements; (4) feedback mechanisms to determine whether the program is achieving its purpose; and (5) the consequences of failure to achieve the stated purpose

This Order addresses each of the five key elements, as described below.

(1) The purpose of the long-term irrigated lands regulatory program, of which this Order is an implementing mechanism, is stated above under the section titled "Goals and Objectives of the Irrigated Lands Regulatory Program." [14] The program goals and objectives include meeting water

[14] The goals and objectives were developed as part of the ILRP Program Environmental Impact Report, ICF International. 2011. *Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Final and Draft, September 2013

quality objectives. The requirements of this Order include requirements to meet applicable water quality objectives and the requirements of State Water Board Resolution 68-16 (antidegradation requirements). Further discussion of this Order's implementation of antidegradation requirements is given below under the section titled "State Water Board Resolution 68-16";

(2) The board is prevented by Water Code section 13360 from prescribing specific management practices to be implemented. However, it may set forth performance standards and require dischargers to report on what practices they have or will implement to meet those standards. Examples of the types of practices that irrigated agricultural operations may implement to meet program goals and objectives have been described in the Economics Report[15] and evaluated in the Program Environmental Impact Report (PEIR)[16] for the long-term ILRP. This Order requires each individual operation to develop a farm evaluation that will describe their management practices in place to protect surface water and groundwater quality. This Order also requires the development of Surface/Groundwater Quality Management Plans (SQMPs/GQMPs) in areas where there are exceedances of water quality objectives. The requirements for SQMPs and GQMPs include that the third-party identify management practices and develop a process for evaluating the effectiveness of such practices. The requirements of this Order are consistent with Key Element 2;

(3) This Order requires the development of SQMPs/GQMPs in areas where water quality objectives are not met. SQMPs/GQMPs must include time schedules for implementing the plans and meeting the surface and groundwater receiving water limitations (section III of the Order) as soon as practicable, but within a maximum of 10 years for surface and groundwater. The time schedules must be consistent with the requirements for time schedules set forth in this Order. The time schedules must include quantifiable milestones that will be reviewed by the Executive Officer and the public prior to approval. The time schedule requirements in this Order are consistent with Key Element 3;

(4) To provide feedback on whether program goals are being achieved, this Order requires surface and groundwater quality monitoring, tracking of management practices, and evaluation of effectiveness of implemented practices. The feedback will allow iterative implementation of practices to ensure that program goals are achieved. This feedback mechanisms required by this Order are consistent with Key Element 4; and

(5) This Order establishes the following consequences where requirements are not met:

(a) The third-party or Members will be required, in an iterative process, to conduct additional monitoring and/or implement management practices where water quality objectives are not being met;

(b) Appropriate Central Valley Water Board enforcement action where the iterative management practices process is unsuccessful, program requirements are not met, or time schedules are not met;

(c) Require noncompliant Members, or all Members where the third-party fails to meet the requirements of this Order, to submit a report of waste discharge to obtain individual waste discharge requirements from the Central Valley Water Board (i.e., revoke coverage under this Order).

March 2011. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.

[15] ICF International. 2010. *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program.* July 2010 (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA.

[16] ICF International. 2011. *Irrigated Lands Regulatory Program - Program Environmental Impact Report*. Final and Draft, March 2011. (ICF 05508.05.) Sacramento, CA. Prepared for Central Valley Regional Water Quality Control Board, Sacramento, CA.

This Order describes consequences for failure to meet requirements and is consistent with Key Element 5.

California Environmental Quality Act (CEQA)

For the purposes of adoption of this Order, the Central Valley Water Board is the lead agency pursuant to CEQA (Public Resources Code sections 21100 et seq.). The Central Valley Water Board has prepared a Final Program Environmental Impact Report (PEIR)[17] that analyzes the potential environmental impacts of six program alternatives for a long term ILRP. As described more fully in Attachment D, this Order relies upon the PEIR for CEQA compliance. The requirements of the Order include regulatory elements that are also contained in the six alternatives analyzed in the PEIR. Therefore, the actions by Members to protect water quality in response to the requirements of this Order are expected to be similar to those described for Alternatives 2-6 of the PEIR (Alternative 1 does not include groundwater protection).

The PEIR describes that potential environmental impacts of all six alternatives are associated with implementation of water quality management practices, construction of monitoring wells, and impacts to agriculture resources (e.g., loss of production of prime farmland) due to increased regulatory costs. Under this Order, Members will be required to implement water quality management practices to address water quality concerns. The PEIR also describes and evaluates potential impacts of practices likely to be implemented to meet water quality and other management goals on irrigated lands. These water quality management practices include:

- Nutrient management;
- Improved water management;
- Tailwater recovery system;
- Pressurized irrigation;
- Sediment trap, hedgerow, or buffer;
- Cover cropping or conservation tillage; and
- Wellhead protection

These practices are examples of the types of practices that would be broadly applied by irrigated agricultural operations throughout the Central Valley and are considered representative of the types of practices that would have potential environmental impacts. It is important to note that the evaluated practices are not required; operators will have the flexibility to select practices to meet water quality goals. This Order represents one order in a series of orders that will be developed, based on the alternatives evaluated in the PEIR for all irrigated agriculture within the Central Valley. The requirements of this Order would lead to implementation of the above practices within the Tulare Lake Basin Area to a similar degree as is described for Alternatives 2-6 analyzed in the PEIR. Also, the requirements of this Order will require installation of monitoring wells (with the extent depending on the adequacy of existing wells for water quality monitoring).

As described in the PEIR for Alternatives 2-6, the combination of an operator's choice of management practice and where that practice is implemented (i.e., located within a sensitive resource area) may result in significant environmental impacts for the following resource areas:

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[17] ICF International. 2011. *Irrigated Lands Regulatory Program Final Program Environmental Impact Report.* Final and Draft, March 2011. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

- Cultural resources: Potential loss of resources from construction and operation of management practices and monitoring wells.
- Noise and vibration: Exposure of sensitive land uses to noise from construction and operation of management practices (e.g., construction of tailwater return system, pump noise) and monitoring wells.
- Air quality: Generation of construction and operational emissions from management practices and monitoring wells (e.g., equipment and pump emissions generated during construction and continued operation of practices).
- Climate change: Cumulative, from a potential increase in greenhouse gas emissions.
- Vegetation and wildlife: Loss of habitat, wildlife, and wetland communities from reduced surface water discharge and construction and operation of practices and monitoring wells (e.g., loss of habitat if a practice is sited in a previously undisturbed area). Cumulative loss of habitat.
- Fisheries: Loss of habitat from construction of management practices, monitoring wells, and toxicity attributable to coagulant additives.
- Agriculture resources: Loss of farmland from increased regulatory cost. Cumulative loss of agriculture resources.

* The above is a generalized summary of affected resource areas. The reader is directed to the Attachment D, Findings of Fact and Statement of Overriding Considerations, of this Order for specific impacts and discussion. Attachment D provides a listing of the above impacts, the written findings regarding those impacts consistent with section 15091 of the CEQA Guidelines, and the explanation for each finding.

Mitigation Measures

The impacts described above, except for agriculture resources, cumulative climate change, and cumulative vegetation and wildlife can be reduced to a less than significant level through the employment of alternate practices or by choosing a location that avoids sensitive areas (e.g., installing a sedimentation basin in a portion of the property that is already developed rather than in an area that provides riparian habitat). Where no alternate practice or less sensitive location for a practice exists, this Order requires that the third-party and Members choosing to employ these practices to avoid impacts to sensitive resources by implementing the mitigation measures described in Attachment C. A CEQA Mitigation Monitoring and Reporting Program is included in Attachment B of this Order, Monitoring and Reporting Program R5-2013-0120.

Statement of Policy With Respect To Maintaining High Quality Waters In California (State Water Board Resolution 68-16)

This section of the Information Sheet first provides background on State Water Board Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Resolution 68-16). Following the background discussion, the Information Sheet describes how the various provisions in the WDR and MRP collectively implement Resolution 68-16. In summary, the requirements of Resolution 68-16 are met through a combination of upfront planning and implementation at the farm level; representative monitoring and assessments to determine whether trends in degradation are occurring; and regional planning and on-farm implementation when degradation trends are identified.

Initially, all Members will need to conduct an on-farm evaluation to determine whether their practices are protective of water quality and whether they are meeting the established farm management performance standards. Through the process of becoming aware of effective management practices; evaluating their practices; and implementing improved practices; Members are expected to meet the farm management performance standards and, thereby, achieve best practicable treatment or control (BPTC), where applicable. All Members must prepare and implement a farm-specific nitrogen management plan. In addition, each Member with the potential to cause erosion and discharge sediment that may degrade surface waters must prepare and implement a sediment and erosion control plan. Implementation of the sediment/erosion control plan should result in achieving BPTC for sediment associated pollutants. Implementation of the nitrogen management plan should result in achieving BPTC for nitrates discharged to groundwater.

Representative monitoring of surface water and groundwater together with periodic assessments of available surface water and groundwater information is required to determine compliance with water quality objectives and determine whether any trends in water quality (improvement or degradation) are occurring. If trends in such degradation are identified that could result in impacts to beneficial uses, a surface water (or groundwater) quality management plan must be prepared by the third party. The plan must include the identification of practices that will be implemented to address the trend in degradation and an evaluation of the effectiveness of those practices in addressing the degradation. The third party must report on the implementation of practices by it's Members. Failure to implement practices or address the degradation by individual Members will result in further direct regulation by the board, including, but not limited to, requiring individual farm water quality management plans; regulating the individual grower directly through WDRs for individual farmers; or taking other enforcement action.

As discussed further below, the combination of these requirements fulfills the requirements of Resolution 68-16 for any degradation of high quality waters authorized by this Order.

Background

Basin Plan water quality objectives are developed to ensure that ground and surface water beneficial uses are protected. The quality of some state ground and surface waters is higher than established Basin Plan water quality objectives. For example, nutrient levels in good, or "high quality" waters may be very low, or not detectable, while existing water quality standards for nutrients may be much higher. In such waters, some degradation of water quality may occur without compromising protection of beneficial uses. State Water Board Resolution 68-16 *Statement of Policy with Respect to Maintaining High Quality of Waters in California* (Resolution 68-16) was adopted in October of 1968 to address high quality waters in the state. Title 40 of the Code of Federal Regulations, Section 131.12—Antidegradation Policy (40 CFR 131.12) was developed in 1975 to ensure water quality necessary to protect existing uses in waters of the United States. Resolution 68-16 applies to discharges to all high quality waters of the state, including groundwater and surface water (Water Code section 13050[e]); 40 CFR 131.12 applies only to surface waters.

The requirement to implement the Antidegradation Policy is contained in Resolution 68-16 (provision 2 presented below) and in the Basin Plan. The Basin Plan states that the Central Valley Water Board actions must conform with State Water Board plans and policies and among these policies is Resolution 68-16, which requires that:

1) *"Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."*

2) *"Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."*

For discharges to surface waters only, the Federal Antidegradation Policy (Section 131.12, Title 40, CFR) requires:

1) *"Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.*
2) *Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.*
3) *When high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.*
4) *In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."*

The State Water Board has interpreted Resolution 68-16 to incorporate the Federal Antidegradation Policy in situations where the policy is applicable. (SWRCB Order WQ 86-17). The application of the Federal Antidegradation Policy to nonpoint source discharges (including discharges from irrigated agriculture) is limited.[18]

Administrative Procedures Update (APU) 90-004, Antidegradation Policy Implementation for NPDES Permitting, provides guidance for the Regional Water Boards in implementing Resolution 68-16 and 40 CFR 131.12, as these provisions apply to NPDES permitting. APU 90-004 is not applicable in the context of this Order because nonpoint discharges from agriculture are exempt from NPDES permitting.

A number of key terms are relevant to application of Resolution 68-16 and 40 CFR 131.12 to this Order. These terms are described below.

High Quality Waters: Resolution 68-16 applies whenever "existing quality of water is better than quality established in policies as of the date such policies become effective,"[19] and 40 CFR 131.12 refers to "quality of waters [that] exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation." Such waters are "high quality waters" under the state and federal

[18] 40 CFR 131.12(a)(2) requires that the "State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and *all cost-effective and reasonable best management practices for nonpoint source control.*" The EPA Handbook, Chapter 4, clarifies this as follows: "Section 131.12(a)(2) does not mandate that States establish controls on nonpoint sources. The Act leaves it to the States to determine what, if any, controls on nonpoint sources are needed to provide attainment of State water quality standards (See CWA Section 319). States may adopt enforceable requirements, or voluntary programs to address nonpoint source pollution. Section 40 CFR 131.12(a)(2) does not require that States adopt or implement best management practices for nonpoint sources prior to allowing point source degradation of a high quality water. However, States that have adopted nonpoint source controls must assure that such controls are properly implemented before authorization is granted to allow point source degradation of water quality." Accordingly, in the context of nonpoint discharges, the BPTC standard established by state law controls.
[19] Such policies would include policies such as State Water Board Resolution 88-63, Sources of Drinking Water Policy, establishing beneficial uses, and water quality control plans.

antidegradation policies. In other words, high quality waters are waters with a background quality of better quality than that necessary to protect beneficial uses.[20] The Water Code directs the State Water Board and the Regional Water Boards to establish water quality objectives for the reasonable protection of beneficial uses. Therefore, where water bodies contain levels of water quality constituents or characteristics that are better than the established water quality objectives, such waters are considered high quality waters.

Both state and federal guidance indicates that the definition of high quality waters is established by constituent or parameter [State Water Board Order WQ 91-10; USEPA Water Quality Handbook, Chapter 4 Antidegradation (40 CFR 131.12) ("EPA Handbook")]. Waters can be of high quality for some constituents or beneficial uses but not for others. With respect to degraded groundwater, a portion of the aquifer may be degraded with waste while another portion of the same aquifer may not be degraded with waste. The portion not degraded is high quality water within the meaning of Resolution 68-16. See State Water Board Order WQ 91-10.

In order to determine whether a water body is a high quality water with regard to a given constituent, the background quality of the water body unaffected by the discharge must be compared to the water quality objectives. If the quality of a water body has declined since the adoption of the relevant policies and that subsequent lowering was not a result of regulatory action consistent with the state antidegradation policy, a baseline representing the historically higher water quality may be an appropriate representation of background.[21] However, if the decline in water quality was permitted consistent with state and federal antidegradation policies, the most recent water quality resulting from permitted action constitutes the relevant baseline for determination of whether the water body is high quality. See, e.g., SWRCB Order WQ 2009-0007 at 12. Additionally, if water quality conditions have improved historically, the current higher water quality would again be the point of comparison for determining the status of the water body as a high quality water.

Best Practicable Treatment or Control: Resolution 68-16 requires that, where degradation of high quality waters is permitted, best practicable treatment or control (BPTC) limits the amount of degradation that may occur. Neither the Water Code nor Resolution 68-16 defines the term "best practicable treatment or control."

Despite the lack of a BPTC definition, certain State Water Board water quality orders and other documents provide direction on the interpretation of BPTC. The State Water Board has stated: "one factor to be considered in determining BPTC would be the water quality achieved by other similarly situated dischargers, and the methods used to achieve that water quality." (See Order WQ 2000-07, at pp. 10-11). In a "Questions and Answers" document for Resolution 68-16 (the Questions and Answers Document), BPTC is interpreted to additionally include a comparison of the proposed method to existing proven technology; evaluation of performance data (through treatability studies); comparison of alternative methods of treatment or control; and/or consideration of methods currently used by the discharger or similarly situated dischargers.[22] The costs of the treatment or control should also be considered. Many of the above considerations are made under the "best efforts" approach described later in this section. In fact, the State Water Board has not distinguished between the level of treatment and control required under BPTC and what can be achieved through "best efforts."

[20] USEPA Water Quality Handbook, Chapter 4 Antidegradation (40 CFR 131.12) , defines "high quality waters" as "those whose quality exceeds that necessary to protect the section 101(a)(2) goals of the Act [Clean Water Act], regardless of use designation."

[21] The state antidegradation policy was adopted in 1968, therefore water quality as far back as 1968 may be relevant to an antidegradation analysis. For purposes of application of the federal antidegration policy only, the relevant year would be 1975.

[22] See *Questions and Answers, State Water Resources Control Board, Resolution 68-16* (February 16, 1995).

The Regional Water Board may not "specify the design, location, type of construction, or particular manner in which compliance may be had with [a] requirement, order, or decree" (Water Code 13360). However, the Regional Water Board still must require the discharger to demonstrate that the proposed manner of compliance constitutes BPTC (SWRCB Order WQ 2000-7). The requirement of BPTC is discussed in greater detail below.

Maximum Benefit to People of the State: Resolution 68-16 requires that where degradation of water quality is permitted, such degradation must be consistent with the "maximum benefit to people of the state." Only after "intergovernmental coordination and public participation" and a determination that "allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located" does 40 CFR 131.12 allow for degradation.

As described in the Question and Answers Document, factors considered in determining whether degradation of water quality is consistent with maximum benefit to people of the State include economic and social costs, tangible and intangible, of the proposed discharge, as well as the environmental aspects of the proposed discharge, including benefits to be achieved by enhanced pollution controls. Closely related to the BPTC requirement, consideration must be given to alternative treatment and control methods and whether lower water quality can be abated or avoided through reasonable means, and the implementation of feasible alternative treatment or control methods should be considered.

USEPA guidance clarifies that the federal antidegradation provision "is not a 'no growth' rule and was never designed or intended to be such. It is a policy that allows public decisions to be made on important environmental actions. Where the state intends to provide for development, it may decide under this section, after satisfying the requirements for intergovernmental coordination and public participation, that some lowering of water quality in "high quality waters" is necessary to accommodate important economic or social development" (EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters, Chapter 4). Similarly, under Resolution 68-16, degradation is permitted where maximum benefit to the people of the state is demonstrated.

Water Quality Objectives and Beneficial Uses: As described above, Resolution 68-16 and Section 40 CFR 131.12 are both site-specific evaluations that are not easily employed to address large areas or broad implementation for classes of discharges. However, as a floor, any degradation permitted under the antidegradation policies must not cause an exceedance of water quality objectives or a pollution or nuisance. Furthermore, the NPS Policy establishes a floor for all water bodies in that implementation programs must address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses.

***Waters that are Not High Quality: The "Best Efforts" Approach*:** Where a water body is not high quality and the antidegradation policies are accordingly not triggered, the Central Valley Water Board should, under State Water Board precedent, set limitations more stringent than the objectives set forth in the Basin Plan. The State Water Board has directed that, "where the constituent in a groundwater basin is already at or exceeding the water quality objective, . . . the Regional Water Board should set limitations more stringent than the Basin Plan objectives if it can be shown that those limitations can be met using 'best efforts.'" SWRCB Order WQ 81-5; *see also* SWRCB Orders Nos. WQ 79-14, WQ 82-5, WQ 2000-07. Finally, the NPS Policy establishes standards for management practices.

The "best efforts" approach involves the Regional Water Board establishing limitations expected to be achieved using reasonable control measures. Factors which should be analyzed under the "best efforts" approach include the effluent quality achieved by other similarly situated dischargers, the good faith efforts of the discharger to limit the discharge of the constituent, and the measures necessary to achieve compliance. SWRCB Order WQ 81-5, at p. 7. The State Water Board has applied the "best efforts" factors in interpreting BPTC. (See SWRCB Order Nos. WQ 79-14, and WQ 2000-07).

In summary, the board may set discharge limitations more stringent than water quality objectives even outside the context of the antidegradation policies. The "best efforts" approach must be taken where a water body is not "high quality" and the antidegradation policies are accordingly not triggered.

Application of Resolution 68-16 Requirements to this Order

The determination of a high quality water within the meaning of the antidegradation policies is water body and constituent-specific. Very little guidance has been provided in state or federal law with respect to applying the antidegradation policy to a program or general permit where multiple water bodies are affected by various discharges, some of which may be high quality waters and some of which may, by contrast, have constituents at levels that already exceed water quality objectives. Given these limitations, the Central Valley Water Board has used readily available information regarding the water quality status of surface and groundwaters in the Tulare Lake Basin Area to construct provisions in this Order to meet the substantive requirements of Resolution 68-16.

This Order regulates discharges from thousands of individual fields to a very large number of water bodies within the Tulare Lake Basin Area. There is no comprehensive, waste constituent–specific information available for all surface waters and groundwater aquifers accepting irrigated agricultural wastes that would allow site-specific assessment of current conditions. Likewise, there is no comprehensive historical dataset.[23]

However, data collected by the Central Valley Water Board, dischargers, educational institutions, and others demonstrate that many water bodies within the Tulare Lake Basin Area are already impaired for various constituents that are or could be associated with irrigated agricultural activities. As described above, there are surface water quality management plan requirements for the following constituents and indicators: pH, electrical conductivity, dissolved solids, dissolved oxygen, E. coli, fecal coliform, boron, molybdenum, chlorpyrifos, DDE, toxaphene, Ceriodaphnia dubia, Pimephales promelas, Selenastrum capricornutum, and Hyalella azteca. Those same data collection efforts also indicate that other surface water bodies within the watershed meet objectives for particular constituents and would be considered "high quality waters" with respect to those constituents.

Similarly, as described above in the "Groundwater Quality Monitoring" section, large areas within the Tulare Lake Basin Area contain groundwater wells which contain maximum nitrate levels above applicable water quality objectives. The groundwater represented by these wells may not be considered "high quality" with respect to nitrates.[24] However, it is unknown when the degradation occurred. Available data show that currently existing quality of certain water bodies is better than the water quality objectives; for example, deeper groundwaters, represented by municipal supply wells, are generally high quality with respect to pesticides and nitrates. Degradation of such waters can be permitted only consistent with the state and federal antidegradation policies.

Given the significant variation in conditions over the broad areas covered by this Order, any application of the antidegradation requirements must account for the fact that at least some of the waters into which agricultural discharges will occur are high quality waters (for some constituents). Further, the Order provisions should also account for the fact that even where a water body is not high quality (such that discharge into that water body is not subject to the antidegradation policy), the Central Valley Water Board should, under State Water Board precedent, impose limitations more stringent than the objectives set forth in the Basin Plan, if those limits can be met by "best efforts."

[23]Irrigated lands discharges have been regulated under a conditional waiver since 1982, but comprehensive data as to trends under the waiver are not available.
[24] As mentioned above, water quality dating as far back as 1968 may be needed to determine whether such waters are considered "high quality" under Resolution 68-16.

Consistency with BPTC and the "Best Efforts" Approach

Due to the numerous commodities being grown on irrigated agricultural lands and varying hydrogeologic conditions within the Tulare Lake Basin Area, identification of a specific technology or treatment device as BPTC or "best efforts" has not been accomplished. By contrast, there are a variety of technologies that have been shown to be effective in protecting water quality. For example, Chapter 5 of the Irrigated Lands Program Existing Conditions Report[25] (ECR) describes that there are numerous management practices that Members could implement to achieve water quality protection goals. The Central Valley Water Board recognizes that there is often site-specific, crop-specific, and regional variability that affects the selection of appropriate management practices, as well as design constraints and pollution-control effectiveness of various practices.

Growers need the flexibility to choose management practices that best achieve a management measure's performance expectations given their own unique circumstances. Management practices developed for agriculture are to be used as an overall system of measures to address nonpoint-source pollution sources on any given site. In most cases, not all of the practices will be needed to address the nonpoint sources at a specific site. Operations may have more than one constituent of concern to address and may need to employ two or more of the practices to address the multiple sources. Where more than one source exists, the application of the practices should be coordinated to produce an overall system that adequately addresses all sources for the site in a cost-effective manner.

There is no specific set of technologies, practices, or treatment devices that can be said to achieve BPTC/best efforts universally in the Tulare Lake Basin Area. This Order, therefore, establishes a set of performance standards that must be achieved and an iterative planning approach that will lead to implementation of BPTC/best efforts. The iterative planning approach will be implemented as two distinct processes, 1) establishment of a baseline set of universal farm water quality management performance standards combined with upfront evaluation, planning and implementation of management practices to attain those goals, and 2) additional planning and implementation measures where degradation trends are observed that threaten to impair a beneficial use or where beneficial uses are impaired (i.e., water quality objectives are not being met). Taken together, these processes are considered BPTC/best efforts. The planning and implementation processes that growers must follow on their farms should lead to the on-the-ground implementation of the optimal practices and control measures to address waste discharge from irrigated agriculture.

1. Farm Management Performance Standards

This Order establishes on-farm standards for implementation of management practices that all Members must achieve. The selection of appropriate management practices must include analysis of site-specific conditions, waste types, discharge mechanisms, and crop types. Considering this, as well as the Water Code 13360 mandate that the Regional Water Board not specify the manner of compliance with its requirements, selection must be done at the farm level. Following are the performance standards that all Members must achieve:

a. minimize waste discharge offsite in surface water;
b. minimize or eliminate the discharge of sediment above background levels;
c. minimize percolation of waste to groundwater;
d. minimize excess nutrient application relative to crop consumption;
e. prevent pollution and nuisance;
f. achieve and maintain water quality objectives and beneficial uses, and

[25] California Regional Water Quality Control Board, Central Valley Region, and Jones and Stokes. 2008. *Irrigated Lands Regulatory Program Existing Conditions Report.* Sacramento, CA.

g. protect wellheads from surface water intrusion.

BPTC is not defined in Resolution 68-16. However, the State Water Board describes in it's 1995 Questions and Answers, Resolution 68-16: "To evaluate the best practicable treatment or control method, the discharger should compare the proposed method to existing proven technology; evaluate performance data, e.g., through treatability studies; compare alternative methods of treatment or control; and/or consider the method currently used by the discharger or similarly situated dischargers." Available state and federal guidance on management practices may serve as a measure of the types of water quality management goals for irrigated agriculture recommended throughout the state and country (e.g., water quality management goals for similarly situated dischargers). This will provide a measure of whether implementation of the above performance standards will lead to implementation of BPTC/best efforts.

- As part of California's Nonpoint Source Pollution Control Program, the State Water Board, California Coastal Commission, and other state agencies have identified seven management measures to address agricultural nonpoint sources of pollution that affect state waters (*California's Management Measures for Polluted Runoff*, referred to below as "Agriculture Management Measures").[26] The agricultural management measures include practices and plans installed under various NPS programs in California, including systems of practices commonly used and recommended by the USDA as components of resource management systems, water quality management plans, and agricultural waste management systems.
- USEPA's National Management Measures to Control Nonpoint Source Pollution from Agriculture (EPA 841-B-03-004, July 2003;),[27] "*is a technical guidance and reference document for use by State, local, and tribal managers in the implementation of nonpoint source pollution management programs. It contains information on the best available, economically achievable means of reducing pollution of surface and ground water from agriculture."*

Both of the above guidance documents describe a series of management measures, similar to the farm management performance standards and related requirements of the Order. The agricultural management measures described in the state and USEPA reference documents generally include: 1) erosion and sediment control, 2) facility wastewater and runoff from confined animal facilities, 3) nutrient management, 4) pesticide management, 5) grazing management, 6) irrigation water management, and 7) education and outreach. A comparison of the recommendations with the Order's requirements is provided below.

Management measure 1, erosion and sediment control. Practices implemented to minimize waste discharge offsite and erosion (performance standards a and b) are consistent with this management measure to achieve erosion and sediment control. The Order requires that all Members implement sediment discharge and erosion prevention practices to minimize or eliminate the discharge of sediment above background levels. Those Members that have the potential to cause erosion and discharge sediment that may degrade surface waters must develop a farm-specific sediment and erosion control plan.

Management measure 2 is not applicable, as this Order does not address waste discharges from confined animal facilities

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[26] *California's Management Measures for Polluted Runoff* (<http://www.waterboards.ca.gov/water_issues/programs/nps/docs/cammpr/info.pdf>)

[27] (<http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm>)

Management measure 3, nutrient management. As described in the State's Agricultural Management Measures document, "*this measure addresses the development and implementation of comprehensive nutrient management plans for areas where nutrient runoff is a problem affecting coastal waters and/or water bodies listed as impaired by nutrients*." Nutrient management practices implemented to meet performance standards are consistent with this measure. The Order also requires nitrogen management plans to be developed by Members within both high vulnerability and low vulnerability groundwater areas. Nitrogen management plans require Members to document how their fertilizer use management practices meet performance standard d. Finally, where nutrients are causing exceedances of water quality objectives in surface waters, this Order would require development of a detailed SQMP which would address sources of nutrients and require implementation of practices to manage nutrients. Collectively, these requirements work together in a manner consistent with management measure 3.

Management measure 4, pesticide management. As described in the State's Agricultural Management Measures document, this measure "*is intended to reduce contamination of surface water and groundwater from pesticides*." Performance standards a, c, e, f, and g are consistent with this management measure, requiring Members to implement practices that minimize waste discharge to surface and groundwater (such as pesticides), prevent pollution and nuisance, achieve and maintain water quality objectives, and implement wellhead protection measures.

Management measure 5, grazing management. As described in the state Agriculture Management Measures document, this measure is "*intended to protect sensitive areas (including stream banks, lakes, wetlands, estuaries, and riparian zones) by reducing direct loadings of animal wastes and sediment.*" While none of the Order's farm management goals directly address grazing management, performance standards a, b, e and f, when considered by an irrigated pasture operation would lead to the same management practices, e.g., preventing erosion, discharge of sediment, and ensuring that animal waste loadings do not cause pollution or nuisance, and achieve water quality objectives. The Order also requires that all Members implement sediment discharge and erosion prevention practices to minimize or eliminate the discharge of sediment above background levels.

Management measure 6, irrigation water management. As described in the state Agricultural Management Measures document, this measure "*promotes effective irrigation while reducing pollutant delivery to surface and ground waters.*" Performance standards a and c, requiring Members to minimize waste discharge to surface and groundwater will lead to practices that will also achieve this management measure. For example, a Member may choose to implement efficient irrigation management programs (e.g., timing, uniformity testing), technologies (e.g., spray, drip irrigation, tailwater return), or other methods to minimize discharge of waste to surface water and percolation to groundwater.

Management measure 7, education and outreach. The Order requires that third-party groups conduct education and outreach activities to inform Members of program requirements and water quality problems.

Implementation of practices to achieve the Order's water quality requirements described above is consistent with the state and federal guidance for management measures. Because these measures are recommended for similarly situated dischargers (e.g., agriculture), compliance with the requirements of the Order will lead to implementation of BPTC/best efforts by all Members.

2. Additional Planning and Implementation Measures (SQMP/GQMPs)

This Order requires development of water quality management plans (surface or groundwater) where degradation trends are observed that threaten to impair a beneficial use or where beneficial uses are impaired (i.e., water quality objectives are not being met). SQMPs/GQMPs include requirements to investigate sources, develop strategies to implement practices to ensure waste discharges are meeting the Orders surface and groundwater receiving water limitations, and develop a monitoring strategy to provide feedback on the effectiveness of the management plan. In addition, the SQMPs/GQMPs must include actions to "Identify, validate, and implement management practices to reduce loading of COC's [constituents of concern] to surface water or groundwater, as applicable, thereby improving water quality" (see Appendix MRP-1). Under these plans, additional management practices will be implemented in an iterative manner, to ensure that the management practices represent BPTC/best efforts and that degradation does not threaten beneficial uses. The SQMPs/GQMPs need to meet the performance standards set forth in this Order. The SQMPs/GQMPs are also reviewed periodically to determine whether adequate progress is being made to address the degradation trend or impairment. If adequate progress is not being made, then the Executive Officer can require field monitoring studies, on-site verification of implementation of practices, or the board may revoke the coverage under this Order and regulate the discharger through an individual WDR.

In cases where effectiveness of practices in protecting water quality is not known, the data and information gathered through the SQMP/GQMP and MPEP processes will result in the identification of management practices that meet the performance standards and represent BPTC/best efforts. Since the performance standards also apply to low vulnerability areas with high quality waters, those data and information will help inform the Members and Central Valley Water Board of the types of practices that meet performance standard requirements.

It is also important to note that in some cases, other agencies may establish performance standards that are equivalent to BPTC and may be relied upon as part of a SQMP or GQMP. For example, the Department of Pesticide Regulation (DPR) has established Groundwater Protection Areas within the Tulare Lake Basin Area that require growers to implement specific groundwater quality protection requirements for certain pesticides. The practices required under DPR's Groundwater Protection Program are considered BPTC for those pesticides requiring permits in groundwater protection areas, since the practices are designed to prevent those pesticides from reaching groundwater and they apply uniformly to similarly situated dischargers in the area.

The State Water Board indicates in its Questions and Answers, Resolution 68-16: "To evaluate the best practicable treatment or control method, the discharger should…evaluate performance data, e.g., through treatability studies..." Water quality management plans, referred to as SQMPs/GQMPs above, institute an iterative process whereby the effectiveness of any set of practices in minimizing degradation will be periodically reevaluated as necessary and/or as more recent and detailed water quality data become available. This process of reviewing data and instituting additional practices where necessary will continue to assure that BPTC/best efforts are implemented and will facilitate the collection of information necessary to demonstrate the performance of the practices. This iterative process will also ensure that the highest water quality consistent with maximum benefit to the people of the state will be maintained.

Resolution 68-16 does not require Members to use technology that is better than necessary to prevent degradation. As such, the Central Valley Water Board presumes that the performance standards required by this Order are sufficiently achieving BPTC where water quality conditions and management practice implementation are already preventing degradation. Further, since BPTC determinations are informed by the consideration of costs, it is important that discharges in these areas not be subject to the more stringent and expensive requirements associated with SQMPs/GQMPs. Therefore, though Members in "low vulnerability" areas must still meet the farm management performance standards described above, they do not need to incur additional costs associated with SQMPs/GQMPs where there is no evidence of their contributing to degradation of high quality waters.

3. Management Practices Evaluation Program (MPEP) and Other Reporting and Planning Requirements

In addition to the SQMPs/GQMPs, the Order includes a comprehensive suite of reporting requirements that should provide the Central Valley Water Board with the information it needs to determine whether the necessary actions are being taken to achieve BPTC and protect water quality, where applicable. In high vulnerability groundwater areas, the third-party must develop and implement a Management Practices Evaluation Program (MPEP). The MPEP will include evaluation studies of management practices to determine whether those practices are protective of groundwater quality (e.g., that will not cause or contribute to exceedances of water quality objectives) for identified constituents of concern under a variety of site conditions. If the management practices are not protective, new practices must be developed, implemented, and evaluated. Any management practices that are identified as being protective of water quality, or those that are equally effective, must be implemented by Members who farm under similar conditions (e.g., crop type, soil conditions) (see provision IV.B.21 of the Order).

Farm management performance standards are applicable to both high and low vulnerability areas. The major difference in high and low vulnerability areas is the priority for action. High vulnerability areas may contain both high and low quality waters with respect to constituents discharged by irrigated agriculture, and the MPEP and other reporting, planning, and implementation requirements will determine and require actions to achieve BPTC and best efforts for high and low quality waters, respectively. Because low vulnerability areas present less of a threat of degradation or pollution, additional time is provided, or a lower level of review and certification is required, for some of the planning and reporting requirements. Also, while an MPEP is not required for the low vulnerability areas, the actions required by the MPEP must be implemented as applicable by Members in both high and low vulnerability areas, and will therefore result in the implementation of BPTC and best efforts in high and low vulnerability areas, and will inform evaluation of compliance with performance standards in all areas. The Order requires implementation of actions that achieve BPTC and best efforts for both high and low quality waters, respectively.

To determine whether a degradation trend is occurring, the Order requires surface water monitoring at sites designated by the Surface Water Monitoring Plan. The data gathered from the surface water monitoring effort will allow the Central Valley Water Board to determine whether there is a trend in degradation of water quality related to discharges from irrigated agriculture. For groundwater, a trend monitoring program is required in both "low vulnerability" and "high vulnerability" areas. The trend monitoring for the low vulnerability areas is required to help the Central Valley Water Board determine whether any trend in degradation of groundwater quality is occurring. For pesticides in groundwater, the Central Valley Water Board will initially rely on the information gathered through the Department of Pesticide Regulation's (DPR) monitoring efforts to determine whether any degradation related to pesticides is occurring. If the available groundwater quality data (e.g., nitrates, pesticides) in a low vulnerability area suggests that degradation is occurring that could threaten to impair beneficial uses, then the area would be re-designated as a high vulnerability area.

The third-party is required to prepare a Groundwater Quality Assessment Report (GAR) and update that report every five years. The GAR will include an identification of high vulnerability and low vulnerability areas, including identification of constituents that could cause degradation. The initial submittal of the GAR will include a compilation of water quality data, which the Central Valley Water Board and third-party will use to evaluate trends. The periodic updates to the GAR will require the consideration of data collected by the third-party, as well as other organizations, and will also allow the Central Valley Water Board and third-party to evaluate trends. The GAR will provide a reporting vehicle for the Central Valley Water Board to periodically evaluate water quality trends to determine whether degradation is occurring. If the degradation triggers the requirement for a GQMP, then the area in which the GQMP is required would be considered "high vulnerability" and all of the requirements associated with a high vulnerability area would apply to those Members.

All Members will also need to report on their management practices through the farm evaluation process. In addition, all members will need to prepare nitrogen management plans prepared in accordance with the nitrogen management plan templates approved by the Executive Officer. The plans require Members to document how their fertilizer use management practices minimize excess nutrient application relative to crop consumption. The planning requirements are phased according to threat level such that members in low vulnerability areas have more time to complete their plans than those in high vulnerability areas. Members in high vulnerability areas will need to submit nitrogen management plan summary reports. Through the farm evaluation, the Member must identify on-farm management practices implemented to achieve the Order's farm management performance standards. In addition, the nitrogen management plan summary reports required in high vulnerability areas will include, at a minimum, information on the ratio of total nitrogen available for crop uptake to the estimated crop consumption of nitrogen. Nitrogen management plans and nitrogen management plan summary reports provide indicators as to whether the Member is meeting the performance standard to minimize excess nutrient application relative to crop need for nitrogen. The MPEP study process would be used to determine whether the nitrogen consumption ratio meets the performance standard of the Order.

Summary

Members are required to implement practices to meet the above goals and periodically review the effectiveness of implemented practices and make improvements where necessary. Members in both high and low vulnerability areas will identify the practices they are implementing to achieve water quality protection goals as part of farm evaluations and nitrogen management plans. Members in high vulnerability areas have additional requirements associated with the SQMPs/GQMPs; preparing sediment and erosion control plans; implementing practices identified as protective through the MPEP studies; and reporting on their activities more frequently.

Also, the Order requires water quality monitoring and assessments aimed to identify trends and evaluate effectiveness of management practices, and detect exceedances of water quality objectives. The process of periodic review of SQMPs/GQMPs provides a mechanism for the Central Valley Water Board to better ensure that Members are meeting the requirements of the Order, if the third-party led efforts are not effective in ensuring BPTC is achieved, where applicable.

Requirements for individual farm evaluations, nitrogen management plans, sediment and erosion control plans, management practices tracking, and water quality monitoring and reporting are designed to ensure that degradation is minimized and that management practices are protective of water quality. These requirements are aimed to ensure that all irrigated lands are implementing management practices that minimize degradation, the effectiveness of such practices is evaluated, and feedback monitoring is conducted to ensure that degradation is limited. Even in low vulnerability areas where there is no information indicating degradation of a high quality water, the farm management performance standards act as a preventative requirement to ensure degradation does not occur. The information and evaluations conducted as part of the GQMP/SQMP process will help inform those Members in low vulnerability areas of the types of practices that meet the performance standards. In addition, even Members in low vulnerability groundwater areas must implement practices (or equivalent practices) that are identified as protective through the MPEP studies (where these practices are applicable to the Members site conditions). The farm evaluations and nitrogen management plan requirements for low vulnerability areas provide indicators as to whether Members are meeting applicable performance standards. The required monitoring and periodic reassessment of vulnerability designations will allow the Central Valley Water Board to determine whether degradation is occurring and whether the status of a low vulnerability area should be changed to high vulnerability, and vice versa.

The Order is designed to achieve site-specific antidegradation and antidegradation-related requirements through implementation of BPTC/best efforts as appropriate and monitoring, evaluation, and reporting to confirm the effectiveness of the BPTC/best efforts measures in achieving their goals. The Order relies on implementation of practices and treatment technologies that constitute BPTC/best efforts, based to the extent possible on existing data, and requires monitoring of water quality and evaluation studies to ensure that the selected practices in fact constitute BPTC where degradation of high quality waters is or may be occurring, and best efforts where waters are already degraded. Because the State Water Board has not distinguished between the level of treatment and control required under BPTC and what can be achieved through best efforts, the requirements of this Order for BPTC/best efforts apply equally to high quality waters and already degraded waters

This Order allows degradation of existing high quality waters. This degradation is consistent with maximum benefit to the people of the state for the following reasons:

- At a minimum, this Order requires that irrigated agriculture achieve and maintain compliance with water quality objectives and beneficial uses;
- The requirements implementing the Order will result in use of BPTC where irrigated agricultural waste discharges may cause degradation of high quality waters; where waters are already degraded, the requirements will result in the pollution controls that reflect the “best efforts” approach. Because BPTC will be implemented, any lowering of water quality will be accompanied by implementation of the most appropriate treatment or control technology;
- Central Valley communities depend on irrigated agriculture for employment (PEIR, Appendix A);
- The state and nation depend on Central Valley agriculture for food (PEIR, Appendix A);
- Consistent with the Order’s and PEIR’s stated goal of ensuring that irrigated agricultural discharges do not impair access to safe and reliable drinking water, the Order protects high quality waters relied on by local communities from degradation of their water supplies by current practices on irrigated lands. The Order is designed to prevent irrigated lands discharges from causing or contributing to exceedances of water quality objectives, which include maximum contaminant levels for drinking water. The Order also is designed to detect and address exceedances of water quality objectives, if they occur, in accordance with the compliance time schedules provided therein;.
- As stated in the PEIR, one goal of this Order is to maintain the economic viability of agriculture in California’s Central Valley. The Central Valley of California is renowned worldwide as the most productive food production region of the world. Agriculture is the principal element of California’s economy and it is the lifeblood of the Central Valley. The Tulare Lake Basin contains three of the nation’s four leading agricultural counties. Fresno, Tulare and Kern Counties lead the nation being

the only counties in the nation each exceeding $5 billion in agricultural production.[28] Correspondingly, agricultural employment in the San Joaquin Valley generally exceeds 220,000.[29]

- The Order prohibits degradation above a water quality objective and establishes representative surface water monitoring and groundwater monitoring programs to determine whether irrigated agricultural waste discharges are in compliance with the Order's receiving water limitations, local communities should not incur any additional treatment costs associated with the degradation authorized by this Order. In situations where water bodies are already above water quality objectives and communities are currently incurring treatment costs to use the degraded water, the requirements established by this Order will institute time schedules for reductions in irrigated agricultural sources to achieve the Order's receiving water limitations; therefore, this Order will, over time, work to reduce treatment costs of such communities; and
- The Order requires Members to achieve water quality management practice performance standards and includes farm management practices monitoring to ensure practices are implemented to achieve these standards. The iterative process whereby Members implement practices to achieve farm management performance standards, coupled with representative surface and groundwater monitoring feedback to assess whether practices are effective, will prevent degradation of surface and groundwater quality above water quality objectives.

The requirements of the Order and the degradation that would be allowed are consistent with State Water Board Resolution 68-16. The requirements of the Order will result in the implementation of BPTC necessary to assure the highest water quality consistent with the maximum benefit to the people of the State. The receiving water limitations in section III of the Order, the compliance schedules in section XII, and the Monitoring and Reporting Program's requirements to track compliance with the Order, are designed to ensure that the authorized degradation will not cause or contribute to exceedances of water quality objectives, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance. Finally, the iterative process of reviewing data and instituting additional management practices where necessary will ensure that the highest water quality consistent with the maximum benefit to the people of the State will be maintained.

California Water Code Sections 13141 and 13241

The total estimated average annual cost of compliance with this Order, e.g., summation of costs for administration, monitoring, reporting, tracking, implementation of management practices, is expected to be approximately $8.90 per acre greater than the cost associated with the protection of surface water only under the Coalition Group Conditional Waiver. The total estimated average cost of compliance associated with continuation of the previous Coalition Group Conditional Waiver within the Tulare Lake Basin Area is expected to be approximately 51.0 million dollars per year ($17.65 per acre annually). The total estimated cost of this Order is expected to be approximately 76.7 million dollars per year ($26.55 per acre annually).

Approximately $20.21 of the estimated $26.55 per acre annual cost of the Order is associated with implementation of water quality management practices (see discussion below for a breakdown of estimated costs). This Order does not require that Members implement specific water quality management practices.[30] Many of the management practices that have water quality benefits can have other economic and environmental benefits (e.g., improved irrigation can reduce water and energy consumption, as well as reduce runoff). Management practice selection will be based on decisions by individual Members in consideration of the unique conditions of their irrigated agricultural lands; water quality concerns; and other benefits expected from implementation of the practice. As such, the cost

[28] California County Agricultural Commissioners Reports 2011 (published December 17, 2012).
[29] North American Industry Classification System Reports of California EDD.
[30] Per Water Code section 13360, the Central Valley Water Board may not specify the manner in which a Member complies with water quality requirements.

estimate is an estimate of potential, not required costs of implementing specific practices. Any costs for water quality management practices will be based on a market transaction between Members and those vendors or individuals providing services or equipment and not based on an estimate of those costs provided by the Central Valley Water Board. The cost estimates include estimated fees the third-party may charge to prepare the required reports and conduct the required monitoring, as well as annual permit fees that are charged to permitted dischargers for permit coverage. In accordance with the State Water Board's Fee Regulations, the current annual permit fee charged to Members covered by this Order is $0.56/acre There are a number of funding programs that may be available to assist growers in the implementation of water quality management practices through grants and loans (e.g., Environmental Quality Incentives Program, State Water Board Agricultural Drainage Management Loan Program). Following is a discussion regarding derivation of the cost estimate for the Order.

This Order, which implements the Long-term ILRP within the Tulare Lake Basin Area, is based mainly on Alternatives 2 and 4 of the PEIR, but does include elements from Alternatives 2-5. The Order contains the third-party lead entity structure, surface and groundwater management plans, and surface water quality monitoring approach similar to Alternative 2 of the PEIR; farm planning, management practices tracking, nitrogen tracking, and groundwater monitoring similar to Alternative 4 of the PEIR; sediment and erosion control plan (under Alternative 3, "farm plan") recommendation/ certification requirements similar to Alternative 3; prioritized installation of groundwater monitoring wells similar to Alternative 5; and a prioritization system based on systems described by Alternatives 2 and 4. Therefore, potential costs of these portions of the Order are estimated using the costs for these components of Alternative 2 and Alternative 5 given in the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program* (Economics Report). Table 2 summarizes the major regulatory elements of the Order and provides reference to the PEIR alternative basis.

Table 2 - Summary of regulatory elements

Order elements	Equivalent element from Alternatives 2-5
Third-party administration	Alternative 2
Farm evaluation Sediment and erosion control plan Nitrogen management plans	Alternative 4: farm water quality management plan and certified nutrient management plan
Recommended/ certified sediment and erosion plans	Alternative 3: certification of farm water quality plans
Surface and groundwater management plans	Alternative 2 surface and groundwater management plans
Surface water monitoring	Alternative 2 surface water monitoring
Trend groundwater monitoring	Alternative 4 groundwater monitoring
Management practices evaluation program	Alternative 4 groundwater monitoring, targeted site-specific studies to evaluate the effects of changes in management practices on groundwater quality and Alternative 5 installation of groundwater monitoring wells at prioritized sites
Management practice reporting	Alternative 4 tracking of practices
Nitrogen management plan summary reporting	Alternative 4 nutrient tracking
Management practices implementation	Alternative 2 or 4 management practice implementation

The administrative costs of the Order are estimated to be similar to the costs shown for Alternative 2 in Table 2-19 of the Economics Report. Additional costs have been included for third-party preparation of: notice of applicability, sediment and erosion assessment report, monitoring report. Farm evaluation, sediment and erosion control plan and nitrogen management planning (farm plans) costs are estimated using costs and methodology provided by the Kern River Watershed.[31] Total surface water monitoring and reporting costs are estimated to be similar to the costs shown for Alternative 2 –essentially a continuation of the current surface water monitoring approach. Total trend groundwater monitoring and reporting costs are estimated using groundwater monitoring costs and planning costs given on page 2-20 and in Table 2-14 of the Economics Report respectively. Additional cost estimates have been included for the groundwater assessment report[32] and management evaluation program. Costs for installation of groundwater monitoring wells are estimated using the costs shown in Table 2-15 of the Economics Report. Tracking costs of management practices and nitrogen management plan information are estimated to be similar to the costs shown for Alternative 4 in Table 2-21 of the economics report –under "tracking." Additional costs are estimated for Member application requirements (e.g., notice of certification/intent) and potential Member CEQA mitigation monitoring.[33] Management practices costs have been estimated for the South Valley Floor and Coast Range watersheds (pages 3-124 to 3-133 and 3-137 to 3-140, Existing Conditions Report) generally using the methodology outlined in pages 2-6 to 2-16 of the Economics Report. Estimated average annualized costs per acre of the Order relative to full implementation of the current waiver program in the Tulare Lake Basin Area are summarized below in Table 3[34].

Table 3 - Estimated annual average per acre cost* of the Order relative to full implementation of the current program (PEIR Alternative 1) in the Tulare Lake Basin Area

	Order	Current program	Change
Administration	1.29	0.91	0.38
Farm planning	1.71	--	1.71
Monitoring/reporting/tracking	3.33	.79	2.54
Management practices	20.21	15.95	4.26
Total	26.55	17.65	8.90

*Costs are an estimate of potential, not required costs of implementing specific practices.

The Tulare Lake Basin Plan includes an estimate of potential costs and sources of financing for the long-term irrigated lands program. The estimated costs were derived by analyzing the alternatives evaluated in the PEIR using the cost figures provided in the Economics Report. The Basin Plan cost estimate is provided as a range applicable to implementation of the program throughout the Central Valley. The Basin Plan's estimated total annualized cost of the irrigated lands program is $216 million to $1.3 billion, or $27 to $168 per acre[35]. The estimated total annual average cost of this Order of $76.7 million dollars ($26.55 per acre) does not exceed the estimated cost range for the irrigated lands program as described in the Basin Plan when considering per acre costs ($27-$168 per acre).

The estimated total annual average cost per acre of Alternative 3 in the Tulare Lake Basin Area is $27.00. The Order has a similar average annual cost to Members and is expected to have similar overall economic impacts, as described in the Economics Report. This is because all costs of the ILRP are paid by Members through fees or other direct costs (e.g., individual implementation of improved practices).

[31] Based on Provost & Pritchard Consulting Group Technical Report; *Estimated Cost of Compliance Technical Report – Kern Coalition* (4-15-2013)
[32] Based on costs and methodology provided by the Kern River Watershed Coalition (2013)
[33] Based on costs and methodology provided by the Kern River Watershed Coalition (2013)
[34] This discussion provides a brief summary of the major costs. A detailed cost spreadsheet showing calculations and assumptions for this analysis is available by contacting the Central Valley Water Board.
[35] Per acre average cost calculated using an estimate for total irrigated agricultural acres in the Central Valley (7.9 million acres, Table 3-3, Economics Report).

Therefore potential economic effects to individual Members associated with such costs will also be similar in nature.

California Water Code Section 13263

California Water Code section 13263 requires that the Central Valley Water Board consider the following factors, found in section 13241, when considering adoption of waste discharge requirements.

(a) Past, present, and probable future beneficial uses of water

The Central Valley Water Board's Water Quality Control Plan for the Tulare Lake Basin (Basin Plan) identifies applicable beneficial uses of surface and groundwater within the Tulare Lake Basin. The Order protects the beneficial uses identified in the Basin Plan. Applicable past, present, and probable future beneficial uses of Tulare Lake Basin waters were considered by the Central Valley Water Board as part of the Basin Planning process and are reflected in the Basin Plans themselves. The Order is a general order applicable to a wide geographic area. Therefore, it is appropriate to consider beneficial uses as identified in the Basin Plan and applicable policies, rather than a site specific evaluation that might be appropriate for WDRs applicable to a single discharger.

(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto

Environmental characteristics of the Tulare Lake Basin Area have been considered in the development of irrigated lands program requirements as part of the Central Valley Water Board's 2008 *Irrigated Lands Regulatory Program Existing Conditions Report* and the PEIR. In these reports, existing water quality and other environmental conditions throughout the Central Valley have been considered in the evaluation of six program alternatives for regulating waste discharge from irrigated lands. This Order's requirements are based on the alternatives evaluated in the PEIR.

(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area

This Order provides a process to review these factors during implementation of water quality management plans (SQMPs/GQMPs). The Order requires that discharges of waste from irrigated lands to surface water and groundwater do not cause or contribute to an exceedance of applicable water quality objectives. SQMPs and GQMPs are required in areas where water quality objectives are not being met –where irrigated lands are a potential source of the concern, and in areas where irrigated agriculture may be causing or contributing to a trend of degradation that may threaten applicable beneficial uses. GQMPs are also required in high vulnerability groundwater areas. Under these plans, sources of waste must be estimated along with background water quality to determine what options exist for reducing waste discharge to ensure that irrigated lands are not causing or contributing to the water quality problem. The SQMPs and GQMPs must be designed to ensure that waste discharges from irrigated lands do not cause or contribute to an exceedance of a water quality objective and meet other applicable requirements of the Order, including, but limited to, section III.

(d) Economic considerations

The PEIR was supported by the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program* (Economics Report). An extensive economic analysis was presented in this report to estimate the cost and broader economic impact on irrigated agricultural operations associated with the five alternatives for the irrigated lands program, including the lands regulated by this Order. Central Valley Water Board Staff was also able to use that analysis to estimate costs of a sixth alternative, since the sixth alternative fell within the range of the five alternatives. This cost estimate is found in Appendix A of the PEIR. This Order is based on the alternatives evaluated in the PEIR, which is part of the administrative record. Therefore, potential economic considerations related to the Order have been considered as part of the overall economic analysis for implementation of the long-term irrigated lands regulatory program. This Order is a single action in a series of actions to implement the ILRP in the Central Valley region. Because the

Order has been developed from the alternatives evaluated in the PEIR, economic effects will be within the range of those described for the alternatives.

One measure considered in the PEIR is the potential loss of Important Farmland[36] due to increased regulatory costs. This information has been used in the context of this Order to estimate potential loss of Important Farmland within the Tulare Lake Basin Area. It is estimated that approximately 22,887 thousand acres of Important Farmland within the Tulare Lake Basin Area potentially would be removed from production under full implementation of the previous conditional waiver program (Conditional Waiver Order R5-2006-0053); it is estimated that an additional 838 acres of Important Farmland may be removed from production due to increased regulatory costs of this Order (total of approximately 23,726 thousand acres, as described in Attachment D of this Order).. As described in the Economics Report, most of the estimated losses would be to lower value crop land, such as irrigated pasture and forage crops.

(e) *The need for developing housing within the region*

This Order establishes waste discharge requirements for irrigated lands in the Tulare Lake Basin Area. The Order is not intended to establish requirements for any facilities that accept wastewater from residences or stormwater runoff from residential areas. This Order will not affect the development of housing within the region.

(f) *The need to develop and use recycled water*

This Order does not establish any requirements for the use or purveyance of recycled wastewater. Where an agricultural operation may have access to recycled wastewater of appropriate quality for application to fields, the operation would need to obtain appropriate waste discharge requirements from the Central Valley Water Board prior to initiating use. This need to obtain additional waste discharge requirements in order to recycle wastewater on agricultural fields instead of providing requirements under this Order may complicate potential use of recycled wastewater on agricultural fields. However, the location of agricultural fields in rural areas generally limits access to large volumes of appropriately treated recycled wastewater. As such, it is not anticipated that there is a need to develop general waste discharge requirements for application of recycled wastewater on agricultural fields in the Tulare Lake Basin Area.

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FIGURES

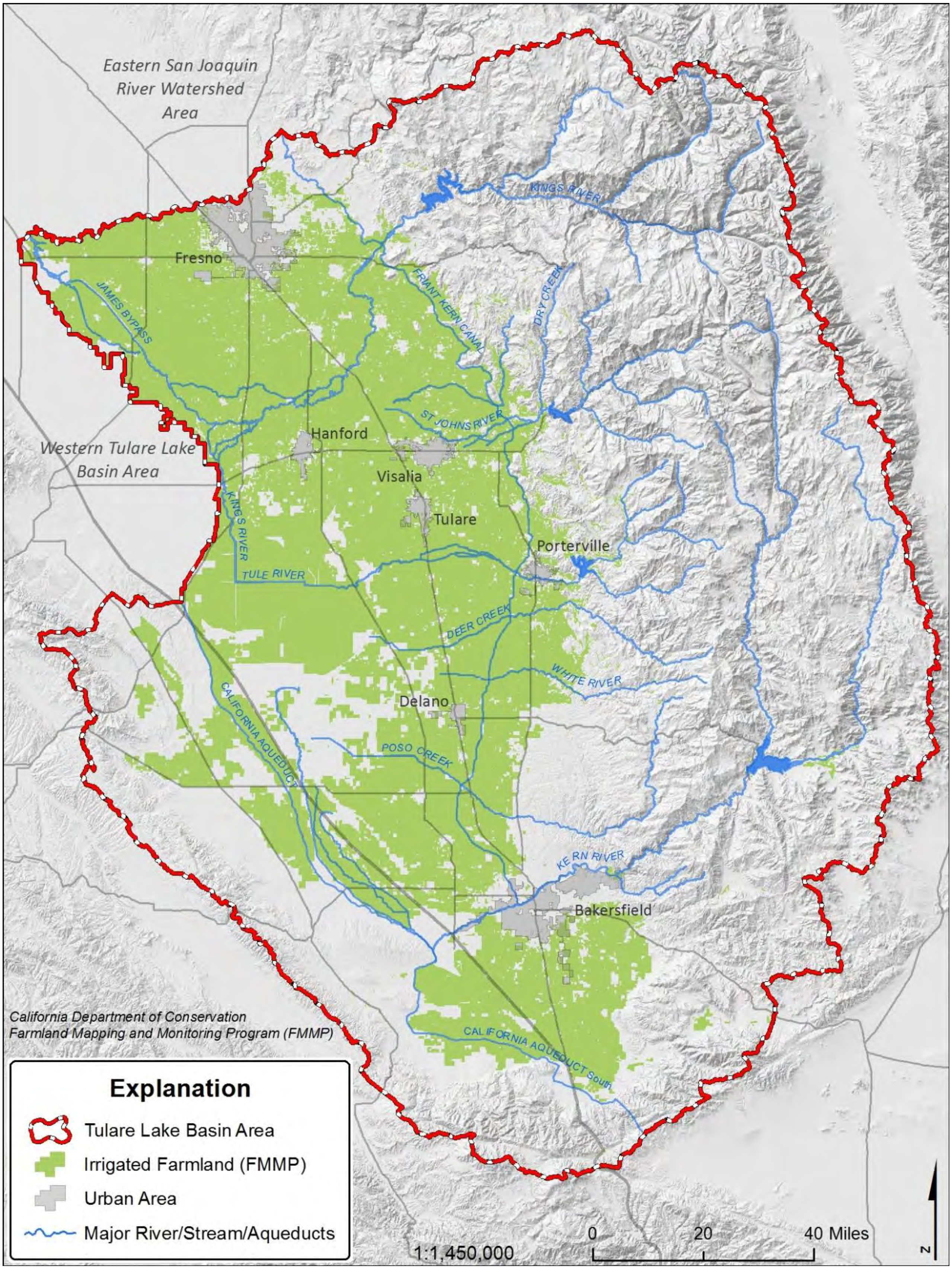
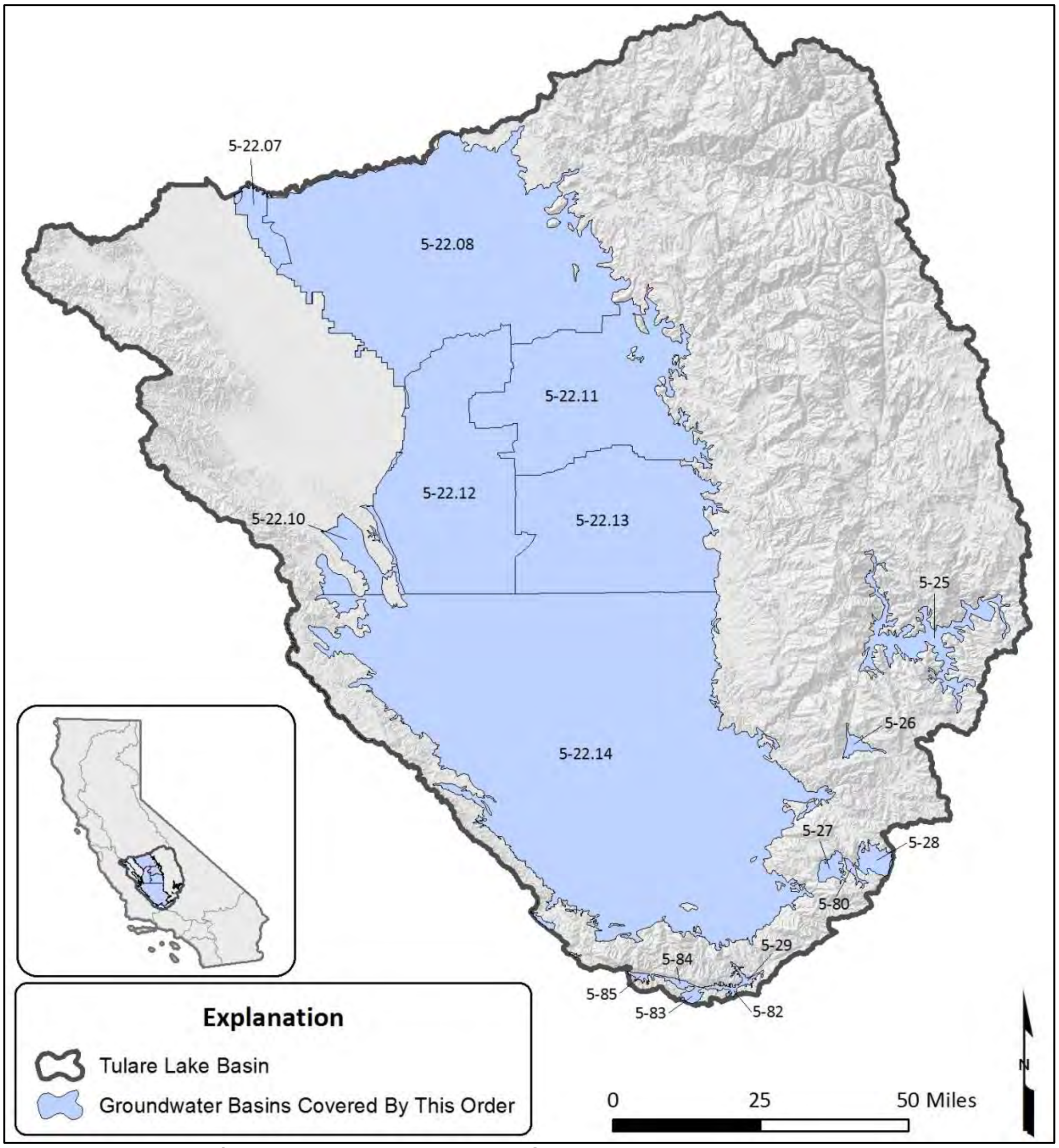


Figure 1 – Tulare Lake Basin Area



*The southern portion of basin 5-22.10 is covered by this Order

Groundwater Basins covered by this Order	
5-22 .07 Delta-Mendota	5-27 Cummings Valley
5-22 .08 Kings	5-28 Tehachapi Valley West
5-22 .11 Kaweah	5-29 Castaic Lake Valley
5-22 .12 Tulare Lake	5-80 Brite Valley
5-22 .13 Tule	5-82 Cuddy Canyon Valley
5-22 .14 Kern County	5-83 Cuddy Ranch Area
5-25 Kern River Valley	5-84 Cuddy Valley
5-26 Walker Basin	5-85 Mil Potrero Area

Figure 2 – Groundwater Basins/sub-basins within the Tulare Lake Basin Area – adapted from DWR

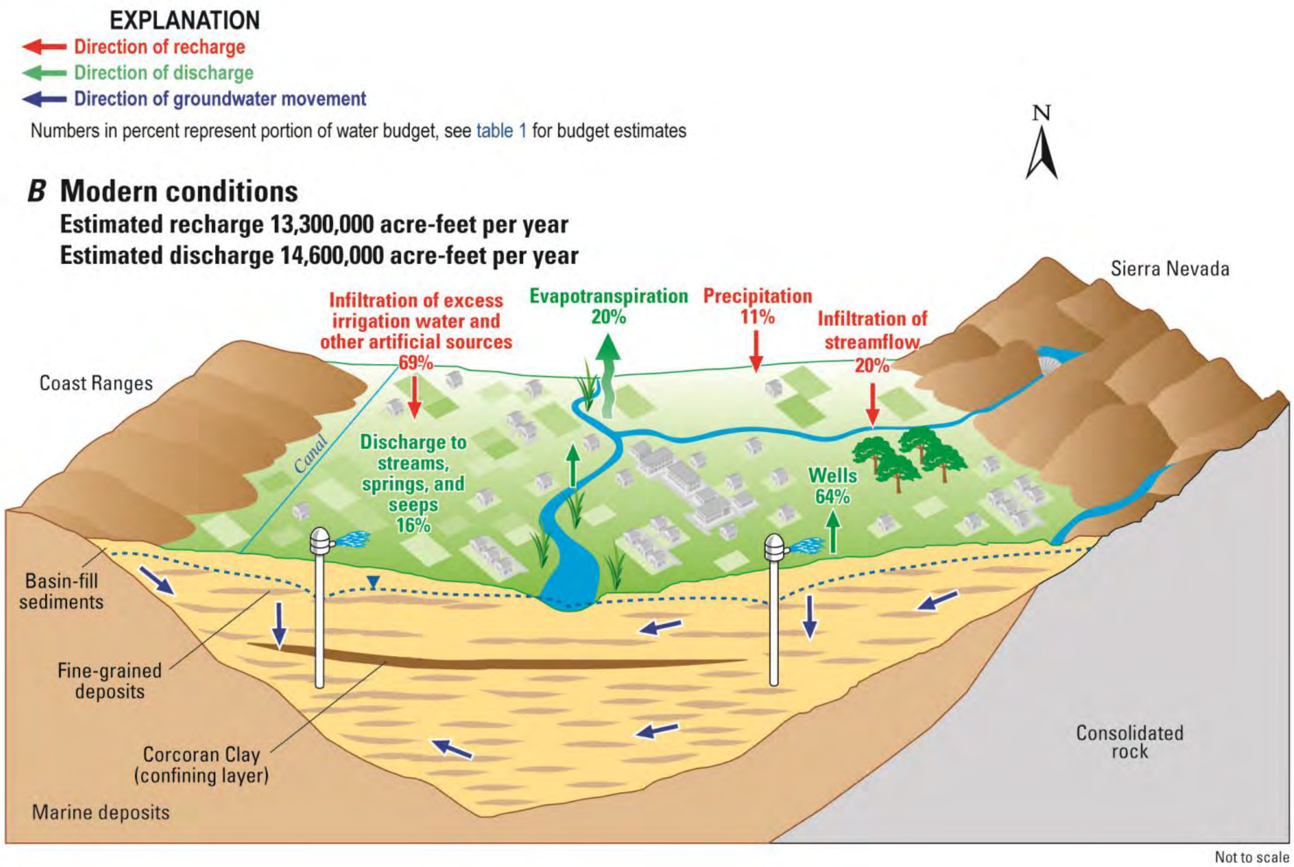


Figure 3 – Generalized Diagram for the Central Valley, Showing the Basin-fill Deposits and Components of the Groundwater System under Modern Conditions – Thiros (2010)

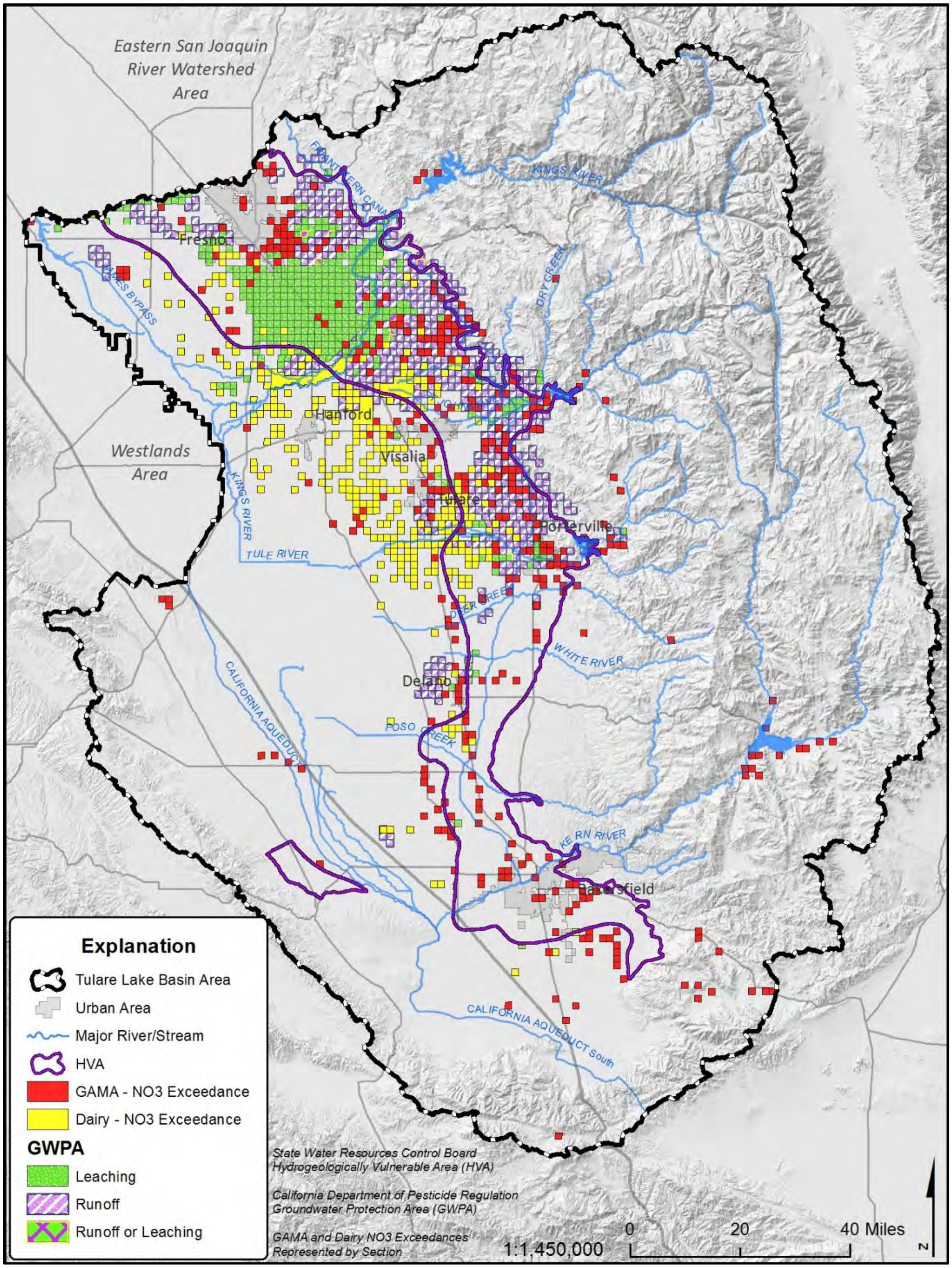


Figure 4 – DPR Groundwater Protection Areas (GWPA) by section, State Water Board's Hydrogeologically Vulnerable Area (HVA), Nitrate Exceedances from the GAMA Database by section (section contains a well that exceeds the nitrate MCL concentration), and Nitrate Exceedances Associated with the Dairy General Order by section (section contains a well that exceeds the nitrate MCL concentration).

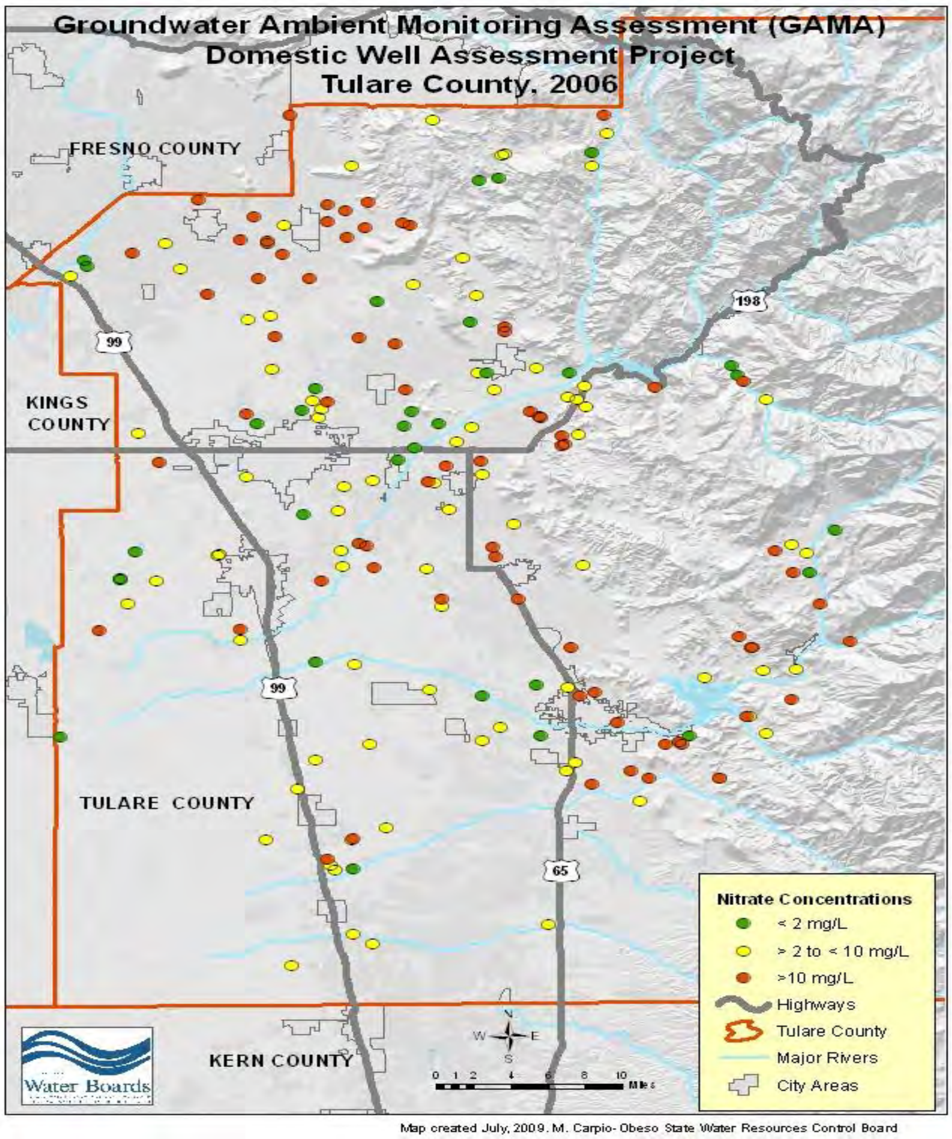


Figure 5 - GAMA Voluntary Domestic Well Project – showing nitrate concentrations obtained from the GAMA domestic well sampling program in Tulare County (2006).

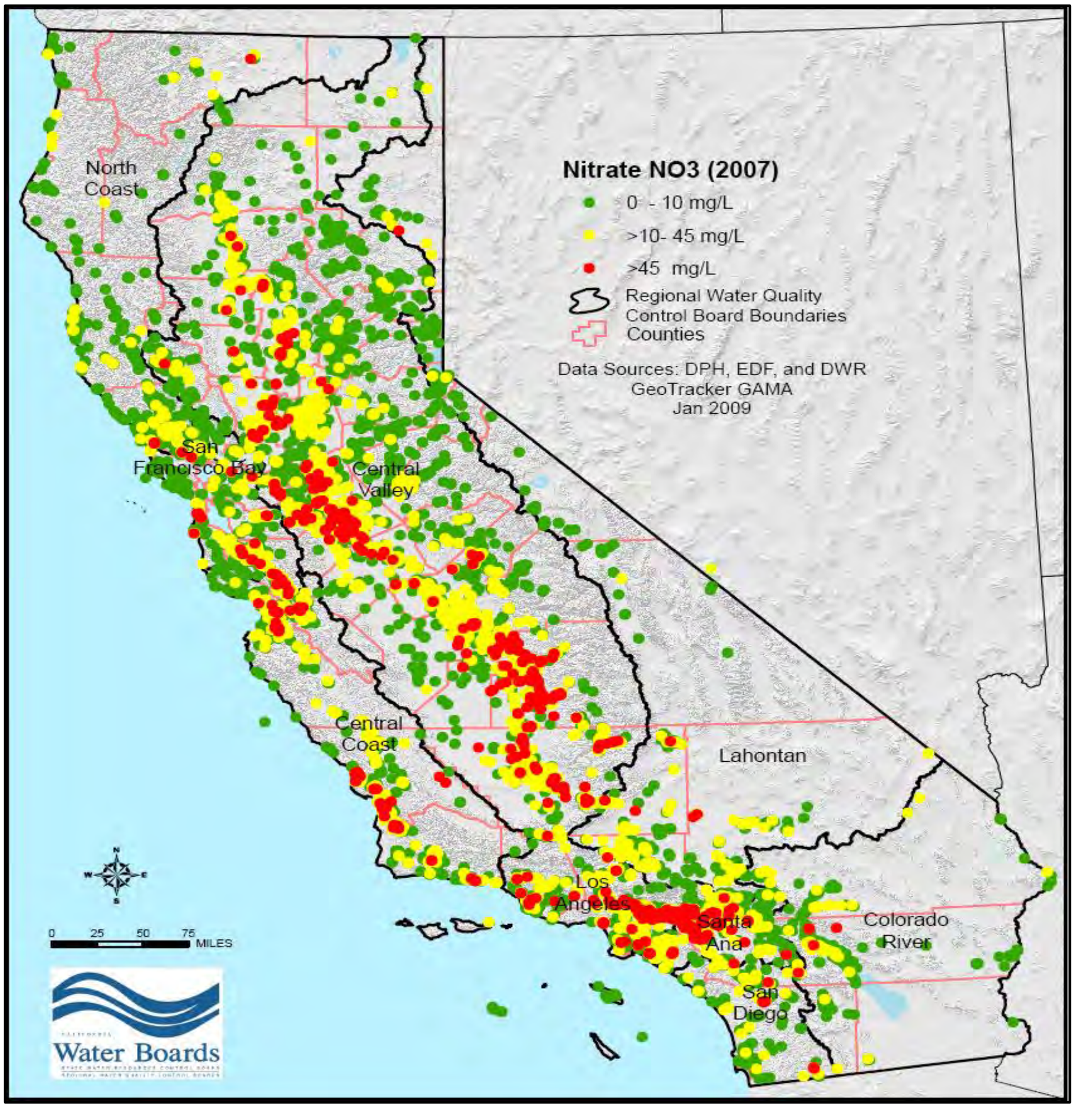


Figure 6 – Nitrate in Groundwater From: Erik J. Ekdahl, Maria de la Paz Carpio-Obeso, and John Borkovich, California State Water Resources Control Board, 2009; in: Harter, T., 2009. Agricultural impacts on groundwater nitrate, Southwest Hydrology, July/August 2009, p.23-25.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER R5-2013-0120
ATTACHMENT B TO ORDER R5-2013-0120
MONITORING AND REPORTING PROGRAM

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER
FOR
GROWERS WITHIN THE TULARE LAKE BASIN AREA
THAT ARE MEMBERS OF A THIRD-PARTY GROUP

TABLE OF CONTENTS

I. Introduction

This Monitoring and Reporting Program (MRP) is issued pursuant to California Water Code (Water Code) section 13267 which authorizes the California Regional Water Quality Control Board, Central Valley Region (hereafter Central Valley Water Board or "board"), to require preparation and submittal of technical and monitoring reports. This MRP includes requirements for a third-party representative entity assisting individual irrigated lands operators or owners that are members of the third-party (Members), as well as requirements for individual Members subject to and enrolled under Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of the Third-Party Group, Order R5-2013-0120 (hereafter referred to as the "Order"). This MRP applies to each third-party issued an NOA by the Executive Officer. The requirements of this MRP are necessary to monitor Member compliance with the provisions of the Order and determine whether state waters receiving discharges from Members are meeting water quality objectives. Additional discussion and rationale for this MRP's requirements are provided in Attachment A of the Order.

This MRP establishes specific surface and groundwater monitoring, reporting, and electronic data deliverable requirements for the third-party. Due to the nature of irrigated agricultural operations, monitoring requirements for surface waters and groundwater will be periodically reassessed to determine if changes should be made to better represent irrigated agriculture discharges to state waters. The monitoring schedule will also be reassessed so that constituents are monitored during application and/or release timeframes when constituents of concern are most likely to affect water quality. The third-party shall not implement any changes to this MRP unless the Central Valley Water Board or the Executive Officer issues a revised MRP.

II. General Provisions

This Monitoring and Reporting Program (MRP) conforms to the goals of the Non-point Source (NPS) Program as outlined in *The Plan for California's Nonpoint Source Pollution (NSP) Program* by:

- tracking, monitoring, assessing and reporting program activities;
- ensuring consistent and accurate reporting of monitoring activities;
- targeting NPS Program activities at the watershed level;
- coordinating with public and private partners; and
- tracking implementation of management practices to improve water quality and protect existing beneficial uses.

Monitoring data collected to meet the requirements of the Order must be collected and analyzed in a manner that assures the quality of the data. The third-party must follow sampling and analytical procedures as specified in Attachment C, Order No. R5-2008-0005, Coalition Group Monitoring Program Quality Assurance Project Plan Guidelines (QAPP Guidelines) and any revisions thereto approved by the Executive Officer.[1]

To the extent feasible, all technical reports required by this MRP must be submitted electronically in a format specified by the Central Valley Water Board that is reasonably available to the third-party.

This MRP requires the third-party to collect information from its Members and allows the third-party to report the information to the board in a summary format. The third-party must submit specific

[1] Central Valley Water Board staff will circulate proposed revisions of the QAPP Guidelines for public review and comment prior to Executive Officer consideration for approval.

Member information collected as part of the Order and this MRP when requested by the Executive Officer or as specified in the Order.

This MRP Order becomes effective on 19 September 2013. The Central Valley Water Board Executive Officer may revise this MRP as necessary. Upon the Executive Officer issuing the Notice of Applicability to the third-party, the third-party, on behalf of the individual Members, shall implement the following monitoring and reporting.

III. Surface Water Quality Monitoring Requirements

The surface water quality monitoring and reporting requirements in the MRP have been developed in consideration of the critical questions identified in the Information Sheet (Attachment A). The third-party must collect sufficient data to describe irrigated agriculture's impacts on surface water quality and to determine whether existing or newly implemented management practices comply with the surface water receiving water limitations of the Order. Surface water monitoring shall include a comprehensive suite of constituents (also referred to as "parameters") monitored periodically in a manner that allows for an evaluation of the condition of a water body and determination of whether irrigated agriculture operations in the Tulare Lake Basin Area are causing or contributing to any surface water quality problems.

A. Surface Water Monitoring Plan

The third-party group shall design a scientifically and technically justifiable Surface Water Monitoring Plan sufficient to characterize water quality for all waters of the state within the third-party group's boundaries. Two (2) months after receiving a NOA from the Central Valley Water Board, the third party will proved a proposed outline for the Surface Water Monitoring Plan to the Executive Officer, that describes the Monitoring Plan and data sources and references that will be considered in developing the Surface Water Monitoring Plan. The completed plan is due 180 after receiving an NOA (see section VIII.E. of Waste Discharge Requirements Order R5-2013-0120). Monitoring proposed within the Surface Water Monitoring Plan must provide sufficient data to describe irrigated agriculture's impacts on surface water quality and to determine whether existing or newly implemented management practices comply with the Surface Water Limitations of the Order. If the Executive Officer disapproves the Surface Water Monitoring Plan in whole or part, the Executive Officer may require revisions to the Surface Water Monitoring Plan, or issue a Surface Water Monitoring Plan to address the surface water quality monitoring elements identified in Section III.A. of this MRP. The Surface Water Monitoring Plan shall:

- Provide a discussion of the scientific rationale used for the monitoring site selection process (e.g., based on historical and/or on-going monitoring, lack of monitoring data, drainage size, crop types and distribution, topography and land use). Monitoring sites shall be established in a manner to evaluate the effects of irrigated agricultural waste discharges to all surface water bodies within the third-party coverage area receiving such wastes. In selecting sites, the third-party may choose to sample a location that is representative of a class or area of irrigated agricultural waste discharges, essentially reducing the number of sampling sites but still obtaining the information necessary to evaluate the effects of Member waste discharges throughout the coverage area. Adequate justification of the representativeness of the sampling location must be provided (note that follow-up and management plan actions will apply to all operations represented by the sampling location);
- Discuss the specific conditions/rationale used for the selection of each proposed monitoring site and include the proposed site's location (Albers Projection, NAD83, and units in meters);
- Identify monitoring schedule and frequency (section III.B.1 below);

- Identify parameters to be monitored including site specific requirements (i.e. Special Project monitoring sites) (section III.B.2. below);
- Identify priorities with respect to work on specific watersheds, sub-watersheds, and water quality parameters;
- Identify the method(s) to be used to demonstrate the effectiveness of current management practices and the processes to be used for implementing new management practices, if necessary to achieve compliance with the Surface Water Limitations of the Order;
- Include the requirements provided in Section III of the MRP; and
- Include the requirements provided in Section VIII of the MRP.

The Surface Water Monitoring Plan shall utilize four different but interrelated types of surface water monitoring sites: 1) fixed, long-term core sites, 2) assessment sites, 3) ephemeral sites, and, 4) special project sites (site types are described in detail below). Representative monitoring may be used to address water quality in several waterways with respect to assessment or ephemeral monitoring.

1. Core Monitoring Sites

Core monitoring sites will be used to track trends in water conditions over time. Core monitoring shall occur at fixed stations, at probabilistic sites, or at some other combination of sites that typically contain surface water during some portion of time each year (perennial or intermittent waterway). Core monitoring sites will be sampled on a regular basis (see section III. B.1.), and must include a repetition of the Assessment Monitoring analytical parameters on a regular basis. The purpose of periodically repeating the Assessment Monitoring analytical regime is to evaluate the effects of changes in land-use and management practices and provide information about long-term trends and effectiveness of the management practices. Core monitoring shall not be limited to largest volume water bodies that would dilute waste constituents that may be in higher concentrations in tributary streams and drainages. The Core Monitoring component of the Surface Water Monitoring Plan shall:

- Focus on a diversity of monitoring sites across the third party's area (hydrology, size, and flow);
- Include sites that through Assessment Monitoring or other information have been shown to be characteristic of key crop types, topography, and hydrology within the third-party group's boundaries;
- Discuss the criteria for the selection of each monitoring site (based on existing monitoring projects, historical information, or lack of information);
- Propose the approach, including a schedule, for sampling core monitoring sites;
- Include water bodies that carry agricultural drainage, are dominated by agricultural drainage, or otherwise could be affected by other irrigated agriculture activities; and
- Include management practice information in order to establish relationships (e.g. status and trends) with water quality monitoring information.

Core monitoring sites shall be chosen from locations where Assessment monitoring has already been conducted, or at other sites demonstrated to be appropriate for long-term trend monitoring, and that have been adequately characterized. It is anticipated that many Core monitoring sites will be chosen from the third-party's existing monitoring sites allowing for a continuous or near continuous database from which trends may be evaluated.

2. Assessment Monitoring Sites

Assessment monitoring sites shall be selected to represent varying sizes and flows of surface water bodies (including perennial and intermittent waterways) and land uses (e.g., agricultural activities, crops and pesticide use), focusing on diversity across the watershed, and must include water bodies that are carrying agricultural drainage into natural water bodies, whether directly or indirectly. Assessment monitoring will be conducted on a rotating basis (see section III.B.1.). Rotation will be continuous so that any given water body will be reassessed on a regular basis. This strategy will allow for the characterization of a large number of water bodies throughout the third-party area over time. Assessment monitoring shall:

- Focus on a diversity of monitoring sites across the third-party group's area (hydrology, size, and flow);
- Evaluate different types of water bodies for assessment parameters (perennial, intermittent, constructed agricultural conveyance structures [excluding on-farm conveyance structures] and ephemeral waterways);
- Include a sufficient number of sampling sites or representative monitoring sites (defined in number 5 below) to assess all surface waters of the state within the third-party group area; and
- Include sampling sites in areas of known water quality impairments, even if they are not currently identified on the Clean Water Act (CWA) 303(d) listing.

Assessment monitoring shall be used to provide supporting data for sites that a third-party group wishes to select as Core monitoring sites for trends. Assessment monitoring shall also take place at all newly established monitoring sites or at sites that have not been fully characterized. Core and Assessment sites shall be selected in a manner to be fully representative of Member waste discharges and receiving water conditions throughout the third-party coverage area. Any watershed drainage area that does not contain a Core monitoring site or an Assessment monitoring site must have a designated representative monitoring site unless the Executive Officer has approved an exemption. Any surface water quality management plan (SQMP) actions required by the representative site must take place in the represented drainages.

3. Ephemeral Monitoring Sites

Ephemeral monitoring sites shall be established on representative ephemeral streams (a stream channel which carries water only during and immediately after periods of rainfall or snow melt) which may be impacted by agricultural operations (e.g., spray drift, tailwater flows, storm water runoff). Because ephemeral waterways are typically dry for extended periods of time (in some cases for multiple years), they are to be monitored for all of the parameters listed in section III.B.2.

4. Special Project Monitoring Sites

In addition to Core, Assessment, and Ephemeral sites, the third-party may designate Special Project Monitoring sites as needed to implement a Surface Water Quality Management Plan (SQMP), to evaluate commodity or management practice-specific effects on identified water quality problems,[2] or to evaluate sources of identified water quality problems. In accordance with Water Code section 13267, the Executive Officer may require the third-party to conduct local or site-specific monitoring, in addition to the Core and Assessment monitoring, where monitoring identifies a localized water quality problem. Core sites and Assessment sites located in areas where management plans are required will also be considered Special Project sites for the parameter(s) subject to the management plan(s).

[2] "Water quality problem" is defined in Attachment E.

5. Representative Monitoring

The third-party's Surface Water Monitoring Plan may rely on representative monitoring to evaluate the effects of Member waste discharges on receiving waters in lieu of conducting applicable Core, Assessment and Ephemeral monitoring in all surface water bodies receiving irrigated agricultural waste discharges. If the Surface Water Monitoring Plan proposes to rely on representative monitoring, it must specify which areas, crop types, waterways or watershed areas are to be represented by the monitored sites and provide a technically sound justification for the representative nature of the monitoring locations including: similarities in hydrology, crop types, pesticide use, and other factors that affect the discharge of wastes from irrigated lands to surface waters. Third-party Members within watershed areas that are represented by monitoring in another watershed must apply all SQMP requirements, if any, associated with the representative monitoring site.

B. Monitoring Requirements and Schedule

Surface water monitoring shall consist of the general water quality parameters, nutrients, pathogen indicators, water column and sediment toxicity, pesticides, and metals identified in section III.B.2. The third-party shall continue monitoring at sites within the third-party's boundaries, and as described in the Southern San Joaquin Valley Water Quality Coalition's conditionally approved 8 May 2009, Monitoring and Reporting Program Plan (2009 MRPP) or existing approved Surface Water Quality Management Plan (SQMP), until the Executive Officer has approved or issued the Surface Water Monitoring Plan required by this Order, or otherwise requests a SQMP, prepared in accordance with Appendix MRP-1.

Surface Water Quality Management Plan (SQMP): The third-party is required to develop SQMPs for monitoring sites where there is an exceedance of a water quality objective or trigger limit more than one time in a three-year period[3]. SQMPs may also be required where there is a trend of degradation that threatens a beneficial use. SQMPs will be reviewed and approved by the Executive Officer as specified in Appendix MRP-1. Also, because SQMPs may cover broad areas potentially impacting multiple surface water users in the plan area, these plans will be circulated for public review. Prior to plan approval, the Executive Officer will consider public comments on proposed SQMPs.

Follow-up sampling: The Central Valley Water Board Executive Officer may request that a parameter(s) of concern continue to be monitored at a specific Core, Assessment, Ephemeral, or Special Study site during non-scheduled years. Parameters of concern may include, but are not limited to, parameters that exceed an applicable water quality objective or water quality trigger (see section VII and Table 5).

Sampling events shall be scheduled to capture at least two storm runoff events per year, except where a different frequency has been required or approved by the Executive Officer. The third-party shall identify storm runoff monitoring criteria that are based on precipitation levels and knowledge of soils or other factors affecting when storm runoff is expected to occur at monitoring sites. The collection of storm runoff samples shall not be contingent upon the timing of other sampling events.

1. Monitoring Schedule and Frequency

Core Monitoring Sites - Core Monitoring Sites are to be monitored on a repeating three-year cycle (one year of sampling for assessment monitoring parameters followed by two consecutive years of sampling for core monitoring parameters followed by a repeat of the cycle [see Table 1 below]).

[3] Surface and Groundwater Management Plans requirements are presented in the attached Monitoring and Reporting Program Appendix MRP-1.

Table 1 - Core Monitoring Cycle†

Monitoring Type	Year 1	Year 2	Year 3
Assessment	X		
Core		X*	X

†Repeat cycle every three years.

*The first year of core monitoring will include assessment monitoring parameters that exceeded a water quality objective in the previous assessment period.

Assessment Monitoring Sites - Assessment monitoring shall be conducted at all new sites for a period of one year and then repeated on a regular rotating basis. The period of rotation is to be proposed in the third-party's Surface Water Monitoring Plan.

Ephemeral Monitoring Sites - Due to the transitory nature of surface water flow within an ephemeral stream, sampling shall be conducted once monthly whenever water is present. Rainfall forecasts shall be utilized to identify potential sampling events and to provide advanced notice to sampling and laboratory personnel for preparation purposes. Specific Ephemeral sampling triggers and procedures shall be developed by the third-party and included in the third-party's Surface Water Monitoring Plan The third-party shall identify the appropriate monitoring periods (e.g., months, seasons) for all parameters that require testing (Table 2), including a discussion of the rationale to support the proposed schedule.

In the Surface Water Monitoring Plan the third-party shall identify the appropriate monitoring periods (e.g., months, seasons) for all parameters that require testing (Table 2), including a discussion of the rationale to support the proposed schedule.

For metals, pesticides, and aquatic toxicity, the monitoring periods shall be determined utilizing previous monitoring results, knowledge of agricultural use patterns (if applicable), pesticide use trends, chemical characteristics, and other applicable criteria. Parameters not previously monitored under Monitoring and Reporting Program Order R5-2008-0005 at a site shall be monitored for two consecutive years during periods when most likely to be present. All other required parameters shall be monitored according to an approved schedule and frequency during the years in which monitoring is conducted at Core and Assessment sites.

Monitoring shall be conducted when the pollutant is most likely to be present. If there is a temporal or seasonal component to the beneficial use, monitoring must also be conducted when beneficial use impacts could occur. The frequency of data collection must be sufficient to allow determination of compliance with the relevant numeric water quality objective(s) or water quality triggers. Adequate characterization of the presence of some pollutants may require monitoring more than once per month. The third-party may submit written requests for the removal or addition of monitoring sites or parameters, or to modify the monitoring schedule and frequency, for approval by the Executive Officer.

2. Monitoring Parameters

Water quality and flow monitoring shall be used to assess the wastes in discharges from irrigated lands to surface waters and to evaluate the effectiveness of management practice implementation. Water quality is evaluated with both field-measured parameters and laboratory analytical data as listed on Table 2 of this MRP, according to time of year and monitoring regime. The pesticides marked as "to be determined" (TBD) in Table 2 shall be identified as part of a process that includes input from qualified scientists and coordination with the Department of Pesticide Regulation. Based on this process, the Executive Officer will provide the third-party with a list of pesticides that require monitoring in areas where they are applied and have the potential to impair water quality.

The metals to be monitored at sites within each site sub-watershed shall be determined through an evaluation of several factors. The evaluation will provide the basis for including or excluding each metal. Evaluation factors shall include, but not be limited to: documented use of the metal applied to lands for irrigated agricultural purposes in the last three years; prior monitoring results; geological or hydrological conditions; and mobilization or concentration by irrigated agricultural operations. The third-party may also consider other factors such as acute and chronic toxicity thresholds and chemical characteristics of the metals. The third-party shall evaluate the monitoring parameters listed in Table 2 to determine which metals and metal fractions warrant monitoring for each site sub-watershed. Documentation of the evaluations must be provided to the Central Valley Water Board as part of the Monitoring Plan Update.

The third-party shall identify in an annual Surface Water Monitoring Plan update all parameters to be monitored and the proposed monitoring periods and frequency at selected sites no later than 60 days prior to the beginning of the annual monitoring period [4]. The Surface Water Monitoring Plan update shall be subject to Executive Officer review and approval prior to the initiation of changes in monitoring activities.

[4] Annual monitoring period is defined as either the water year, which is 1 October through 30 September, or the calendar year. The third party must inform the Executive Officer which annual reporting period will be used when submitting the Surface Water Monitoring Plan. Once established, the monitoring period may be changed only with the concurrence of the Executive Officer.

Table 2 - Monitoring Parameters

	Measured Parameter	Matrix	Required
Field Measurements	Estimated Flow (cfs)†	Water	x
	Photo Documentation†	Site	x
	Conductivity (at 25 ºC) (µs/cm)†	Water	x
	Temperature (ºC)†	Water	x
	pH†	Water	x
	Dissolved Oxygen (mg/L)†	Water	x
Drinking Water	*E. coli*†	Water	x
	Total Organic Carbon (TOC)†	Water	x
Gen Phys	Hardness (as $CaCO_3$)†	Water	To be Determined (TBD)
	Total Suspended Solids (TSS)†	Water	x
	Turbidity†	Water	x
Metals	Arsenic (total)	Water	TBD
	Boron (total)	Water	TBD
	Cadmium (total and dissolved)**	Water	TBD
	Copper (total and dissolved)**	Water	TBD
	Lead (total and dissolved)**	Water	TBD
	Molybdenum (total)	Water	TBD
	Nickel (total and dissolved)**	Water	TBD
	Selenium (total)	Water	TBD
	Zinc (total and dissolved)**	Water	TBD
Nutrients	Total Ammonia (as N)†	Water	x
	Unionized Ammonia (calculated value)†	Water	x
	Nitrogen, Nitrate+Nitrite†	Water	x
	Soluble Orthophosphate†	Water	x
Pesticides	Registered pesticides determined according to the process identified in section III.B.2.	Water	TBD
303(d)	TMDL constituents required by the Basin Plan 303(d) listed constituents to be monitored if irrigated agriculture is identified as a contributing source within the Tulare Lake Basin Area and	Water or Sediment	TBD

Table 2 - Monitoring Parameters

	Measured Parameter	Matrix	Required
	requested by the Executive Officer.		
Water Toxicity	*Ceriodaphnia dubia*†	Water	x
	Pimephales promelas†	Water	x
	Selenastrum capricornutum†	Water	x
	Toxicity Identification Evaluation	Water	see section III.B.
Sediment Toxicity	*Hyalella azteca*	Sediment	x
Pesticides & Sediment Parameters	Bifenthrin	Sediment	As needed*
	Cyfluthrin	Sediment	As needed*
	Cypermethrin	Sediment	As needed*
	Deltamethrin	Sediment	As needed*
	Esfenvalerate/Fenvalerate	Sediment	As needed*
	Fenpropathrin	Sediment	As needed*
	Lambda cyhalothrin	Sediment	As needed*
	Permethrin	Sediment	As needed*
	Piperonyl butoxide (PBO)	Sediment	As needed*
	Chlorpyrifos	Sediment	As needed*
	Total Organic Carbon	Sediment	x
	Grain Size	Sediment	x

† Core monitoring parameter. The first year of core monitoring must also include any assessment monitoring parameter that exceeded a water quality objective during the previous assessment period.
* For sediment samples measuring significant toxicity and < 80% organism survival compared to the control, the sediment pesticide analysis will be performed. Sediment pesticide analyses may be identified according to an evaluation of pesticide use information (see sediment toxicity testing requirements in section III.B. below).
** Hardness samples shall be collected when sampling for these metals.

3. Toxicity Testing

The purpose of toxicity testing is to: 1) evaluate compliance with the Basin Plan narrative toxicity water quality objective; 2) identify the causes of toxicity when and where it is observed (e.g. metals, pesticides, ammonia, etc.); and 3) evaluate any additive toxicity or synergistic effects due to the presence of multiple constituents.

a. Aquatic Toxicity

Aquatic toxicity testing shall include *Ceriodaphnia dubia (water flea)*, *Pimephales promelas (fathead minnow)*, and *Selenastrum capricornutum (green algae)* in the water column (see Table 2). Testing for *C. dubia* and *P. promelas* shall follow the USEPA acute toxicity testing methods.[5] Testing for *S. capricornutum* shall follow the USEPA short-term chronic toxicity testing methods.[6] Toxicity test endpoints are survival for *C. dubia* and *P. promelas*, and growth for *S. capricornutum*.

Water column toxicity analyses shall be conducted on 100% (undiluted) sample for the initial screening. A sufficient sample volume shall be collected in order to allow the laboratory to conduct a Phase I Toxicity Identification Evaluation (TIE) on the same sample, should toxicity be detected, in an effort to identify the cause of the toxicity.

If a 50% or greater difference in *Ceriodaphnia dubia* or *Pimephales promelas* mortality in an ambient sample, as compared to the laboratory control, is detected at any time in an acceptable test, a TIE shall be initiated within 48 hours of such detection. If a 50% or greater reduction in *Selenastrum capricornutum* growth in an ambient sample, as compared to the laboratory control, is detected at the end of an acceptable test, a TIE shall be initiated within 48 hours of such detection.

At a minimum, Phase I TIE[7] manipulations shall be conducted to determine the general class(es) (e.g., metals, non-polar organics, and polar organics) of the chemical(s) causing toxicity. The laboratory report of TIE results submitted to the Central Valley Water Board must include a detailed description of the specific TIE manipulations that were utilized.

If within the first 96 hours of the initial toxicity screening, the mortality reaches 100%, a multiple dilution test shall be initiated. The dilution series must be initiated within 24 hours of the sample reaching 100% mortality, and must include a minimum of five (5) sample dilutions in order to quantify the magnitude of the toxic response. For the fathead minnow test, the laboratory must take the steps to procure test species within one working day, and the multiple dilution tests must be initiated the day fish are available.

Ceriodaphnia dubia and Pimephales promelas Media Renewal

Daily sample water renewals shall occur during all acute toxicity tests to minimize the effects of rapid pesticide losses from test waters. A feeding regime of 2 hours prior to test initiation and 2 hours prior to test renewal shall be applied. Test solution renewal must be 100% renewal for *Ceriodaphnia dubia* by transferring organisms by pipet into fresh aliquot of the original ambient sample, as defined in the freshwater toxicity testing manual.

Selanastrum capricornutum Pre-Test Treatment

Algae toxicity testing shall not be preceded with treatment of the chelating agent EDTA. The purpose of omitting EDTA is to ensure that metals used to control algae in the field are not removed from sample aliquots prior to analysis or during the initial screening.

b. Sediment Toxicity

Sediment toxicity analyses shall be conducted according to EPA Method 600/R-99/064. Sampling and analysis for sediment toxicity testing utilizing *Hyalella azteca* shall be conducted at each monitoring location established by the third-party for water quality monitoring, if appropriate sediment (i.e. silt, clay) is present at the site. If appropriate sediment is not present at the designated water quality monitoring site, an alternative site with appropriate sediment shall be designated for all sediment collection and toxicity testing events. Sediment samples

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[5] USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition. Office of Water, Washington, D.C. USEPA-821-R-02-012.
[6] USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. Office of Water, Washington, D.C. USEPA-821-R-02-013.
[7] USEPA. 1991. Methods for Aquatic Toxicity Identification Evaluations. Phase I Toxicity Characterization Procedures. Office of Research and Development, Washington DC. 20460. EPA-600-6-91-003.

shall be collected and analyzed for toxicity twice per year, with one sample collected between 15 August and 15 October, and one sample collected between 1 March and 30 April, during each year of monitoring. The *H. azteca* sediment toxicity test endpoint is survival. The Executive Officer may request different sediment sample collection timing and frequency under a SQMP.

All sediment samples must be analyzed for total organic carbon (TOC) and grain size. Analysis for TOC is necessary to evaluate the expected magnitude of toxicity to the test species. Note that sediment collected for grain size analysis shall not be frozen. If the sample is not toxic to the test species, the additional sample volume can be discarded.

Sediment samples that show significant toxicity to *Hyalella azteca* at the end of an acceptable test and that exhibit < 80% organism survival compared to the control will require pesticide analysis of the same sample in an effort to determine the potential cause of toxicity. The third-party may use the previous three years of available pesticide use information to determine which of the parameters listed in Table 2 require testing in the sediment sample. Analysis at practical reporting limits of 1 ng/g on a dry weight basis for each pesticide is required to allow comparison to established lethal concentrations of these chemicals to the test species. This follow-up analysis must begin within five business days of when the toxicity criterion described above is exceeded. The third-party may also follow up with a sediment TIE when there is ≥ 50% reduction in test organism survival as compared to the laboratory control. Sediment TIEs are an optional tool.

4. Special Project Monitoring

The Central Valley Water Board or Executive Officer may require the third-party to conduct local or site-specific monitoring where monitoring identifies a water quality problem (Special Project Monitoring). The studies shall be representative of the effects of changes in management practices for the parameters of concern. Once Special Project Monitoring is required, the third-party must submit a Special Project Monitoring proposal. The proposal must provide the justification for the proposed study design, specifically identifying how the study design will quantify irrigated agriculture's contribution to the water quality problem, identify sources, and evaluate management practice effectiveness. When such a study is required, the proposed study must include an evaluation of the feasibility of conducting commodity and management practice specific field studies for those commodities and irrigated agricultural practices that could be associated with the constituents of concern. Special Project Monitoring studies will be designed to evaluate the effectiveness of practices used by multiple Members and will not be required of the third-party to evaluate compliance of an individual Member.

C. Surface Water Data Management Requirements

All surface water field and laboratory data (including sediment) must be submitted electronically to the ILRP in the required templates. The third-party shall ensure that the most current version of the templates are being utilized and that updates to database lookup lists are communicated to the ILRP on a routine basis. Required formatting and business rules for field, chemistry and toxicity data are detailed within the respective template instruction manuals (see below). These manuals are maintained in collaboration with the Central Valley Regional Data Center (CV RDC) to ensure comparability with the California Environmental Data Exchange Network (CEDEN). In addition to the use of required templates for field, chemistry, and toxicity data, the third-party shall maintain an electronic version of their approved Quality Assurance Project Plan (eQAPP). Detailed electronic water quality data submittal requirements are provided in section V.A of this MRP. Note that PDF copies of all original field sheets, field measurement instrumentation calibration logs, chain of custody forms and laboratory reports must accompany the electronic data submittal.

Once data have been submitted to the ILRP, the data will undergo a series of reviews for adherence to the required formatting and business rules. The data will also be reviewed for the required quality control elements as detailed within the third-party's eQAPP. The third-party will be notified of any changes made to the dataset in order to successfully load the data. If significant changes are found to be needed, the dataset will be returned to the third-party for revision. Once the data sets have been reviewed and corrected, if needed, the data will be uploaded by the ILRP into a CV RDC CEDEN comparable database. The dataset will then undergo a final set of reviews to ensure completeness and then be transferred to CEDEN for public access.

A narrative describing each required template is provided below. Links to the required templates, instruction manuals and optional tools are available on the ILRP Electronic Water Quality Monitoring Data Submission Resources webpage:

http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/electronic_data_submission/

Field Data Template (Required)

The third-party shall input all site visit information and field measurement results into the field data template, which is an Excel workbook. Site visit information (Location and Habitat) must be recorded for any site visit conducted to comply with the requirements in this Order, including events when a site is dry. The field data template contains three required worksheets (Locations, FieldResults, HabitatResults) and four optional worksheets (Stations, FundingCode, GroupCode and Personnel). An instruction manual for the template is available on the ILRP Electronic Data Submission webpage.

Chemistry Data Template (Required)

The third-party shall input all chemistry analysis and associated quality control information into the chemistry data template, which is an Excel workbook. The chemistry data template contains two required worksheets: Results and LabBatch. An instruction manual for the template is available on the ILRP Electronic Data Submission webpage.

Toxicity Data Template (Required)

The third-party shall input all toxicity analysis and associated quality control information, with the exception of reference toxicity analyses, into the toxicity data template, which is an Excel workbook. The toxicity data template contains three required worksheets: Results, Summary, and ToxBatch. An instruction manual for the template is available on the ILRP Electronic Data Submission webpage.

Electronic Quality Assurance Program Plan (eQAPP) (Required)

The eQAPP is an Excel workbook containing a worksheet of the quality control requirements for each analyte and method as detailed in the most current version of the third-party's approved QAPP. The eQAPP workbook will also include additional worksheets containing references for applicable codes, CEDEN retrieval information, and other project specific information. The ILRP has already provided each third-party an eQAPP associated with their previously approved QAPP. The third-party shall be responsible for updating the Quality Control worksheet to the most current approved QAPP. Each analyte, method, extraction, units, recovery limits, QA sample requirement, etc. are included in this document using the appropriate codes required for the CEDEN comparable database. This information should be used to conduct a quality control review prior to submission. Data that do not meet the project quality assurance acceptance requirements must be flagged accordingly and include applicable comments.

The ILRP and CV RDC have also developed several optional tools to assist the third-party. Links to these tools, unless otherwise noted, are available on the ILRP Electronic Data Submission webpage.

Field Sheet Template (Optional)

An example of a CEDEN comparable field sheet can be found on the ILRP webpage. This field sheet was designed to match the entry user interface within the CEDEN comparable database to allow for easier data entry of all sample collection information.

CV RDC Field Entry Shell Database (Optional)

The CV RDC Field Entry Shell Database is a copy of the CV RDC database infrastructure that provides a user interface for site visit and field measurements data entry only. The shell database may be used by those who prefer to enter field data through a user interface rather than directly into the required Excel template. The database provides an export function that can populate the required CV RDC field data template with the data entered. The populated template is then required to be submitted to the ILRP. The shell database may not be used for entry of chemistry or toxicity data. A custom field entry shell database may be obtained by contacting the CV RDC: http://mlj-llc.com/contact.html.

Format Quick Guide (Optional Tool)

The Format Quick Guide is a guidance document developed to aid the third-party with data entry and can be used as a reference tool for commonly used codes necessary for populating the required data entry templates. The ILRP will provide this document, and updates to it, upon request.

EDD Checklist with example Pivots (Optional Tool)

The electronic data deliverable (EDD) checklist provides for a structured method for reviewing data deliverables from data entry staff or laboratories prior to loading. Example pivot tables are provided to assist with the review of the data. Documentation on how to use the checklist and associated pivot tables are available on the ILRP Electronic Data Submission webpage.

Online Data Checker (Optional Tool)

An online data checker was developed to automate the checking of the datasets against many of the format requirements and business rules associated with CEDEN comparable data. The data checker can be accessed through the ILRP Electronic Data Submission webpage. Please note that data submission will not be accepted through this tool; however, the checker can still be used to check data for formatting and business rule compliance.

IV. Groundwater Quality Monitoring and Management Practice Assessment, and Evaluation Requirements

The groundwater quality monitoring, assessment, and evaluation requirements in this MRP have been developed in consideration of the critical questions developed by the Groundwater Monitoring Advisory Workgroup (questions are presented in the Information Sheet, Attachment A). The third-party must collect sufficient data to describe irrigated agricultural impacts on groundwater quality and to determine whether existing or newly implemented management practices comply with the groundwater receiving water limitations of the Order.

The strategy for evaluating groundwater quality and protection consists of 1) Groundwater Quality Assessment Report, 2) Management Practices Evaluation Program, and 3) Groundwater Quality Trend Monitoring Program.

1. The Groundwater Quality Assessment Report (GAR) provides the foundational information necessary for design of the Management Practices Evaluation Program and the Groundwater Quality Trend Monitoring Program. The GAR also identifies the high vulnerability groundwater areas where a Groundwater Quality Management Plan must be developed and implemented.

2. The overall goal of the Management Practice Evaluation Program (MPEP) is to determine the effects, if any, irrigated agricultural practices have on first encountered groundwater under different conditions that could affect the discharge of waste from irrigated lands to groundwater (e.g., soil type, depth to groundwater, irrigation practice, crop type, nutrient management practice).
3. The overall objectives of the Groundwater Quality Trend Monitoring Program are to determine current water quality conditions of groundwater relevant to irrigated agriculture and develop long-term groundwater quality information that can be used to evaluate the regional effects of irrigated agricultural practices.

Each of these elements has its own specific objectives (provided below), and the design of each will differ in accordance with the specific objectives to be reached. While it is anticipated that these programs will provide sufficient groundwater quality and management practice effectiveness data to evaluate whether management practices of irrigated agriculture are protective of groundwater quality, the Executive Officer may also, pursuant to Water Code section 13267, order Members to perform additional monitoring or evaluations, where violations of this Order are documented or the irrigated agricultural operation is found to be a significant threat to groundwater quality.

A. Groundwater Quality Assessment Report

The purpose of the Groundwater Quality Assessment Report (GAR) is to provide the technical basis informing the scope and level of effort for implementation of the Order's groundwater monitoring and implementation provisions. Three (3) months after receiving an NOA from the Central Valley Water Board, the third-party will provide a proposed outline of the GAR to the Executive Officer that describes data sources and references that will be considered in developing the GAR. The third-party must review and update the GAR to incorporate new information every five (5) years after Executive Officer approval of the GAR.

1. *Objectives.* The main objectives of the GAR are to:
   - Provide an assessment of all available, applicable and relevant data and information to determine the high and low vulnerability areas where discharges from irrigated lands may result in groundwater quality degradation;
   - Establish priorities for implementation of monitoring and studies within high vulnerability areas;
   - Provide a basis for establishing workplans to assess groundwater quality trends;
   - Provide a basis for establishing workplans and priorities to evaluate the effectiveness of agricultural management practices to protect groundwater quality; and
   - Provide a basis for establishing groundwater quality management plans in high vulnerability areas and priorities for implementation of those plans.
2. *GAR components.* The GAR shall include, at a minimum, the following data components:
   - Detailed land use information with emphasis on land uses associated with irrigated agricultural operations. The information shall identify the largest acreage commodity types in the third-party area, including the most prevalent commodities comprising up to at least 80% of the irrigated agricultural acreage in the third-party area;
   - Information regarding depth to groundwater, provided as a contour map(s);
   - Groundwater recharge information, including identification of areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply;

- Soil survey information including significant areas of high salinity, alkalinity, and acidity;
- Shallow groundwater constituent concentrations (potential constituents of concern include any material applied as part of the agricultural operation, including constituents in irrigation supply water [e.g., pesticides, fertilizers, soil amendments, etc.] that could impact beneficial uses or cause degradation); and
- Information on existing groundwater data collection and analysis efforts relevant to this Order (e.g., Department of Pesticide Regulation [DPR] United States Geological Survey [USGS] State Water Board Groundwater Ambient Monitoring and Assessment [GAMA], California Department of Public Health, local groundwater management plans, etc.). This groundwater data compilation and review shall include readily accessible information relative to the Order on existing monitoring well networks, individual well details, and monitored parameters. For existing monitoring networks (or portions thereof) and/or relevant data sets, the third-party should assess the possibility of data sharing between the data-collecting entity, the third-party, and the Central Valley Water Board.

3. *GAR data review and analysis.* To develop the above data components, the GAR shall include review and use, where applicable, of relevant existing federal, state, county, and local databases and documents. The GAR shall include an evaluation of the above data components to:

   - Determine where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities;
   - Determine the merit and feasibility of incorporating existing groundwater data collection efforts, and their corresponding monitoring well systems for obtaining appropriate groundwater quality information to achieve the objectives of and support groundwater monitoring activities under this Order. This shall include specific findings and conclusions and provide the rationale for conclusions;
   - Prepare a ranking of high vulnerability areas to provide a basis for prioritization of workplan activities; and
   - The GAR shall discuss pertinent geologic and hydrogeologic information for the third-party area(s) and utilize GIS mapping applications, graphics, and tables, as appropriate, in order to clearly convey pertinent data, support data analysis, and show results.

4. *Groundwater vulnerability designations.* The GAR shall designate high/low vulnerability areas for groundwater in consideration of high and low vulnerability definitions provided in Attachment E of the Order. Vulnerability designations may be refined/ updated periodically during the Monitoring Report process. The third-party must review and confirm or modify vulnerability designations every five (5) years after Executive Officer approval of the GAR. The vulnerability designations will be made by the third-party using a combination of physical properties (soil type, depth to groundwater, known agricultural impacts to beneficial uses, etc.) and management practices (irrigation method, crop type, nitrogen application and removal rates, etc.). If the third-party intends to develop a Basin Plan Amendment Workplan (section VIII.M of the Order), the third-party must identify the areas where a high vulnerability designation results from exceedances due to naturally elevated levels of a constituent. The third-party shall provide the rationale for proposed vulnerability determinations. The Executive Officer will make the final determination regarding vulnerability designations.

If the GAR is not submitted to the board by the required deadline, the Executive Officer will designate default high/low vulnerability groundwater areas using such information as 1) those areas that have been identified by the State Water Board as Hydrogeologically Vulnerable Areas, 2) California Department of Pesticide Regulation groundwater protection areas, and 3) areas with exceedances of water quality objectives for which irrigated agriculture waste discharges may cause or contribute to the exceedance.

5. *Prioritization of high vulnerability groundwater areas.* The third-party may prioritize the areas designated as high vulnerability areas to comply with the requirements of this Order, including conducting monitoring programs and carrying out required studies. When establishing relative priorities for high vulnerability areas, the third party may consider, but not be limited to, the following:

   - Identified exceedances of water quality objectives for which irrigated agriculture waste discharges are the cause, or a contributing source;
   - The proximity of the high vulnerability area to areas contributing recharge to urban and rural communities where groundwater serves as a significant source of supply;
   - Existing field or operational practices identified to be associated with irrigated agriculture waste discharges that are the cause, or a contributing source;
   - The largest acreage commodity types comprising up to at least 80% of the irrigated agricultural acreage in the high vulnerability areas and the irrigation and fertilization practices employed by these commodities;
   - Legacy or ambient conditions of the groundwater;
   - Groundwater basins currently or proposed to be under review by CV-SALTS; and
   - Identified constituents of concern (e.g., relative toxicity, mobility).

   Additional information such as models, studies, and information collected as part of this Order may also be considered in designating and prioritizing vulnerability areas for groundwater. Such data includes, but is not limited to, 1) those areas that have been identified by the State Water Board as Hydrogeologically Vulnerable Areas, 2) California Department of Pesticide Regulation groundwater protection areas, and 3) areas with exceedances of water quality objectives for which irrigated agriculture waste discharges may cause or contribute to the exeedance.

   The Executive Officer will review and may approve or require changes to any third-party proposed high/low vulnerability areas and the proposed priority ranking. The vulnerability areas, or any changes thereto, shall not be effective until third-party receipt of written approval by the Executive Officer. An interested person may seek review by the Central Valley Water Board of the Executive Officer’s decision on the designation of high and low vulnerability areas associated with approval of the Groundwater Quality Assessment Report.

B. Management Practice Evaluation Program

The goal of the Management Practice Evaluation Program (MPEP) is to determine the effects, if any, irrigated agricultural practices[8] have on groundwater quality. A MPEP is required in high vulnerability groundwater areas and must address the constituents of concern described in the GAR. This section provides the goals, objectives, and minimum reporting requirements for the

[8] In evaluating management practices, the third-party is expected to focus on those practices that are most relevant to the Members’ groundwater quality protection efforts.

MPEP. As specified in section IV.D of this MRP, the third-party is required to develop a workplan that will describe the methods that will be utilized to achieve the MPEP requirements.

1. *Objectives*. The objectives of the MPEP are to:
   - Identify whether existing site-specific and/or commodity-specific management practices are protective of groundwater quality within high vulnerability groundwater areas;
   - Determine if newly implemented management practices are improving or may result in improving groundwater quality;
   - Develop an estimate of the effect of Members' discharges of constituents of concern on groundwater quality in high vulnerability areas. A mass balance and conceptual model of the transport, storage, and degradation/chemical transformation mechanisms for the constituents of concern, or equivalent method approved by the Executive Officer or as a result of the recommendations by the expert panels by CDFA and the State Water Board, must be provided; and
   - Utilize the results of evaluated management practices to determine whether practices implemented at represented Member farms (i.e., those not specifically evaluated, but having similar site conditions), need to be improved.

   Given the wide range of management practices/commodities that are used within the third-party's boundaries, it is anticipated that the third-party will rank or prioritize its high vulnerability areas and commodities, and present a phased approach to implement the MPEP.

2. *Implementation*. Since management practices evaluation may transcend watershed or third-party boundaries, this Order allows developing a MPEP on a watershed or regional basis that involves participants in other areas or third-party groups, provided the evaluation studies are conducted in a manner representative of areas to which it will be applied. The MPEP may be conducted in one of the following ways:
   - By the third-party;
   - By watershed or commodity groups within an area with known groundwater impacts or vulnerability; or
   - By watershed or commodity groups that wish to determine the effects of regional or commodity driven management practices.

   A master schedule describing the rank or priority for the investigation(s) of the high vulnerability areas (or commodities within these areas) to be examined under the MPEP shall be prepared and submitted to the Executive Officer as detailed in the Management Practices Evaluation Program Workplan section IV.D below.

3. *Report.* Reports of the MPEP must be submitted to the Executive Officer as part of the third-party's Monitoring Report or in a separate report due on the same date as the Monitoring Report. The report shall include all data[9] (including analytical reports) collected by each phase of the MPEP since the previous report was submitted. The report shall also contain a tabulated summary of data collected to date by the MPEP. The report shall summarize the activities conducted under the MPEP, and identify the number and location of installed monitoring wells relative to each other and other types of monitoring devices. Within each report, the third-party shall evaluate the data and make a determination whether groundwater is being impacted by activities at farms being monitored by the MPEP.

[9] The data need not be associated with a specific parcel or Member.

Each report shall also include an evaluation of whether the specific phase(s) of the Management Practices Evaluation Program is/are on schedule to provide the data needed to complete the Management Practices Evaluation Report (detailed below) by the required deadline. If the evaluation concludes that information needed to complete the Management Practices Evaluation Report may not be available by the required deadline, the report shall include measures that will be taken to bring the program back on schedule.

4. *Management Practices Evaluation Report*. No later than six (6) years after implementation of each phase of the MPEP, the third-party shall submit a Management Practices Evaluation Report (MPER) identifying management practices that are protective of groundwater quality for the range of conditions found at farms covered by that phase of the study. The identification of management practices for the range of conditions must be of sufficient specificity to allow Members of the third-party and staff of the Central Valley Water Board to identify which practices at monitored farms are appropriate for farms with the same or similar range of site conditions, and generally where such farms may be located within the third-party area (e.g., the summary report may need to include maps that identify the types of management practices that should be implemented in certain areas based on specified site conditions). The MPER must include an adequate technical justification for the conclusions that incorporates available data and reasonable interpretations of geologic and engineering principles to identify management practices protective of groundwater quality.

   The report shall include an assessment of each management practice to determine which management practices are protective of groundwater quality. If monitoring concludes that management practices currently in use are not protective of groundwater quality based upon information contained in the MPER, and therefore are not confirmed to be sufficient to ensure compliance with the groundwater receiving water limitations of the Order, the third-party in conjunction with commodity groups and/or other experts (e.g., University of California Cooperative Extension, Natural Resources Conservation Service) shall propose and implement new/alternative management practices to be subsequently evaluated. Where applicable, existing GQMPs shall be updated by the third-party group to be consistent with the findings of the Management Practices Evaluation Report.

C. Groundwater Quality Trend Monitoring

This section provides the objectives and minimum sampling and reporting requirements for Groundwater Quality Trend Monitoring. As specified in section IV.E of this MRP, the third-party is required to develop a workplan that will describe the methods that will be utilized to meet the trend monitoring requirements.

1. *Objectives.* The objectives of Groundwater Quality Trend Monitoring are (1) to determine current water quality conditions of groundwater relevant to irrigated agriculture, and (2) to develop long-term groundwater quality information that can be used to evaluate the regional effects (i.e., not site-specific effects) of irrigated agriculture and its practices.

2. *Implementation.* To reach the stated objectives for the Groundwater Quality Trend Monitoring program, the third-party shall develop a groundwater monitoring network that will (1) be implemented over both high and low vulnerability areas in the third-party area; and (2) employ shallow wells, but not necessarily wells completed in the uppermost zone of first encountered groundwater. The use of existing wells is less costly than installing wells specifically designed for groundwater monitoring, while still yielding data which can be compared with historical and future data to evaluate long-term groundwater trends. The third party may also consider using existing monitoring networks such as those used by AB 3030 and SB 1938 plans.

The third-party shall submit a proposed Trend Groundwater Monitoring Workplan described in section IV.E below to the Central Valley Water Board. The proposed network shall consist of a sufficient number of wells to provide coverage in the third-party geographic area so that current water quality conditions of groundwater and composite regional effects of irrigated agriculture can be assessed according to the trend monitoring objectives. The rationale for the distribution of trend monitoring wells shall be included in the workplan.

3. *Reporting.* The results of trend monitoring are to be included in the third-party's Monitoring Report and shall include a map of the sampled wells, tabulation of the analytical data, and time concentration charts. Groundwater monitoring data are to be submitted electronically to the State Water Board's GeoTracker Database and to the Central Valley Water Board.

   Following collection of sufficient data (sufficiency to be determined by the method of analysis proposed by the third-party) from each well, the third-party is to evaluate the data for trends. The methods to be used to evaluate trends shall be proposed by the third-party in the Trend Groundwater Monitoring Workplan described in section IV.E below.

D. Management Practices Evaluation Workplan

The third-party, either solely or in conjunction with a Management Practices Evaluation Group (watershed or commodity based), shall prepare a Management Practices Evaluation Workplan. The workplan shall be submitted to the Executive Officer for review and approval. The workplan must identify a reasonable number of locations situated throughout the high vulnerability groundwater area(s), and encompassing the range of management practices used, the major agricultural commodities, and site conditions under which these commodities are grown. The workplan shall be designed to meet the objectives and minimum requirements described in section IV.B of this MRP.

1. *Workplan approach.* The workplan must include a scientifically sound approach to evaluating the effect of management practices on groundwater quality. The proposed approach may include:
   - Groundwater monitoring;
   - Modeling;
   - Vadose zone sampling; and/or
   - Other scientifically sound and technically justifiable methods for meeting the objectives of the Management Practices Evaluation Program.

   Sufficient groundwater monitoring data should be collected or available to confirm or validate the conclusions regarding the effect of the evaluated practices on groundwater quality. Any groundwater quality monitoring that is part of the workplan must be of first encountered groundwater. Monitoring of first encountered groundwater more readily allows identification of the area from which water entering a well originates than deeper wells and allows identification of changes in groundwater quality from activities on the surface at the earliest possible time.

2. *Groundwater quality monitoring –constituent selection.* Where groundwater quality monitoring is proposed, the Management Practices Evaluation Workplan must identify:
   - The constituents to be assessed and
   - The frequency of the data collection (e.g., groundwater quality or vadose zone monitoring; soil sampling) for each constituent.

The proposed constituents shall be selected based upon the information collected from the GAR and must be sufficient to determine if the management practices being evaluated are protective of groundwater quality. At a minimum, the baseline constituents for any groundwater quality monitoring must include those parameters required under trend monitoring.

3. *Workplan implementation and analysis.* The proposed Management Practices Evaluation Workplan shall contain sufficient information/justification for the Executive Officer to evaluate the ability of the evaluation program to identify whether existing management practices in combination with site conditions, are protective of groundwater quality. The workplan must explain how data collected at evaluated farms will be used to assess potential impacts to groundwater at represented farms that are not part of the Management Practices Evaluation Program's network. This information is needed to demonstrate whether data collected will allow identification of management practices that are protective of water quality at Member farms, including represented farms (i.e., farms for which on-site evaluation of practices is not conducted).

4. *Master workplan –prioritization.* If the third-party chooses to rank or prioritize its high vulnerability areas in its GAR, a single Management Practices Evaluation Workplan may be prepared which includes a timeline describing the priority and schedule for each of the areas/commodities to be investigated and the submittal dates for addendums proposing the details of each area's investigation.

5. *Installation of monitoring wells.* Upon approval of the Management Practices Evaluation Workplan, the third-party shall prepare and submit a Monitoring Well Installation and Sampling Plan (MWISP), if applicable. A description of the MWISP and its required elements/submittals are presented as Appendix MRP-2. The MWISP must be approved by the Executive Officer prior to the installation of the MWISP's associated monitoring wells.

E. Trend Monitoring Workplan

The third-party shall develop a workplan for conducting trend monitoring within its boundaries that meets the objectives and minimum requirements described in section IV.C of this MRP. The workplan shall be submitted to the Executive Officer for review and approval. The Trend Monitoring Workplan shall provide information/details regarding the following topics:

1. *Workplan approach.* A discussion of the rationale for the number of proposed wells to be monitored and their locations. The rationale needs to consider: 1) the variety of agricultural commodities produced within the third-party's boundaries (particularly those commodities comprising the most irrigated agricultural acreage), 2) the conditions discussed/identified in the GAR related to the vulnerability prioritization within the third-party area, and 3) the areas identified in the GAR as contributing significant recharge to urban and rural communities where groundwater serves as a significant source of supply.

2. *Well details.* Details for wells proposed for trend monitoring, including:
- GPS coordinates;
- Physical address of the property on which the well is situated (if available);
- California State well number (if known);
- Well depth;
- Top and bottom perforation depths;
- A copy of the water well drillers log, if available;

- Depth of standing water (static water level), if available (this may be obtained after implementing the program); and
- Well seal information (type of material, length of seal).

3. *Proposed sampling schedule*. Trend monitoring wells will be sampled, at a minimum, annually at the same time of the year for the indicator parameters identified in Table 3 below.

4. *Workplan implementation and analysis.* Proposed method(s) to be used to evaluate trends in the groundwater monitoring data over time.

Table 3 - Trend Monitoring Constituents

Annual Monitoring: • Conductivity (at 25 ºC)* (µmhos/cm) • pH* (pH units) • Dissolved oxygen (DO)* (mg/L) • Temperature* (ºC) • Nitrate as nitrogen (mg/L) **field parameters*

Trend monitoring wells are also to be sampled initially and once every five years thereafter for the following COCs:
• Total dissolved solids (TDS) (mg/L)
• General minerals (mg/L):
  o Anions (carbonate, bicarbonate, chloride, and sulfate)
  o Cations (boron, calcium, sodium, magnesium, and potassium)

V. Third-Party Reporting Requirements

Reports and notices shall be submitted in accordance with section IX of the Order, Reporting Provisions.

A. Quarterly Submittals of Surface Water Monitoring Results

Each quarter, the third-party shall submit the previous quarter’s surface water monitoring results in an electronic format. The deadlines for these submittals are listed in Table 4 below.

Table 4 - Quarterly Surface Water Monitoring Data Reporting Schedule

Due Date	Type	Reporting Period
1 March	Quarterly Monitoring Data Report	1 October through 31 December of previous calendar year
1 June	Quarterly Monitoring Data Report	1 January through 31 March of same calendar year
1 September	Quarterly Monitoring Data Report	1 April through 30 June of same calendar year
1 December	Quarterly Monitoring Data Report	1 July of through 30 September of same calendar year

Exceptions to due dates for submittal of electronic data may be granted by the Executive Officer if good cause is shown. The Quarterly Surface Water Monitoring Data Report shall include the following for the required reporting period:

1. An Excel workbook containing an export of all data records uploaded and/or entered into the CEDEN comparable database (surface water data). The workbook shall contain, at a minimum, those items detailed in the most recent version of the third-party's approved QAPP;
2. The most current version of the third-party's eQAPP;
3. Electronic copies of all field sheets;
4. Electronic copies of photos obtained from all surface water monitoring sites, clearly labeled with the CEDEN comparable station code and date;
5. Electronic copies of all applicable laboratory analytical reports on a CD;
6. For toxicity reports, all laboratory raw data must be included in the analytical report (including data for failed tests), as well as copies of all original bench sheets showing the results of individual replicates, such that all calculations and statistics can be reconstructed. The toxicity analyses data submittals must include individual sample results, negative control summary results, and replicate results. The minimum in-test water quality measurements reported must include the minimum and maximum measured values for specific conductivity, pH, ammonia, temperature, and dissolved oxygen;
7. For chemistry data, analytical reports must include, at a minimum, the following:
    a. A lab narrative describing QC failures;
    b. Analytical problems and anomalous occurrences;
    c. Chain of custody (COCs) and sample receipt documentation;
    d. All sample results for contract and subcontract laboratories with units, RLs and MDLs;
    e. Sample preparation, extraction, and analysis dates; and
    f. Results for all QC samples including all field and laboratory blanks, lab control spikes, matrix spikes, field and laboratory duplicates, and surrogate recoveries.

Laboratory raw data such as chromatograms, spectra, summaries of initial and continuing calibrations, sample injection or sequence logs, prep sheets, etc., are not required for submittal, but must be retained by the laboratory in accordance with the requirements of section X of the Order, Record-keeping Requirements.

If any data are missing from the quarterly report, the submittal must include a description of what data are missing and when they will be submitted to the Central Valley Water Board. If data are not loaded into the CEDEN comparable database, this shall also be noted with the submittal.

B. Annual Groundwater Monitoring Results

Annually, by 1 May, the third-party shall submit the prior year's groundwater monitoring results as an Excel workbook containing an export of all data records uploaded and/or entered into the State Water Board GeoTracker database. If any data are missing from the report, the submittal must include a description of what data are missing and when they will be submitted to the Central Valley Water Board. If data are not loaded into the GeoTracker database, this shall also be noted with the submittal.

C. Monitoring Report

The Monitoring Report shall be submitted by 1 May every year, with the first report due 1 May 2014. The report shall cover the monitoring periods from the previous hydrologic water year. A hydrologic water year is defined as 1 October through 30 September. The report shall include the following components:

1. Signed transmittal letter;
2. Title page;
3. Table of contents;
4. Executive summary;
5. Description of the third-party geographical area;
6. Monitoring objectives and design;
7. Sampling site/monitoring well descriptions and rainfall records for the time period covered under the Monitoring Report;
8. Location map(s) of sampling sites/monitoring wells, crops and land uses;
9. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible;
10. Discussion of data relative to water quality objectives, and water quality management plan milestones/Basin Plan Amendment Workplan updates, where applicable;
11. Sampling and analytical methods used;
12. Associated laboratory and field quality control samples results;
13. Summary of Quality Assurance Evaluation results (as identified in the most recent version of the third-party's approved QAPP for Precision, Accuracy and Completeness);
14. Specification of the method(s) used to obtain estimated flow at each surface water monitoring site during each monitoring event;
15. Summary of exceedances of water quality objectives/trigger limits occurring during the reporting period and for surface water related pesticide use information;
16. Actions taken to address water quality exceedances that have occurred, including but not limited to, revised or additional management practices implemented;
17. Evaluation of monitoring data to identify spatial trends and patterns;
18. Summary of Nitrogen Management Plan information submitted to the third-party;
19. Summary of management practice information collected as part of Farm Evaluations;
20. Summary of mitigation monitoring;
21. Summary of education and outreach activities; and
22. Conclusions and recommendations.

Additional requirements and clarifications necessary for many of the report components listed above are described below.

Report Component (1) —Signed Transmittal Letter

A transmittal letter shall accompany each report. The transmittal letter shall be submitted and signed in accordance with the requirements of section IX of the Order, Reporting Provisions.

Report Component (8) — Location Maps

Location map(s) showing the sampling sites/monitoring wells, crops, and land uses within the third party's geographic area must be updated (based on available sources of information) and included in the Monitoring Report. An accompanying GIS shapefile or geodatabase of monitoring site and monitoring well information must include the CEDEN comparable site code and name (surface water only) and Global Positioning System (GPS) coordinates (surface water sites and wells used for monitoring). The map(s) must contain a level of detail that ensures they are informative and useful. GPS coordinates must be provided as latitude and longitude in the decimal degree coordinate system (at a minimum of five decimal places). The datum must be either WGS 1984 or NAD83, and clearly identified on the map(s) or in an associated key or table included in the report. The source and date of all data layers must be identified on the map(s). All data layers/shapefiles/geodatabases included in the map shall be submitted with the Monitoring Report. If changes occur to any submitted data, the updated portion shall be submitted in the subsequent quarterly electronic data submission.

Report Component (9) – Tabulated Results

In reporting monitoring data, the third-party shall arrange the data in tabular form so that the required information is readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with the data collection requirements of the MRP.

Report Component (10) — Data Discussion to Illustrate Compliance

The report shall include a discussion of the third-party's compliance with the data collection requirements of the MRP. If a required component was not met, an explanation for the missing data must be included. Results must also be compared to water quality objectives and trigger limits. If a Basin Plan Amendment Workplan (BPAW) has been approved by the Executive Officer, updates on progress made toward BPAW goals and milestones, including any adjustments to the time schedule, must be included.

Report Component (13) — Quality Assurance Evaluation (Precision, Accuracy and Completeness)

A summary of precision and accuracy results (both laboratory and field) is required in the report. The required data quality objectives are identified in the most recent version of the third-party's approved QAPP; acceptance criteria for all measurements of precision and accuracy must be identified. The third-party must review all QA/QC results to verify that protocols were followed and identify any results that did not meet acceptance criteria. A summary table or narrative description of all QA/QC results that did not meet objectives must be included. Additionally, the report must include a discussion of how the failed QA/QC results affect the validity of the reported data. The corrective actions to be implemented are described in the QAPP Guidelines.

In addition to precision and accuracy, the third-party must also calculate and report completeness. Completeness includes the percentage of all quality control results that meet acceptance criteria, as well as a determination of project completeness. For further explanation of this requirement, refer to the most recent version of the QAPP Guidelines. The third-party may ask the laboratory to provide assistance with evaluation of their QA/QC data, provided that the third-party prepares the summary table or narrative description of the results for the Monitoring Report.

Report Component (15) — Summary of Exceedances

A summary of the exceedances of water quality objectives or triggers that have occurred during the monitoring period is required in the Monitoring Report. In the event of exceedances for pesticides or toxicity in surface water, pesticide use data must be included in the Monitoring Report. Pesticide use information may be acquired from the agricultural commissioner. This requirement is described further in the following section on Exceedance Reports.

Report Component (17) — Evaluation of Monitoring Data

The third-party must evaluate its monitoring data in the Monitoring Report in order to identify potential trends and patterns in surface and groundwater quality that may be associated with waste discharge from irrigated lands. As part of this evaluation, the third-party must analyze all readily available monitoring data that meet program quality assurance requirements to determine deficiencies in monitoring for discharges from irrigated agricultural lands and whether additional sampling locations are needed. If deficiencies are identified, the third-party must propose a schedule for additional monitoring or source studies. Upon notification from the Executive Officer, the third-party must monitor any parameter in an area that lacks sufficient monitoring data (i.e., a data gap should be filled to assess irrigated agriculture's effects on water quality).

The third-party should incorporate pesticide use information, as needed, to assist in its data evaluation. Wherever possible, the third-party should utilize tables or graphs that illustrate and summarize the data evaluation.

Report Component (18) – Summary of Reported Nitrogen Data

The third-party shall aggregate information from Members' Nitrogen Management Plan Summary Reports to characterize the input, uptake, and loss of nitrogen fertilizer applications by specific crops in the Tulare Lake Basin Area. The third-party's assessment of Nitrogen Management Plan information must include, at a minimum, comparisons of farms with the same crops, similar soil conditions, and similar practices (e.g., irrigation management). At a minimum, the statistical summary of nitrogen consumption ratios by crop or other equivalent reporting units and the estimated crop nitrogen consumed for the different crop types. The nitrogen consumption ratio is the ratio of total nitrogen available for crop uptake (from sources including, but not limited to, fertilizers, manures, composts, nitrates in irrigation supply water and soil) to the estimated crop consumption of nitrogen. At a minimum, the annual report shall contain a statistical summary of the nitrogen consumption ratios by describing the range, percentiles (10th, 25th, 50th, 75th, 90th), and any outliers for similar soil conditions and similar crops on a township basis. A box and whisker plot or equivalent tabular or graphical presentation of the data approved by the Executive Officer may be used. The summary of nitrogen management data must include a quality assessment of the collected information by township (e.g. missing data, potentially incorrect/inaccurate reporting), and a description of corrective actions to be taken regarding any deficiencies in the quality of data submitted, if such deficiencies were identified. The third-party will also provide an aggregate of the data submitted by their Members in an electronic format, compatible with ArcGIS, identified to at least the township level.[10]

Report Component (19) – Summary of Management Practice Information

The third-party will aggregate and summarize information collected from Farm Evaluations.[11] The summary of management practice data must include a quality assessment of the collected information by township (e.g. missing data, potentially incorrect/inaccurate reporting), and a description of corrective actions to be taken regarding any deficiencies in the quality of data submitted, if such deficiencies were identified. In addition to summarizing and aggregating the

[10] The Member and their associated parcel need not be identified.
[11] Note that the evaluation of the reported management practices information is discussed in Appendix MRP-1 and will be part of the annual Management Plan Progress Report.

information collected, the third party will provide the individual data records used to develop this summary in an electronic format, compatible with ArcGIS, identified to at least the township level. [12]

Report Component (20) – Mitigation Monitoring
As part of the Monitoring Report, the third-party shall report on the CEQA mitigation measures reported by Members to meet the provisions of the Order and any mitigation measures the third-party has implemented on behalf of Members. The third-party is not responsible for submitting information that Members do not send them directly by the 1 March deadline (see section VII.E of the Order for individual Discharger mitigation monitoring requirements). The Mitigation Monitoring Report shall include information on the implementation of CEQA mitigation measures (mitigation measures are described in Attachment C of the Order), including the measure implemented, identified potential impact the measure addressed, location of the mitigation measure (township, range, section), and any steps taken to monitor the ongoing success of the measure.

D. Surface Water Exceedance Reports

The third-party shall provide surface water exceedance reports if monitoring results show exceedances of adopted numeric water quality objectives or trigger limits, which are based on interpretations of narrative water quality objectives. For each surface water quality objective exceeded at a monitoring location, the third-party shall submit an Exceedance Report to the Central Valley Water Board. The estimated flow at the monitoring location and photographs of the site must be submitted in addition to the exceedance report but do not need to be submitted more than once. The third-party shall evaluate all of its monitoring data and determine exceedances no later than five (5) business days after receiving the laboratory analytical reports for an event. Upon determining an exceedance, the third-party shall send the Exceedance Report by email to the third-party's designated Central Valley Water Board staff contact by the next business day. The Exceedance Report shall describe the exceedance, the follow-up monitoring, and analysis or other actions the third-party may take to address the exceedance. Upon request, the third-party shall also notify the agricultural commissioner of the county in which the exceedance occurred and/or the director of the Department of Pesticide Regulation.

Surface water exceedances of pesticides or toxicity: When any pesticide or toxicity exceedance is identified at a location that is not under an approved management plan for toxicity or pesticides, follow-up actions must include an investigation of pesticide use within the location's watershed area. For toxicity exceedances, the investigation must include all pesticides applied within the area that drains to the monitoring site during the four weeks immediately prior to the exceedance date. The pesticide use information may be acquired from the agricultural commissioner, or from information received from Members within the same drainage area. Results of the pesticide use investigation must be summarized and discussed in the Monitoring Report.

E. Basin Plan Amendment Workplan

Should the third-party choose to pursue a Basin Plan Amendment as described in Section VIII.M. of the WDR, the third-party must prepare a Basin Plan Amendment Workplan (BPAW) that includes the following elements:

1. A technical justification for initiating the basin plan amendment process including maps of the areas proposed for basin plan amendment. The justification must include an assessment of naturally occurring (background) concentrations of the constituent(s); evaluate the potential for irrigated agriculture to further degrade groundwater quality beyond background in the identified

[12] The Member and their associated parcel need not be identified. Any farm map or information on the location of wells on the farm does not need to be provided as part of the Monitoring Report submittal.

areas; and a provide preliminary evaluation as to whether controllable water quality factors (as defined in the Basin Plan) are reasonably likely to result in attainment of the applicable use(s);

2. A use attainability study plan to determine whether the beneficial use(s) proposed for de-designation may be attained through the application of current or anticipated technologies, whether groundwater within the proposed basin plan amendment area is currently being used for the beneficial use proposed for de-designation, and whether the groundwater proposed for de-designation meets any of the criteria set forth in the Basin Plan that the Board considers in making exceptions to beneficial use designations;
3. A description of how the third-party will coordinate the basin plan amendment process through CV-SALTS, if the amendment is based on elevated salt and/or nitrate concentrations;
4. A proposal for reduced reporting requirements for Members in the areas proposed for basin plan amendment. The third party may propose that trend monitoring be reduced in those areas. The third-party may also propose that the requirement that the Management Practice Evaluation Program evaluate those areas be suspended. The reduced monitoring and reporting requirements shall be no less stringent than the requirements for low vulnerability areas;
5. A description of the monitoring and reporting required to complete the BPAW must be identified; and
6. A time schedule including workplan goals and milestones for completing BPAW items.

To the extent applicable, the above BPAW workplan elements may be met by existing efforts. However, the third-party must provide the information associated with the applicable element demonstrating that element's requirements are met.

The Executive Officer may approve the BPAW workplan if the Executive Officer determines that the BPAW workplan includes all of the required elements. To approve the workplan, the Executive Officer must conclude that the technical justification provides sufficient evidence indicating that waters within the identified high vulnerability areas would likely qualify for de-designation of a beneficial use or uses under the Basin Plan. Should the Executive Officer approve the BPAW workplan, the Executive Officer will also provide the applicable approved modifications to the monitoring and reporting program.

Annual updates on progress made toward BPAW goals and milestones, including any proposed adjustments to the time schedule, must be included in the Annual Monitoring Report.

The Executive Officer may reinstate high vulnerability monitoring and reporting requirements if any of the following occur: 1) information gathered during implementation of the BPAW indicates a basin plan amendment is unlikely to be adopted, 2) the basin plan amendment is not likely to be brought before the board within five years of the original proposal date due to insufficient progress in meeting workplan goals and milestones, or 3) the basin plan amendment is not approved by the regional board or state water board.

VI. Sediment Discharge and Erosion Assessment Report

The third-party shall prepare a Sediment Discharge and Erosion Assessment Report. The report shall be submitted to the Executive Officer for review. The goal of the report is to determine which irrigated agricultural areas within the Tulare Lake Basin Area are subject to erosion and may discharge sediment that may degrade surface waters. The objective of the report is to determine which Member operations are within such areas, and need to develop a Sediment and Erosion Control Plan. The report must be developed to achieve the above goal and objective and must at a minimum, provide a description of the sediment and erosion areas as a series of ArcGIS shapefiles with a discussion of the methodologies utilized to develop the report.

VII. Water Quality Triggers for Development of Management Plans

This Order requires that Members comply with all adopted water quality objectives and established federal water quality criteria applicable to their discharges. The *Water Quality Control Plan for the Tulare Lake Basin Plan* (Basin Plan) contains numeric and narrative water quality objectives applicable to surface water and groundwater within the Order's watershed area. USEPA's 1993 National Toxics Rule (NTR) and 2000 California Toxics Rule (CTR) contain water quality criteria which, when combined with Basin Plan beneficial use designations constitute numeric water quality standards. Table 5 of this MRP lists Basin Plan numeric water quality objectives and NTR/CTR criteria for constituents of concern that may be discharged by Members.

Trigger limits will be developed by the Central Valley Water Board staff through a process involving coordination with the Department of Pesticide Regulation (for pesticides) and stakeholder input. The trigger limits will be designed to implement narrative Basin Plan objectives and to protect applicable beneficial uses. The Executive Officer will make a final determination as to the appropriate trigger limits.

VIII. Quality Assurance Project Plan (QAPP)

The third-party must develop and/or maintain a QAPP that includes watershed and site-specific information, project organization and responsibilities, and the quality assurance components in the QAPP Guidelines. The QAPP shall be submitted with the Surface Water Monitoring Plan (Section III.A, MRP). Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the California Department of Public Health (DPH), except where the DPH has not developed a certification program for the material to be analyzed.

Any necessary modifications to the QAPP for groundwater monitoring shall be submitted with the MPEP and groundwater trend monitoring workplans (section IV, MRP). Any proposed modifications to the approved QAPP must receive Executive Officer approval prior to implementation.

The Central Valley Water Board may conduct an audit of the third-party's contracted laboratories at any time in order to evaluate compliance with the most current version of the QAPP Guidelines. Quality control requirements are applicable to all of the constituents listed in the QAPP Guidelines, as well as any additional constituents that are analyzed or measured, as described in the appropriate method. Acceptable methods for laboratory and field procedures as well as quantification limits are described in the QAPP Guidelines.

Table 5 - **Basin Plan Numeric Water Quality Objectives for the Tulare Lake Basin Area.** ** Where more than one objective is applicable, the most stringent shall be applied.*

Constituent / Parameter (Synonym)	Basin Plan Water Quality Objective	Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold (a)	Units	G= Groundwater IS= Inland Surface Water	Numeric Threshold Protects Designated Beneficial Use(s) in the Water Body:							CAS Number
						Groundwater (b)			Inland Surface Waters				
						MUN-MCL	MUN-Toxicity	AGR	MUN-MCL	MUN-Toxicity	Aquatic Life & Consump	AGR	
Boron, total	Chemical Constituents	Basin Plan, discharge limitation (A)	1,000	µg/L	IS							X	7440-42-8
Coliform, fecal	Bacteria	Basin Plan (c) (d)	200/100	MPN/mL	IS				X				
		Basin Plan (c) (e)	400/100	MPN/mL	IS				X				
Coliform, total	Bacteria	Basin Plan	2.2/100	MPN/mL	G	X							
Conductivity at 25 C	Salinity	Basin Plan. Kings River, Reach I, Above Kirch Flat	100	µmhos/cm	IS								
		Basin Plan. Kings River, Reach II, Kirch Flat to Pine Flat Dam	100(f)	µmhos/cm	IS								
		Basin Plan. Kings River, Reach III, Pine Flat Dam to Friant-Kern	100	µmhos/cm	IS								
		Basin Plan. Kings River, Reach IV, Friant-Kern to Peoples Weir	200	µmhos/cm	IS								
		Basin Plan. Kings River, Reach V, Peoples Weir to Island Weir	300(g)	µmhos/cm	IS								
		Basin Plan. Kings River, Reach VI, Island Weir to Stinson Weir (North Fork) and Empire Weir #2 (South Fork)	300(g)	µmhos/cm	IS								
		Basin Plan. Kaweah River, Reach I, Above Lake Kaweah	175	µmhos/cm	IS								
		Basin Plan. Kaweah River, Reach II, Lake Kaweah	175(h)	µmhos/cm	IS								
		Basin Plan. Kaweah River, Reach III, Below Lake Kaweah	(i)	µmhos/cm	IS								
		Basin Plan. Tule River, Reach I, Above Lake Success	450	µmhos/cm	IS								
		Basin Plan. Tule River, Reach II, Lake Success	450	µmhos/cm	IS								
		Basin Plan. Tule River, Reach III, Below Lake Success	(i)	µmhos/cm	IS								
		Basin Plan. Kern River, Reach I, Above Lake Isabella	200	µmhos/cm	IS								
		Basin Plan. Kern River, Reach II, Lake Isabella	300	µmhos/cm	IS								
		Basin Plan. Kern River, Reach III, Lake Isabella to Southern California Edison Powerhouse (KR-1)	300	µmhos/cm	IS								
		Basin Plan. Kern River, Reach IV, KR-1 to Bakersfield	300	µmhos/cm	IS								
		Basin Plan. Kern River, Reach V, Below Bakersfield	(i)	µmhos/cm	IS								
(Electrical conductivity)		California Secondary MCL	900-1600	µmhos/cm	G & IS	X	X		X	X			
Copper	Chemical Constituents	California Secondary MCL (total copper)	1,000	µg/L	G & IS	X			X	X			7440-50-8
	Toxicity	California Toxics Rule (USEPA), (j) (dissolved copper)	variable	µg/L	IS						X		
Dissolved Oxygen, minimum	Dissolved Oxygen	Basin Plan. Kings River, Reach I, Above Kirch Flat	9.0	mg/L	IS						X		7782-44-7
		Basin Plan. Kings River, Reach II, Kirch Flat to Pine Flat Dam	9.0	mg/L	IS						X		
		Basin Plan. Kings River, Reach III, Pine Flat Dam to Friant-Kern	9.0	mg/L	IS						X		
		Basin Plan. Kings River, Reach IV, Friant-Kern to Peoples Weir	7.0	mg/L	IS						X		

Constituent / Parameter (Synonym)	Basin Plan Water Quality Objective	Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold (a)	Units	G= Groundwater IS= Inland Surface Water	Numeric Threshold Protects Designated Beneficial Use(s) in the Water Body:							CAS Number
						Groundwater (b)			Inland Surface Waters				
						MUN-MCL	MUN-Toxicity	AGR	MUN-MCL	MUN-Toxicity	Aquatic Life & Consump	AGR	
		Basin Plan. Kings River, Reach V, Peoples Weir to Island Weir	7.0	mg/L	IS						X		
		Basin Plan. Kaweah River, Lake Kaweah	7.0	mg/L	IS						X		
		Basin Plan. Tule River, Lake Success	7.0	mg/L	IS						X		
		Basin Plan. Kern River, Reach I, Above Lake Isabella	8.0	mg/L	IS						X		
		Basin Plan. Kern River, Reach III, Lake Isabella to Southern California Edison Powerhouse (KR-1)	8.0	mg/L	IS						X		
		Basin Plan. Waters designated WARM	5.0	mg/L	IS						X		
		Basin Plan. Waters designated COLD and/or SPWN	7.0	mg/L	IS						X		
Lead	Chemical Constituents	California Primary MCL (total lead)	15	µg/L	G & IS	X			X				7439-92-1
	Toxicity	California Toxics Rule (USEPA) (j) (dissolved lead)	variable	µg/L	IS						X		
Molybdenum, total	Chemical Constituents	Basin Plan. Kings River, Peoples Weir to Stinson Weir (B)	(B)	µg/L	IS							X	7439-98-7
		Basin Plan. Kings River, Peoples Weir to Empire Weir #2	(B)	µg/L	IS							X	
Nitrate (as nitrogen)	Chemical Constituents	California Primary MCL	10	mg/L	G & IS	X	X		X	X			14797-55-8
Nitrite (as nitrogen)	Chemical Constituents	California Primary MCL	1	mg/L	G & IS	X	X		X	X			14797-65-0
Nitrate+Nitrite (as nitrogen)	Chemical Constituents	California Primary MCL	10	mg/L	G & IS	X	X		X	X			
pH – minimum	pH	Basin Plan	6.5	units	G & IS	X	X		X	X			
pH – maximum	pH	Basin Plan	8.3	units	G & IS	X	X		X	X			
Selenium, total	Chemical Constituents	California Primary MCL	50	µg/L	G & IS	X			X				
	Toxicity	National Toxics Rule (USEPA), 4-day mean	5	µg/L	IS						X		
Simazine	Chemical Constituents	California Primary MCL	4	µg/L	G & IS	X	X		X	X			122-34-9
Temperature	Temperature	Basin Plan (k)	variable		IS								
Total Dissolved Solids (TDS)	Chemical Constituents	California Secondary MCL, recommended level	500 – 1,000	mg/L	G & IS	X	X		X	X			
Turbidity	Turbidity	Where natural turbidity is between 0 and 5 NTUs, increases shall not exceed 1 NTU.	variable; 1-6	NTU	IS								
Turbidity		Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20%.	variable; 6 - 60	NTU	IS								
		Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.	variable; 60-110	NTU	IS								
		Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10%.	variable	NTU	IS								

Constituent / Parameter (Synonym)	Basin Plan Water Quality Objective	Source of Numeric Threshold *(footnotes in parentheses are at bottom of table)*	Numeric Threshold (a)	Units	G= Groundwater IS= Inland Surface Water	Numeric Threshold Protects Designated Beneficial Use(s) in the Water Body: Groundwater (b) MUN-MCL	Groundwater (b) MUN-Toxicity	Groundwater (b) AGR	Inland Surface Waters MUN-MCL	Inland Surface Waters MUN-Toxicity	Inland Surface Waters Aquatic Life & Consump	Inland Surface Waters AGR	CAS Number
Zinc	Chemical Constituents	California Secondary MCL (total zinc)	5,000	µg/L	G & IS	X			X				7440-66-6
	Toxicity	California Toxics Rule (USEPA) (j) (dissolved zinc)	variable	µg/L	IS						X		

Footnotes to Table 5:

a Numeric thresholds are maximum levels unless noted otherwise.

b For groundwater the following beneficial uses have been identified and occur throughout the Tulare Lake Basin: MUN, AGR, IND, PRO, REC-1, and WLD. To protect these beneficial uses, numeric and narrative thresholds not listed in this table may be applicable.

c Applies in waters designated for contact recreation (REC-1).

d Geometric mean of the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed this number.

e No more than ten percent of the total number of samples taken during any 30-day period shall exceed this number.

f Maxium-10-year average – 50 µmhos/cm

g During the period of irrigation deliveries. Providing, further, that for 10 percent of the time (period of low flow) the following shall apply to the following reaches of the Kings River:

Reach V 400 µmhos/cm

Reach VI 600 µmhos/cm

h Maximum 10-year average – 100 µmhos/cm.

i During the irrigation season releases should meet the levels shown in the preceding reach. At other times the channel will be dry or controlled by storm flows.

j These numeric thresholds are hardness dependent. As hardness increases, water quality objectives generally increase.

k The natural receiving water temperature shall not be altered unless it can be demonstrated to the satisfaction of the Water Board that such alteration does not adversely affect beneficial uses. However, at no time shall the temperature of WARM and COLD waters be increased more than 5 degrees F above natural receiving water temperature.

A Agricultural drainage may be discharged to surface waters provided it does not exceed 1,000 µmhos/cm EC, 175 mg/l chloride, nor 1 mg/l boron

B A numeric limit is not prescribed in the Basin Plan. For these reaches of the Kings River agricultural drainage should be reduced using, at minimum, the management practices provided on page IV-3 of the Basin Plan.

Abbreviations:	
CAS	Chemical Abstracts Service Registry Number
fw	freshwater

MCL	maximum contaminant limit
MUN	municipal and domestic supply
Beneficial Uses:	
AGR – Agricultural water uses, including irrigation supply and stock watering	
Aquatic Life & Consump – Aquatic life and consumption of aquatic resources	
MUN-MCL – Municipal or domestic supply with default selection of drinking water MCL when available	
MUN-Toxicity – Municipal or domestic supply with consideration of human toxicity thresholds that are more stringent than drinking water MCLs	

Monitoring and Reporting Program R5-2013-0120
Appendix MRP-1
Management Plan Requirements
Surface Water and Groundwater

Table of Contents

September 2013

MRP - 1: Management Plan Requirements for Surface Water and Groundwater

I. Management Plan Development and Required Components

This appendix describes requirements for the development of water quality management plans under Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group, Order R5-2013-0120 (hereafter "Order"). When a management plan has been triggered, the third-party shall ascertain whether or not irrigated agriculture is known to cause or contribute to the "water quality problem" (as defined in Attachment E). If the potential source(s) of the water quality exceedance(s) is unknown, the third-party may propose studies to be conducted to determine the cause, or to eliminate irrigated agriculture as a potential source (see Source Identification Study Requirements in section I.G. below).

When a Surface Water or Groundwater Quality Management Plan (SQMP/GQMP) has been triggered, the management plan shall contain the required elements presented and discussed in the following sections. The third-party may develop one SQMP or GQMP to cover all areas where plans have been triggered rather than developing separate management plans for each management area where plans have been triggered. The third-party would maintain the overarching plan as new information is collected, potentially triggering additional management areas and completion of other management areas.

If multiple constituents of concern (COCs) are to be included in a single management plan, a discussion of the prioritization process and proposed schedule shall be included in the plan. Prioritization schedules must be consistent with requirements described in section XII of the Order, Time Schedule for Compliance.

If a number of management plans are triggered, the third-party shall submit a SQMP/GQMP prioritization list to the Central Valley Water Board Executive Officer. This list may prioritize the order of SQMP/GQMP development based on, for example, 1) the potential to harm public health; 2) the beneficial use affected; and/or 3) the likelihood of meeting water quality objectives by implementing management practices. Prioritization schedules shall be consistent with requirements described in section XII of this Order, Time Schedule for Compliance. The third-party may continue to utilize the surface water quality prioritization process described in the Tule River Sub-Watershed and Main Drain Management Plans,[1] as approved by the Executive Officer. The Executive Officer may approve or require changes be made to the SQMP/GQMP priority list. The third-party shall implement the prioritization schedule approved by the Executive Officer.

A. Introduction and Background Section

The introduction portion of the management plan shall include a discussion of the COCs that are the subject of the plan and the water quality objective(s) or trigger(s) requiring preparation of the management plan. The introduction shall also include an identification (both narrative and in map form) of the boundaries (geographic and surface water/ groundwater basin[s] or portion of a basin) to be covered by the management plan including how the boundaries were delineated.

For groundwater, previous work conducted to identify the occurrence of the COCs (e.g., studies, monitoring conducted) should be summarized for the GQMP area.

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[1] The Main Drain Management Plan (Kern River Sub-Watershed) and the Tule River Sub-Watershed Management Plan (non-prioritized management plan) were approved by the Executive Officer on 25 October 2012 and 30 October 2012, respectively.

B. Physical Setting and Information

1. General Requirements

The management plan needs to provide a discussion of the physical conditions that affect surface water (for a SQMP) or groundwater (for a GQMP) in the management plan area and the associated existing data. At a minimum, the discussion needs to include the following:

a. Land use maps which identify the crops being grown in the SQMP watershed or GQMP area. For groundwater, these maps may already be presented in the Groundwater Assessment Report (GAR) and may be referenced and/or updated as appropriate. Map(s) must be in electronic format using standard Arc-geographic information system (ArcGIS shapefiles).

b. Identification of the potential irrigated agricultural sources of the COC(s) for which the management plan is being developed. If the potential sources are not known, a study may be designed and implemented to determine the source(s) or to eliminate irrigated lands as a potential source. Requirements for source identification studies are given in section I.G below. In the alternative, instead of conducting a source identification study, the third-party may develop a management plan for the COC(s) that meets the management plan requirements as specified in this appendix.

c. A list of the designated beneficial uses as identified in the applicable Basin Plan.

d. A baseline inventory of identified existing management practices in use within the management plan area that could be affecting the concentrations of the COCs in surface water and/or groundwater (as applicable) and locations of the various practices.

e. A summary, discussion, and compilation of available surface water and/or groundwater quality data (as applicable) for the parameters addressed by the management plan. Available data from existing water quality programs may be used, including but not limited to: Surface Water Ambient Monitoring Program (SWAMP), California State Water Resources Control Board (State Water Board) Groundwater Ambient Monitoring Assessment (GAMA) Program, United States Geological Survey (USGS), California Department of Public Health (DPH), California Department of Pesticide Regulation (DPR), California Department of Water Resources (DWR), and local groundwater management programs. The GAR developed for the third-party's geographic area, and groundwater quality data compiled in that document, may serve as a reference for these data.

2. Surface Water – Additional Requirements

The SQMP shall also include a description of the watershed areas and associated COC being addressed by the plan. For a water body that is representative of other water bodies, those areas being represented must also be identified in the SQMP.

3. Groundwater – Additional Requirements

The GQMP shall include:

a. Soil types and other relevant soils data as described by the appropriate Natural Resources Conservation Service (NRCS) soil survey or other applicable studies. The soil unit descriptions and a map of their areal extent within the study area must be included. The GAR developed for the third-party's geographic area, and the soils mapping contained in that document, may satisfy this requirement.

b. A description of the geology and hydrogeology for the area covered by the GQMP. The description shall include:

i. Regional and area specific geology, including stratigraphy and existing published geologic cross-sections.
ii. Groundwater basin(s) and sub-basins contained within the GQMP area, including a discussion of their general water chemistry as known from existing publications, including the GAR (range of electrical conductivity [conductivity at 25 C, EC], concentrations of major anions and cations, nutrients, total dissolved solids [TDS], pH, dissolved oxygen and hardness). The discussion should reference and provide figures of existing Piper (tri-linear) diagrams, Stiff diagrams and/or Durov Diagrams for the GQMP area (see definitions contained in Attachment E of the Order).
iii. Known water bearing zones, areas of shallow and/or perched groundwater, as well as areas of discharge and recharge to the basin/sub-basin in the GQMP area (rivers, unlined canals, lakes, and recharge or percolation basins).
iv. Identification of which water bearing zones within the GQMP area are being utilized for domestic, irrigation, and municipal water production.
v. Aquifer characteristics such as depth to groundwater, groundwater flow direction, hydraulic gradient, and hydraulic conductivity, as known or estimated based on existing information (see definitions contained in Attachment E of the Order).

c. Identification, where possible, of irrigation water sources (surface water origin and/or groundwater) and their available general water chemistry (range of EC, concentrations of major anions and cations, nutrients, TDS, pH, dissolved oxygen and hardness).

C. Management Plan Strategy

This section provides a discussion of the strategy to be used in the implementation of the management plan and should at a minimum, include the following elements:

1. A description of the approach to be utilized by the management plan (e.g., multiple COC's addressed in a scheduled priority fashion, multiple areas covered by the plan with a single area chosen for initial study, or all areas addressed simultaneously [area wide]). Any prioritization included in the management plan must be consistent with the requirements in section XII of the Order, Time Schedule for Compliance.

2. The plan must include actions to meet the following goals and objectives:

   a. Compliance with the Order's receiving water limitations (section III of the Order).
   b. Educate Members about the sources of the water quality exceedances in order to promote prevention, protection, and remediation efforts that can maintain and improve water quality.
   c. Identify, validate, and implement management practices to reduce loading of COC's to surface water or groundwater, as applicable, thereby improving water quality.

3. Identify the duties and responsibilities of the individuals or groups implementing the management plan. This section should include:

   a. Identification of key individuals involved in major aspects of the project (e.g., project lead, data manager, sample collection lead, lead for stakeholder involvement, quality assurance manager).
   b. Discussion of each individual's responsibilities.
   c. An organizational chart with identified lines of authority.

4. Strategies to implement the management plan tasks.

   a. Identify the entities or agencies that will be contacted to obtain data and assistance.

   b. Identify management practices used to control sources of COCs from irrigated lands that are 1) technically feasible; 2) economically feasible; 3) proven to be effective at protecting water quality, and 4) will comply with sections III.A and B of the Order. Practices that growers will implement must be discussed, along with an estimate of their effectiveness or any known limitations on the effectiveness of the chosen practice(s). Practices identified may include those that are required by local, state, or federal law. Where an identified constituent of concern is a pesticide that is subject to DPR's Groundwater Protection Program, the GQMP may refer to DPR's regulatory program for that pesticide and any requirements associated with the use of that pesticide provided that the requirement(s) are sufficient to meet water quality objectives.

   c. Identify outreach that will be used to disseminate information to participating growers. This discussion shall include: the strategy for informing growers of the water quality problems that need to be addressed, method for disseminating information on relevant management practices to be implemented, and a description of how the effectiveness of the outreach efforts will be evaluated. The third-party may conduct outreach efforts or work with the assistance of the County Agricultural Commissioners, U.C. Cooperative Extension, Natural Resources Conservation Service, Resource Conservation District, California Department of Food and Agriculture, or other appropriate groups or agencies.

   d. A specific schedule and milestones for the implementation of management practices and tasks outlined in the management plan. Items to be included in the schedule include: time estimated to identify new management practices as necessary to meet the Order's surface and groundwater receiving water limitations (section III of the Order); a timetable for implementation of identified management practices (e.g., at least 25% of growers identified must implement management practices by year 1; at least 50% by year 2).

   e. Establish measureable performance goals that are aligned with the elements of the management plan strategy. Performance goals include specific targets that identify the expected progress towards meeting a desired outcome.

D. Monitoring Methods

1. General Requirements

The monitoring system must be designed to measure effectiveness at achieving the goals and objectives of the SQMP or GQMP and capable of determining whether management practice changes made in response to the management plan are effective and can comply with the terms of the Order.

Management practice-specific or commodity-specific field studies may be used to approximate the contribution of irrigated lands operations. Where the third-party determines that field studies are appropriate or the Executive Officer requires a technical report under CWC 13267 for a field study, the third-party must identify a reasonable number and variety of field study sites that are representative of the particular management practice being evaluated.

2. Surface Water – Additional Requirements

The strategy to be used in the development and implementation of the monitoring methods for surface water should address the general requirements and, at a minimum, include the following elements:

a. The location(s) of the monitoring site and schedule (including frequencies) for monitoring should be chosen to be representative of the COC discharge to the watershed.

b. Surface water monitoring data must be submitted electronically per the requirements given in section III.C of the MRP.

3. Groundwater – Additional Requirements

The third-party's Management Practice Evaluation Program and Groundwater Quality Trend Monitoring shall be evaluated to determine whether additional monitoring is needed in conjunction with the proposed management strategy(ies) to evaluate the effectiveness of the strategy(ies). This may include commodity-based representative monitoring that is conducted to determine the effectiveness of management practices implemented under the GQMP. Refer to section IV of the MRP for groundwater monitoring requirements.

E. Data Evaluation

Methods to be used to evaluate the data generated by SQMP/GQMP monitoring and to evaluate the effectiveness of the implemented management practices must be described. The discussion should include at a minimum, the following:

1. Methods to be utilized to perform data analysis (graphical, statistics, modeling, index computation, or some combination thereof).
2. Identify the information necessary to quantify program effectiveness going forward, including the tracking of management practice implementation. The approach for determining the effectiveness of the management practices implemented must be described. Acceptable approaches include field studies of management practices at representative sites and modeling or assessment to associate the degree of management practice implementation to changes in water quality. The process for tracking implementation of management practices must also be described. The process must include a description of how the information will be collected from growers, the type of information being collected, how the information will be verified, and how the information will be reported.

F. Records and Reporting

By 1 May of each year, the third-party must prepare a Management Plan Status Report that summarizes the progress in implementing management plans. The Management Plan Status Report must summarize the progress for the annual reporting period. The Management Plan Status Report shall include the following components:

(1) Title page
(2) Table of contents
(3) Executive Summary
(4) Location map(s) and a brief summary of management plans covered by the report
(5) Updated table that tallies all exceedances for the management plans
(6) A list of new management plans triggered since the previous report
(7) Status update on preparation of new management plans
(8) A summary and assessment of management plan monitoring data collected during the reporting period
(9) A summary of management plan grower outreach conducted
(10) A summary of the degree of implementation of management practices
(11) Results from evaluation of management practice effectiveness

(12) An evaluation of progress in meeting performance goals and schedules
(13) Any recommendations for changes to the management plan

G. Source Identification Study Requirements

Should the third-party conduct a Source Identification Study to comply with this Order, the third-party must first receive approval from the Executive Officer. Once approved, the third party may proceed with its study.

The minimum components for a source identification study are:

(1) An evaluation of the types of practices, commodities, and locations that may be a source
(2) Continued monitoring at the management plan site/area and increased monitoring if appropriate.
(3) An assessment of the potential pathways through which waste discharges can occur.
(4) A schedule for conducting the study.

Commodity specific and/or management practice specific field studies (including edge-of field studies) may be required to approximate the contribution of irrigated agriculture. At a minimum, the third-party must evaluate the feasibility of field studies as part of their source identification study proposal. Where field studies are deemed appropriate, the third-party should identify a reasonable number and variety of field study sites that are representative of the particular commodity or management practice being evaluated. If field studies are not proposed, the third-party must demonstrate how the alternative source identification method will produce data or information that will enable the determination of contributions from irrigated agricultural operations to the water quality problem.

If an approved study shows that irrigated lands are not a source, then the third-party can request the Executive Officer to approve completion of the associated management plan. Where irrigated lands are identified as a source, a full SQMP/GQMP shall be prepared and implemented.

II. Approval and Review of the Management Plan

The following discussion describes the review and approval process for draft management plans submitted to the Executive Officer for approval. Any proposed changes to the management plan must be approved by the Executive Officer prior to implementation.

a. Water quality management plan approval – Prior to Executive Officer approval of any management plan, the Central Valley Water Board will post the draft management plan on its website for a review and comment period. Stakeholder comments will be considered by Central Valley Water Board staff. Based on information provided by the third-party and after consideration of comments provided by other interested stakeholders, the Central Valley Water Board's Executive Officer will either: (1) approve the management plan; (2) conditionally approve the management plan or (3) disapprove the management plan. Review of the management plan and the associated action by the Executive Officer will be based on findings as to whether the plan meets program requirements and goals and contains all of the information required for a management plan.

b. Periodic review of water quality management plans – At least once every five years, the Central Valley Water Board intends to review available data to determine whether the approved management plan is resulting in water quality improvements. Central Valley Water Board staff will meet with the third-party and other interested parties to evaluate the sufficiency of management plans. Based on input from all parties, the Executive Officer will determine whether and how the management plan should be updated based on new information and progress in achieving compliance with the Order’s surface or groundwater receiving water limitations, as applicable (see section III of the Order). The Executive Officer also may require revision of the management plan based on available information indicating that irrigated agriculture waste discharges are not in compliance with surface or groundwater receiving water limitations (as applicable) of the Order. The Executive Officer may also require revision to the management plan if available information indicates that degradation of surface and/or groundwater calls for the inclusion of additional areas, constituents of concern(s), or improved management practices in the management plan. During this review, the Executive Officer will make one of the findings described below:

1. Adequate progress – The Executive Officer will make a determination of adequate progress in implementing the plan if water quality improvement milestones and compliance time schedules have been met or the surface/groundwater receiving water limitations of the Order are met.
2. Inadequate progress – The Executive Officer will make a determination of inadequate progress in implementing the plan if the Order’s surface or groundwater receiving water limitations are not being met; and water quality improvement milestones and compliance time schedules in the approved management plan have not been met.

The actions taken by the Executive Officer upon a determination of inadequate progress include, but are not limited to one or more of the following for the area in which inadequate progress has been made:

- Management practice field monitoring studies – The third-party may be required to develop and implement a field monitoring study plan to characterize the commodity-specific discharge of the constituent of concern and evaluate the pollutant reduction efficacy of specific management practices. Based on the study and evaluation, the Executive Officer may require the SQMP/GQMP to be revised to include additional practices to achieve compliance with the Order’s surface and groundwater receiving water limitations.

- Independent, on-site verification of implementation of management practices and evaluation of their adequacy.

- Individual WDRs or waiver of WDRs – The board may revoke the third-party coverage for individual irrigated agricultural operations and require submittal of a report of waste discharge.

III. Management Plan Completion

Management Plans can be completed in one of two ways. The first way a Management Plan can be completed is if an approved source study shows that irrigated agriculture is not causing or contributing to the water quality problem. The second way a Management Plan can be completed is if the improved management practices have resolved the water quality problem.

The goal of all management plans is to identify the source(s) of COCs, track the implementation of effective management practices, and ultimately ensure that irrigated agriculture waste discharges are meeting the surface and groundwater receiving water limitations of the Order. If an approved source study shows that irrigated agriculture is not a source, then the third-party can request the Executive Officer to approve completion of the associated management plan.

A request for approval of completion of a management plan due to improved management practices will require credible evidence that the water quality problem has been resolved. The Executive Officer will evaluate each request on a case-by-case basis. The following key components must be addressed in the request:

a) Demonstration through evaluation of monitoring data that the water quality problem is no longer occurring (i.e., 3 or more years with no exceedances during the times of the year when previous exceedances occurred) or demonstrated compliance with the Order's surface and groundwater receiving water limitations.
b) Documentation of third-party education and outreach to applicable Members in the watershed where water quality impairment occurred.
c) Documentation of Member implementation of management practices that address the water quality exceedances.
d) Demonstration that the management practices implemented by Members are effective in addressing the water quality problem.

Management plans may be completed for all or some of the constituents that prompted preparation of the management plan. When Executive Officer approval is given for completion of one or more management plan constituents, each constituent shall revert to regular, ongoing monitoring requirements (as described in the MRP). The third-party must also continue tracking on-going implementation of appropriate management practices by growers, which may be done through the Farm Evaluation process.

Requests for management plan completion must summarize and discuss all information and data being used to justify completion. The third-party shall not discontinue any of the associated management plan requirements prior to Executive Officer approval of its completion request.

Monitoring and Reporting Program R5-2013-0120

Appendix MRP-2

Monitoring Well Installation and Sampling Plan
and
Monitoring Well Installation Completion Report

I. Introduction

The provisions of Appendix MRP-2 are set out pursuant to the Central Valley Water Board's authority under California Water Code (CWC) section 13267. The purpose and requirements of the Management Practice Evaluation Program (MPEP) is set forth in Monitoring and Reporting Program (MRP) R5-2013-0120.

Implementation of the MPEP requires that the third-party develop and submit a Monitoring Well Installation and Sampling Plan (MWISP) to the Executive Officer for approval prior to installation of monitoring wells. Stipulations and required elements of the MWISP are presented in section II below.

Upon completion of any monitoring well network, the third-party shall submit to the Central Valley Water Board a Monitoring Well Installation Completion Report (MWICR) which describes the field activities performed during that phase of the work. Required elements to be included in the MWICR are presented in section III below.

II. Monitoring Well Installation and Sampling Plan

Prior to installation of groundwater monitoring wells, an MWISP and schedule prepared by, or under the direct supervision of, and certified by, a California registered civil engineer or a California registered geologist with experience in hydrogeology shall be submitted to the Central Valley Water Board for Executive Officer approval. If the third-party has chosen to rank or prioritize its high vulnerability areas, the initial MWISP must present an overview and justification for the phased approach. Separate MWISPs showing the proposed monitoring well locations are required prior to implementation of each phase (alternatively, the third-party may prepare a master MWISP covering all of the proposed phases of well installation). Installation of monitoring wells shall not begin until the Executive Officer notifies the third-party in writing that the MWISP is acceptable. The MWISP or an MWISP for the initial phase if the third-party has chosen to employ a phased approach must be submitted within 180 days after Executive Officer approval of the Management Practices Evaluation Workplan (see section IV of Monitoring and Reporting Program Order R5-2013-0120, "MRP").

A. Stipulations

1. All monitoring wells shall be constructed in a manner that maintains the integrity of the monitoring well borehole and prevents the well (including the annular space outside of the well casing) from acting as a conduit for waste/contaminant transport. Each monitoring well shall be appropriately designed and constructed to enable collection of representative samples of the first encountered groundwater.

2. Where applicable, the third-party shall follow state, county or local agency standards with respect to water wells and groundwater quality when constructing new wells, modifying existing wells, or destroying wells. Absent such standards, at a minimum, the third-party shall follow the

standards and guidelines described in the California Department of Water Resources' *Water Well Standards (Bulletins 74-81 & 74-90 combined)*. More stringent practices shall be implemented if needed to prevent the well from acting as a conduit for the vertical migration of waste constituents.

3. The horizontal and vertical position of each monitoring well shall be determined by a registered land surveyor or other qualified professional. The horizontal position of each monitoring well shall be measured with one-foot lateral accuracy using the North American Datum 1983 (NAD83 datum). The vertical elevations of each monitoring well, at the point where depth to groundwater shall be measured to an absolute accuracy of at least 0.5 feet and a relative accuracy between monitoring wells of 0.01 feet referenced to the North American Vertical Datum 1988 (NAVD88 datum).

4. Once the groundwater monitoring network is installed pursuant to an approved MWISP, the third-party shall sample monitoring wells for the constituents and at the frequencies as specified in the approved MPEP. Groundwater monitoring shall include monitoring during periods of the expected highest and lowest annual water table levels and be of sufficient frequency to allow for evaluation of any seasonal variations.

5. Groundwater samples from monitoring wells shall be collected as specified in an approved MWISP and in accordance with the third-party's approved QAPP.

B. MWISP Required Elements

At a minimum, the MWISP must contain all of the information listed below.

1. General Information:

   a. Topographic map showing any existing nearby (about 2,000 feet) domestic, irrigation, municipal supply, and known monitoring wells, utilities, surface water bodies, drainage courses and their tributaries/destinations, and other major physical and man-made features, as reasonably known and appropriate.

   b. Site plan showing proposed well locations, other existing wells, unused and/or abandoned wells, and major physical site structures (such as tailwater retention systems, tile-drainage systems including discharge points, chemigation and/or fertigation tanks, flood control features, irrigation canals, etc.).

   c. Rationale for the number of proposed monitoring wells, their locations and depths, and identification of anticipated depth to groundwater. This information must include an explanation of how the location, number, and depths of wells proposed will result in the collection of data that can be used to assess groundwater at farms not directly monitored by the MPEP and under a variety of hydrogeologic conditions.

   d. Local permitting information (as required for drilling, well seals, boring/well abandonment).

   e. Drilling details, including methods and types of equipment for drilling and soils logging activities. Equipment decontamination procedures (as appropriate) should be described.

   f. Health and Safety Plan.

2. Proposed Drilling Details:

   a. Drilling techniques.

   b. Well/soil sample collection and logging method(s).

3. Proposed Monitoring Well Design - all proposed well construction information must be displayed on a construction diagram or schematic. For items f. through i., the vertical location of all annular materials (filter pack, seals, etc.) shall be shown and a description of the material and its method of emplacement given. The construction diagram or schematic shall accurately identify the following:

   a. Well depth.

   b. Borehole depth and diameter.

   c. Well construction materials.

   d. Casing material and diameter - include conductor casing, if appropriate.

   e. Location and length of perforation interval, size of perforations, and rationale.

   f. Location and thickness of filter pack, type and size of filter pack material, and rationale.

   g. Location, thickness, and composition of any intermediate seal.

   h. Location, thickness, and composition of annular seal.

   i. Surface seal depth and composition.

   j. Type of well cap(s).

   k. Type of well surface completion.

   l. Well protection devices (such as below-grade water-tight vaults, locking steel monument, bollards, etc.).

4. Proposed Monitoring Well Development:

   a. Schedule for development (not less than 48 hours or more than 10 days after well completion).

   b. Method of development.

   c. Method of determining when development is complete.

   d. Parameters to be monitored during development.

5. Proposed Surveying:

   a. How horizontal and vertical position of each monitoring well will be determined.

b. The accuracy of horizontal and vertical measurements to be obtained.

6. Proposed Groundwater Monitoring: refer to Monitoring and Reporting Program Order R5-2013-0120 and QAPP Guidelines.

III. Monitoring Well Installation Completion Report (MWICR)

Within 60 days after completion of any monitoring well network, the third-party shall submit to the Executive Officer a Monitoring Well Installation Completion Report (MWICR) prepared by, or under the direct supervision of, and certified by, a California registered civil engineer or a California registered geologist with experience in hydrogeology. In cases where monitoring wells are completed in phases or completion of the network is delayed for any reason, monitoring well construction data are to be submitted within 90 days of well completion, even if this requires submittal of multiple reports. At a minimum, the MWICR shall summarize the field activities as described below.

1. General Information:

   a. Brief overview of field activities including well installation summary (such as number, depths), and description and resolution of difficulties encountered during field program.

   b. A site plan depicting the positions of the newly installed monitoring wells, other existing wells, unused and/or abandoned wells, and major physical site structures (such as tailwater retention systems, tile-drainage systems including discharge points, chemigation and/or fertigation holding tanks, flood control features, irrigation canals, etc.).

   c. Period of field activities and milestone events (e.g., distinguish between dates of well installation, development, and sampling).

2. Monitoring Well Construction:

   a. Number and depths of monitoring wells installed.

   b. Monitoring well identification (i.e., numbers).

   c. Date(s) of drilling and well installation.

   d. Description of monitoring well locations including field-implemented changes (from proposed locations) due to physical obstacles or safety hazards.

   e. Description of drilling and construction, including equipment, methods, and difficulties encountered (such as hole collapse, lost circulation, need for fishing).

   f. Name of drilling company, driller, and logger (site geologist/engineer to be identified).

   g. As-builts for each monitoring well with the following details:

      i. Well identification.

      ii. Total borehole and well depth.

iii. Date of installation.

iv. Boring diameter.

v. Casing material and diameter (include conductor casing, if appropriate).

vi. Location and thickness of slotted casing, perforation size.

vii. Location, thickness, type, and size of filter pack.

viii. Location, thickness, and composition of any intermediate seal.

ix. Location, thickness, and composition of annular seal.

x. Surface seal depth and composition.

xi. Type of well cap.

xii. Type of surface completion.

xiii. Depth to water (note any rises in water level from initial measurement) and date of measurement.

xiv. Well protection device (such as below-grade water-tight vaults, stovepipe, bollards, etc.).

xv. Lithologic log and electric log (if conducted) of well borings

xvi. Results of all soil tests (e.g., grain size, permeability, etc.)

h. All depth to groundwater measurements during field program.

i. Field notes from drilling and installation activities (e.g., subcontractor dailies, as appropriate).

j. Construction summary table of pertinent information such as date of installation, well depth, casing diameter, screen interval, bentonite seal interval, and well elevation.

3. Monitoring Well Development:

a. Date(s) and time of development.

b. Name of developer.

c. Method of development.

d. Methods used to identify completion of development.

e. Development log: volume of water purged and measurements of temperature, pH, electrical conductivity, and any other parameters measured during and after development.

f. Disposition of development water.

g. Field notes (such a bailing to dryness, recovery time, number of development cycles).

4. Monitoring Well Survey:

   a. Identify coordinate system or reference points used.

   b. Description of measuring points (e.g., ground surface, top of casing, etc.).

   c. Horizontal and vertical coordinates of well casing with cap removed (measuring point where water levels are measured to nearest ± 0.01 foot).

   d. Name, license number, and signature of California licensed professional who conducted survey.

   e. Surveyor's field notes.

   f. Tabulated survey data.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ATTACHMENT C TO ORDER R5-2013-0120
CEQA MITIGATION MEASURES

WASTE DISHARGE REQUIREMENTS GENERAL ORDER
FOR
GROWERS WITHIN THE TULARE LAKE BASIN AREA
THAT ARE MEMBERS OF A THIRD-PARTY GROUP

A. Cultural Resources

1. Mitigation Measure CUL-MM-1: Avoid Impacts to Cultural Resources

The measure described below will reduce the severity of impacts on significant cultural resources, as defined and described in sections 5.3.1 and 5.3.3 of the PEIR.[1] Avoidance of such impacts also can be achieved when Members choose the least impactful management practices that will meet the quality improvement goals and objectives of Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group, Order R5-2013-0120 (hereafter referred to as the “Order”). Note that these mitigation measures may not be necessary in cases where no ground-disturbing activities would be undertaken as a result of implementation of the Order.

Although cultural resource inventories and evaluations typically are conducted prior to preparation of a CEQA document, the size of the Order’s coverage area and the lack of specificity regarding the location and type of management practices that would be implemented following adoption of the Order rendered conducting inventories prior to release of the draft Order untenable. Therefore, where the Order’s water quality improvement goals cannot be achieved without modifying or disturbing an area of land or existing structure to a greater degree than through previously employed farming practices, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels.

- Where construction within areas that may contain cultural resources cannot be avoided through the use of alternative management practices, conduct an assessment of the potential for damage to cultural resources prior to construction; this may include the hiring of a qualified cultural resources specialist to determine the presence of significant cultural resources.
- Where the assessment indicates that damage may occur, submit a non-confidential records search request to the appropriate California Historical Resources Information System (CHRIS) information center(s).

[1] ICF International. 2011. *Irrigated Lands Regulatory Program Final Program Environmental Impact Report.* Final and Draft. March. (ICF 05508.05.) Sacramento, CA. Prepared for: Central Valley Regional Water Quality Control Board, Sacramento, CA

- Implement the recommendations provided by the CHRIS information center(s) in response to the records search request.
- Where adverse effects to cultural resources cannot be avoided, the grower's coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

In addition, California state law provides for the protection of interred human remains from vandalism and destruction. According to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (section 8100), and the disturbance of Native American cemeteries is a felony (section 7052). section 7050.5 requires that construction or excavation be stopped in the vicinity of the discovered human remains until the County Coroner has been notified, according to California Public Resource Code (PRC) section 5097.98, and can determine whether the remains are those of Native American origin. If the coroner determines that the remains are of Native American origin, the coroner must contact the Native American Heritage Commission (NAHC) within 24 hours (Health and Safety Code section 7050[c]). The NAHC will identify and notify the most likely descendant (MLD) of the interred individual(s), who will then make a recommendation for means of treating or removing, with appropriate dignity, the human remains and any associated grave goods as provided in PRC section 5097.98.

PRC section 5097.9 identifies the responsibilities of the project proponent upon notification of a discovery of Native American burial remains. The project proponent will work with the MLD (determined by the NAHC) and a professional archaeologist with specialized human osteological experience to develop and implement an appropriate treatment plan for avoidance and preservation of, or recovery and removal of, the remains.

Members implementing management practices should be aware of the following protocols for identifying cultural resources.

- If built environment resources or archaeological resources, including chipped stone (often obsidian, basalt, or chert), ground stone (often in the form of a bowl mortar or pestle), stone tools such as projectile points or scrapers, unusual amounts of shell or bone, historic debris (such as concentrations of cans or bottles), building foundations, or structures are inadvertently discovered during ground-disturbing activities, the land owner should stop work in the vicinity of the find and retain a qualified cultural resources specialist to assess the significance of the resources. If necessary, the cultural resource specialist also will develop appropriate treatment measures for the find.
- If human bone is found as a result of ground disturbance, the land owner should notify the County Coroner in accordance with the instructions described above. If Native American remains are identified and descendants are found, the descendants may (with the permission of the owner of the land or his or her authorized representative) inspect the site of the discovery of the Native American remains. The descendants may recommend to the owner or the person responsible for the excavation work means for treating or disposing of the human remains and any associated grave goods, with appropriate dignity. The descendants will make their recommendation within 48 hours of

inspection of the remains. If the NAHC is unable to identify a descendant, if the descendants identified fail to make a recommendation, or if the landowner rejects the recommendation of the descendants, the landowner will inter the human remains and associated grave goods with appropriate dignity on the property in a location not subject to further and future subsurface disturbance.

B. Vegetation and Wildlife

1. Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources

Implementation of the following avoidance and minimization measures would ensure that the construction activities related to implementation of management practices and installation of monitoring wells on irrigated lands would minimize effects on sensitive vegetation communities (such as riparian habitat and wetlands adjacent to the construction area) and special-status plants and wildlife species as defined and listed in section 5.7.3 of the PEIR. In each instance where particular management practices could result in impacts on the biological resources listed above, Members should use the least impactful effective management practice to avoid such impacts. Where the Order's water quality improvement goals cannot be achieved without incurring potential impacts, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels.

- Where detention basins are to be abandoned, retain the basin in its existing condition or ensure that sensitive biological resources are not present before modification.
- Where construction in areas that may contain sensitive biological resources cannot be avoided through the use of alternative management practices, conduct an assessment of habitat conditions and the potential for presence of sensitive vegetation communities or special-status plant and animal species prior to construction. This may include the hiring of a qualified biologist to identify riparian and other sensitive vegetation communities and/or habitat for special-status plant and animal species.
- Avoid and minimize disturbance of riparian and other sensitive vegetation communities.
- Avoid and minimize disturbance to areas containing special-status plant or animal species.
- Where adverse effects on sensitive biological resources cannot be avoided, the grower's coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

2. Mitigation Measure BIO-MM-2: Determine Extent of Wetland Loss and Compensate for Permanent Loss of Wetlands

Prior to implementing any management practice that will result in the permanent loss of wetlands, conduct a delineation of affected wetland areas to determine the acreage of loss in accordance with current U.S. Army Corps of Engineers (USACE) methods. For compliance with the federal Clean Water Act section 404 permit and WDRs protecting state waters from unauthorized fill, compensate for the permanent loss (fill) of wetlands and ensure no net loss of habitat functions and values. Compensation ratios will be determined through coordination with the Central Valley Water Board and USACE as part of the permitting process. Such process will include additional compliance with CEQA, to the extent that a further discretionary approval by the board would require additional CEQA review. Compensation may be a combination of mitigation bank credits and restoration/creation of habitat, as described below:

- Purchase credits for the affected wetland type (e.g., perennial marsh, seasonal wetland) at a locally approved mitigation bank and provide written evidence to the resource agencies, as needed, that compensation has been established through the purchase of mitigation credits.
- Develop and ensure implementation of a wetland restoration plan that involves creating or enhancing the affected wetland type.

C. Fisheries

1. Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat

This mitigation measure incorporates all measures identified in Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources. In each instance where particular management practices could result in impacts to special-status fish species (see “Regulatory Classification of Special-Status Species” in section 5.8.2 of the PEIR), Members should use the least impactful effective management practice to avoid such impacts. Where the Order’s water quality improvement goals cannot be achieved without incurring potential impacts, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels. Note that these measures may not be necessary in many cases and are dependent on the location of construction in relation to water bodies containing special-status fish.

- Where construction in areas that may contain special-status fish species cannot be avoided through the use of alternative management practices, conduct an assessment of habitat conditions and the potential for presence of special-status fish species prior to construction; this may include the hiring of a qualified fisheries biologist to determine the presence of special status fish species.
- Based on the species present in adjacent water bodies and the likely extent of construction work that may affect fish, limit construction to periods that avoid or minimize impacts to special-status fish species.
- Where construction periods cannot be altered to minimize or avoid effects on special-status fish, the grower’s coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

2. **Mitigation Measure FISH-MM-2: Educate Members on the Use of Polyacrylamides (PAMs) for Sediment Control**

The third-party will provide information on the potential risks to aquatic life, including special-status fish, that may result from the use of cationic or neutral PAMs during water management activities. Information in the form of leaflets and website information will be provided to Member, encouraging the use of anionic PAMs. Application of anionic PAMs at prescribed rates will be emphasized in the information provided to Members. Adoption of the United States Department of Agriculture National Conservation Practice Standard 450 also will be recommended in the information.

D. Agriculture Resources

1. **Mitigation Measure AG-MM-1: Assist the Agricultural Community in Identifying Sources of Financial Assistance that would Allow Members to Keep Important Farmland in Production.**

The third-party will assist the agricultural community in identifying sources of financial assistance from existing federal, state, or local programs that promote water conservation and water quality through improved management practices. Funding received from grants, cost-sharing, or low interest loans would offset some of the local Members' expenditures for compliance with and implementation of the Order, and likely would reduce the estimated losses in irrigated acreage. Potential funding sources for this mitigation measure are discussed below. The programs described below are illustrative and are not intended to constitute a comprehensive list of funding sources.

Federal Farm Bill

Title II of the 2012 Farm Bill (the Food, Conservation, and Energy Act of 2012, in effect through 30 September 2013) authorizes funding for conservation programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program. Both of these programs provide financial and technical assistance for activities that improve water quality on agricultural lands.

State Water Resources Control Board

The Division of Financial Assistance administers water quality improvement programs for the State Water Resources Control Board (State Water Board). The programs provide grant and loan funding to reduce non-point-source pollution discharge to surface waters.

The Division of Financial Assistance currently administers two programs that improve water quality associated with agriculture—the Agricultural Drainage Management Loan Program and the Agricultural Drainage Loan Program. Both of these programs were implemented to address the management of agricultural drainage into surface water. The Agricultural Water Quality Grant Program provides funding to reduce or eliminate the discharge of non-point-source pollution from agricultural lands into surface water and groundwater. It currently is funded through bonds authorized by Proposition 84.

The State Water Board's Clean Water State Revolving Fund also has funding authorized through Proposition 84. It provides loan funds to a wide variety of point-source and non-point-source water quality control activities.

Potential Funding Provided by the Safe, Clean, and Reliable Drinking Water Supply Act

This act was placed on the ballot by the Legislature as SBX 7-2 and was originally scheduled for voter approval in November 2010. In August of 2010, the Legislature removed this issue from the 2010 ballot with the intent to re-introduce it in November of 2012. In July 2012, the Legislature approved a bill to take the measure off the 2012 ballot and put it on the 2014 ballot. If approved by the public, the new water bond would provide grant and loan funding for a wide range of water-related activities, including improving agricultural water quality, conservation and watershed protection, and groundwater protection and water quality. The majority of public funds allocated by the bond would go through a rigorous competitive process to ensure dollars would go to a public benefit. Additionally, this water bond is expected to leverage more than $30 billion in additional investments in local, regional, and state wide infrastructure for water supply, water quality, and environmental restoration enhancements. The actual amount and timing of funding availability will depend on its passage, on the issuance of bonds and the release of funds, and on the kinds of programs and projects proposed and approved for funding.

Other Funding Programs

Other state and federal funding programs have been available in recent years to address agricultural water quality improvements. Integrated Regional Water Management grants were authorized and funded by Proposition 50 and now by Proposition 84. These are administered jointly by the State Water Board and the California Department of Water Resources. Proposals can include agricultural water quality improvement projects. The Bureau of Reclamation also can provide assistance and cost-sharing for water conservation projects that help reduce discharges.

E. Mitigation Measure CC-MM-2: Apply Applicable California Attorney General Mitigation Measures to Reduce Construction and Operational GHG Emissions

A 2008 report by the California Attorney General's office entitled *The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level* identifies various example measures to reduce GHG emissions at the project level (California Department of Justice 2008). The following mitigation measures and project design features were compiled from the California Attorney General's Office report. They are not meant to be exhaustive but to provide a sample list of measures that should be incorporated into future project design. Only those measures applicable to the Order are included.

Solid Waste Measures

- Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).

- Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers.
- Recover by-product methane to generate electricity.

Transportation and Motor Vehicles

- Limit idling time for commercial vehicles, including delivery and construction vehicles.
- Use low- or zero-emission vehicles, including construction vehicles.

ATTACHMENT D

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR GROWERS WITHIN THE TULARE LAKE BASIN AREA THAT ARE MEMBERS OF A THIRD-PARTY GROUP

FINDINGS OF FACT AND STATEMENT OF OVERRIDING CONSIDERATIONS

ORDER R5-2013-0120

September 2013

Contents

Acronyms and Abbreviations

2008 Farm Bill	Food, Conservation, and Energy Act of 2008
CACs	county agricultural commissioners
CCR	California Code of Regulations
Central Valley Water Board	California Regional Water Quality Control Board, Central Valley Region
CEQA	California Environmental Quality Act
CRHR	California Register of Historic Resources
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
DO	dissolved oxygen
DPH	California Department of Public Health
DPM	diesel particulate matter
DPR	California Department of Pesticide Regulation
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	federal Endangered Species Act
PEIR	Long-Term Irrigated Lands Regulatory Program Final Program EIR (incorporates Draft)
FWQMP	Farm Water Quality Management Plans
GHGs	greenhouse gasses
GQMPs	groundwater quality management plans
HAPs	hazardous air pollutants
ILRP	Long-Term Irrigated Lands Regulatory Program
ILRP Framework Report	Recommended Irrigated Lands Regulatory Program Framework Staff Report, March 2011
MLD	most likely descendant
MMRP	Mitigation Monitoring and Reporting Program
NAHC	Native American Heritage Commission
NMFS	National Marine Fisheries Service
NOA	naturally occurring asbestos
NPS	nonpoint source
NPS Policy	State Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program
NRHP	National Register of Historic Places
PAMs	polyacrylamides
PRC	California Public Resources Code
SB	Senate Bill
State Water Board	State Water Resources Control Board
TACs	toxic air contaminants
TMDLs	total maximum daily loads
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDRs	waste discharge requirements

Introduction

The California Environmental Quality Act (CEQA) (California Public Resources Code [PRC] sections 21002, 21002.1, 21081, 21081.5, 21100) and State CEQA Guidelines section 15091(a) provide that no public agency shall approve or carry out a project for which an environmental impact report (EIR) has been certified when one or more significant environmental effects of the project have been identified, unless the public agency makes one or more written findings for each of those significant effects, accompanied by a brief explanation of the rationale for each finding. These findings explain the disposition of each of the significant effects, including those that will be less than significant with mitigation. The findings must be supported by substantial evidence in the record.

There are three possible findings under section 15091(a). The public agency must make one or more of these findings for each significant effect. The section 15091(a) findings are:

1. Changes or alterations have been required in, or incorporated into, the project which avoid or substantially lessen the significant environmental effect as identified in the Long-Term Irrigated Lands Regulatory Program (ILRP) Final Program EIR (PEIR) (ICF International 2011). Pub. Resources Code section 15091(a)(1).
2. Such changes or alterations are within the responsibility and jurisdiction of another public agency and not the agency making the finding. Such changes have been adopted by such other agency or can and should be adopted by such other agency. Pub. Resources Code section 15091(a)(2).
3. Specific economic, legal, social, technological, or other considerations, including provision of employment opportunities for highly trained workers, make infeasible the mitigation measures or project alternatives identified in the PEIR. Pub. Resources Code section 15091(a)(3).

Findings

The following findings discuss the significant direct, indirect, and cumulative effects of the program to be adopted, which is referred to throughout as Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-party, Order R5-2013-0120 (Order). The Order is described in California Regional Water Quality Control Board, Central Valley Region Order R5-2013-0120 and supporting attachments, and is being approved consistent with the requirements of CEQA.

The requirements of this Order have been developed from the alternatives evaluated in the PEIR, and include regulatory elements contained within those alternatives. As described below (see Applicability of the Program EIR), there are no new effects that could occur or no new mitigation measures that would be required as a result of the Order that were not already identified and described in the PEIR. None of the conditions that would trigger the need to prepare a subsequent EIR under State CEQA Guidelines section 15162 exist with respect to the Order.

The findings adopted by the Central Valley Water Board address each of the Order's significant effects in their order of appearance in the PEIR certified for the Long-term ILRP. The findings also address the alternatives analyzed in the PEIR that were not selected as a basis for the Order.

For the purposes of section 15091, the documents and other materials that constitute the record of proceedings upon which the Central Valley Water Board based its decision are held by the Central Valley Water Board.

For findings made under section 15091(a)(1), required mitigation measures have been adopted for the Order. These mitigation measures are included in Attachment C of the Order. A Mitigation Monitoring and Reporting Program (MMRP) for these measures has been included in the Order's Monitoring and Reporting Program R5-2013-0120 (MRP).

Where mitigation measures are within the responsibility and jurisdiction of another public agency, the finding in section 15091(a)(2) should be made by the lead agency. In order to make the finding, the lead agency must find that the mitigation measures have been adopted by the other public agency or can and should be adopted by the other public agency.

Where the finding is made under section 15091(a)(3) regarding the infeasibility of mitigation measures or alternatives, the specific economic, legal, social, technological, or other considerations are described in a subsequent section.

Each of these findings must be supported by substantial evidence in the record.

The Order implements the Long-Term ILRP for irrigated lands in the Tulare Lake Basin Area. The Order is intended to serve as a single implementing order in a series of orders that will implement the Long-Term ILRP for the entire Central Valley.

History of the Project

In 2003 the Central Valley Water Board adopted a conditional waiver of waste discharge requirements for discharges from irrigated agricultural lands. As part of the 2003 waiver program the Central Valley Water Board directed staff to prepare an Environmental Impact Report (EIR) for a long-term irrigated lands regulatory program (ILRP).

On 5 and 6 March 2003, CEQA scoping meetings were held in Fresno and Sacramento to solicit and receive public comment on the scope of the EIR as described in the Notice of Preparation (released on 14 February 2003). Following the scoping meetings, the Central Valley Water Board began preparation of the draft *Existing Conditions Report* (ECR) in 2004 to assist in defining the baseline condition for the EIR's environmental analyses. The draft ECR was circulated in 2006, public comment on the document was received and incorporated and it was released in 2008.[1]

In March and April 2008, the Central Valley Water Board conducted another series of CEQA scoping meetings to generate recommendations on the scope and goals of the long-term ILRP. Information was also gathered as to how stakeholders would like to be involved in development of the long-term program. Stakeholders indicated in these scoping meetings that they would like to be actively involved in developing the program. To address this interest, the Central Valley Water Board initiated the Long-term ILRP Stakeholder Advisory Workgroup. The Stakeholder Advisory Workgroup assisted in the development of long-term program goals and objectives and a range of alternatives to be considered in the PEIR.

[1] ICF Jones & Stokes. 2008. *Irrigated Lands Regulatory Program Existing Conditions Report*. December. (ICF J&S 05508.05.) Sacramento, CA. Prepared for the State Water Resources Control Board and Central Valley Regional Water Quality Control Board, Rancho Cordova, CA.

On 28 July 2010, the Central Valley Water Board, serving as the lead agency under CEQA, released the Draft PEIR for the long-term ILRP. The PEIR provides programmatic analysis of impacts resulting from the implementation of six regulatory alternatives. Five of the alternatives were developed with the Stakeholder Advisory Workgroup. The sixth alternative was developed by staff in an effort to fulfill program goals and objectives, meet applicable state policy and law, and minimize potentially adverse environmental impacts and economic effects. The PEIR does not analyze a preferred program alternative, but rather equally analyzes the environmental impacts of each alternative. Further discussion regarding the PEIR alternatives is included below in the section titled "Feasibility of Alternatives Considered in the EIR."

The Central Valley Water Board provided a 60-day period for submitting written comments on the Draft PEIR. In September 2010, Central Valley Water Board staff held public workshops in Chico, Modesto, Rancho Cordova, and Tulare to receive input. The Central Valley Water Board provided substantive responses to all written comments received on the Draft PEIR. The Central Valley Water Board provided public notice of the availability of the Final PEIR on 8 March 2011. The Central Valley Water Board certified the PEIR on 7 April 2011 (Central Valley Water Board Resolution R5-2011-0017). The requirements of the Order have been developed from the alternatives evaluated in the PEIR.

Applicability of the Program EIR

Pursuant to Guidelines Section 15168(c)(2), the Central Valley Water Board finds that the Order is within the scope of the project covered by the PEIR, and no new environmental document is required. There are no new effects that could occur or no new mitigation measures that would be required as a result of the Order that were not already identified and described in the PEIR. None of the conditions that would trigger the need to prepare a subsequent EIR under State CEQA Guidelines section 15162 exist with respect to the Order.

This Order represents one order in a series of orders that will be developed, based on the alternatives evaluated in the PEIR, for all irrigated agriculture within the Central Valley. The PEIR describes that potential environmental impacts of all six alternatives are associated with implementation of water quality management practices, construction of monitoring wells, and impacts to agriculture resources (e.g., loss of production of prime farmland) due to increased regulatory costs.

The PEIR describes and evaluates potential impacts of practices likely to be implemented to meet water quality and other management goals on irrigated lands. The representative water quality management practices analyzed include:

- Nutrient management
- Improved water management
- Tailwater recovery system
- Pressurized irrigation
- Sediment trap, hedgerow, or buffer
- Cover cropping or conservation tillage
- Wellhead protection

As discussed in Attachment A, the requirements of the Order have been developed from the alternatives evaluated in the PEIR. Because the Order includes regulatory elements that are also contained in the six alternatives analyzed in the PEIR, the actions by Members to protect water quality in response to the requirements of this Order are expected to be similar to those described for Alternatives 2-6 of the PEIR (Alternative 1 does not include groundwater protection). Therefore, the requirements of this Order would lead to implementation of the above practices within the Tulare Lake Basin Area to a similar degree as is described for Alternatives 2-6 analyzed in the PEIR.

Specifically, project-level review of the requirements in the Order has revealed that the requirements of the Order most closely resemble those described for Alternatives 2 and 4 of the PEIR, but do include elements from Alternatives 2-5. The Order contains the third-party lead entity structure, regional surface and groundwater management plans, and regional surface water quality monitoring approach similar to Alternative 2 of the PEIR; farm planning, management practices tracking, nutrient tracking, and regional groundwater monitoring similar to Alternative 4 of the PEIR; sediment and erosion control plan (under Alternative 3, "farm plan") recommendation/certification requirements similar to Alternative 3; prioritized installation of groundwater monitoring wells similar to Alternative 5; and a prioritization system based on systems described by Alternatives 2 and 4.

Impact Findings

Cultural Resources

Impact CUL-1. Physical destruction, alteration, or damage of cultural resources from implementation of management practices (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Upon implementation of the Order, Members may implement a variety of management practices that include physical and operational changes to agricultural land in the Order's regulated area. Such management practices may occur near cultural resources that are historically significant and eligible for listing in the California Register of Historic Resources (CRHR) or the National Register of Historic Places (NRHP). Implementation of these practices may lead to physical demolition, destruction, relocation, or alteration of cultural resources.

The location, timing, and specific suite of management practices to be chosen by Members to improve water quality are not known at this time. This impact is considered significant. **Mitigation Measure CUL-MM-1: Avoid Impacts to Cultural Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are included at the end of the *Impact Findings* section.

Impact CUL-2. Potential Damage to Cultural Resources from Construction Activities and Installation of Groundwater Monitoring Wells (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, construction impacts would result from implementation of management practices that require physical changes, including, installation of groundwater monitoring wells. The location of monitoring wells, as well as the location, timing, and specific suite of management practices to be selected by Members are not known at this time, and will not be defined until the need for additional monitoring wells is established. This impact is considered significant. Mitigation **Measure CUL-MM-1: Avoid Impacts to Cultural Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are included at the end of the *Impact Findings* section.

Noise

Impact NOI-1. Exposure of Sensitive Land Uses to Noise from Construction Activities in Excess of Applicable Standards (Responsibility of Other Agencies)

Finding

As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of the mitigation measures for this impact is within the responsibility and jurisdiction of other public agencies that can and should implement the measures.

Rationale for Finding

Under the Order, construction noise impacts would result from implementation of management practices that require the use of heavy-duty construction equipment. Because management practices are a function of crop type and economics, it cannot be determined whether the management practices selected under the Order would change relative to existing conditions. Accordingly, it is not possible to determine construction-related effects based on a quantitative analysis.

Noise levels from anticipated heavy-duty construction equipment are expected to range from approximately 55 to 88 A-weighted decibels (dBA) at 50 feet. These levels would be short term and would attenuate as a function of distance from the source. Noise from construction equipment operated within several hundred feet of noise-sensitive land uses has the potential to exceed local noise standards. This is considered a potentially significant impact. Implementation of **Mitigation Measure NOI-MM-1: Implement Noise-Reducing Construction Practices**, which is described at the end of the *Impact Findings* section, would reduce this impact to a less-than-significant level. Mitigation Measure NOI-MM-1 is within the responsibility and jurisdiction of local agencies, who can and should implement these measures.

Impact NOI-2. Exposure of Sensitive Land Uses to Noise from Operational Activities in Excess of Applicable Standards (Responsibility of Other Agencies)

Finding

As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of the mitigation measures for this impact is within the responsibility and jurisdiction of other public agencies that can and should implement the measures.

Rationale for Finding

Under the Order, a third-party group would perform regional surface water and groundwater quality monitoring. Surface and groundwater monitoring under the Order would be similar to the regional monitoring described for Alternatives 2 and 4 of the PEIR. The PEIR provides that operational noise from vehicle trips associated with water quality sampling for these alternatives is expected to be minimal.

Operation of new well pumps as part of tailwater recovery systems may result in increased noise levels relative to existing conditions. Noise generated from individual well pumps would be temporary and sporadic. Information on the types and number of pumps, as well as the number and distances of related vehicle trips, is currently unavailable.

Depending on the type of management practice selected, the Order also may result in noise benefits relative to existing conditions. For example, improved irrigation management may reduce the amount of time that pressurized pump generators are used. Enhanced nutrient application may minimize the number of tractors required to fertilize or plow a field. Removing these sources of noise may mediate any increases related to the operation of new pumps. However, in the absence of data, a quantitative analysis of noise impacts related to operations of the Order is not possible. Potential noise from unenclosed pumps located close to noise-sensitive land uses could exceed local noise standards. This is considered a potentially significant impact. Implementation of **Mitigation Measures NOI-MM-1: Implement Noise-Reducing Construction Practices** and **NOI-MM-2: Reduce Noise Generated by Individual Well Pumps**, which are described at the end of the *Impact Findings* section, should reduce this impact to a less-than-significant level. Mitigation measures NOI-MM-1and NOI-MM-2 are within the responsibility and jurisdiction of local agencies, who can and should implement these measures.

Air Quality

Impact AQ-1. Generation of Construction Emissions in Excess of Local Air District Thresholds (Responsibility of Other Agencies)

Finding

As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of the mitigation measures for this impact is within the responsibility and jurisdiction of other public agencies that can and should implement the measures.

Rationale for Finding

Under the Order, construction impacts would result from implementation of management practices that require physical changes or the use of heavy-duty construction equipment. It is difficult to determine how management practices selected under this Order would change relative to existing conditions. Accordingly, it is not possible to determine construction-related effects based on a quantitative analysis. However, under the Order there would be selection and implementation of additional management practices to meet surface and groundwater quality goals. Consequently, implementation of the Order may result in increased criteria pollutant emissions from construction activities relative to existing conditions.

Construction emissions associated with the Order would result in a significant impact if the incremental difference, or increase, relative to existing conditions exceeds the applicable air district thresholds shown in Table 5.5-2 of the PEIR. Management practices with the greatest potential for emissions include those that break ground or move earth matter, thus producing fugitive dust, and those that require the use of heavy-duty construction equipment (e.g., backhoes or bulldozers), thus producing criteria pollutants from exhaust. The management practices fitting this description include sediment trap, hedgerow, or buffer; pressurized irrigation; and tailwater recovery systems.

While it is anticipated that any emissions resulting from construction activities would be minuscule on a per-farm basis, in the absence of a quantitative analysis, data are insufficient to determine whether emissions would exceed the applicable air district thresholds. Consequently, this is considered a potentially significant impact. Implementation of **Mitigation Measure AQ-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction Emissions below the District Thresholds**, which is described at the end of the *Impact Findings* section, should reduce this impact to a less-than-significant level. Mitigation Measure AQ-MM-1 is within the responsibility and jurisdiction of local air districts, who can and should implement these measures.

Impact AQ-2. Generation of Operational Emissions in Excess of Local Air District Thresholds (Responsibility of Other Agencies)

Finding

As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of the mitigation measures for this impact is within the responsibility and jurisdiction of other public agencies that can and should implement the measures.

Rationale for Finding

Under the Order, operational emissions would result from vehicle trips made by the third-party groups to perform surface water and groundwater monitoring, and from new diesel-powered pumps installed as part of tailwater recovery systems.

Any new emissions generated under the Order are not expected to be substantial or to exceed applicable air district thresholds. In addition, they may be moderated by emissions benefits related to management practices that reduce irrigation and cover crops (see Table 5.5-8 of the PEIR). However, the difference in emissions relative to existing conditions is not known at this time and therefore cannot be compared to the significance criteria. This is considered a potentially significant impact. Implementation of **Mitigation Measure AQ-MM-2: Apply Applicable Air District Mitigation Measures to Reduce Operational Emissions below the District Thresholds**, which is described at the end of the *Impact Findings* section, should reduce this impact to a less-than-significant level. Mitigation Measure AQ-MM-2 is within the responsibility and jurisdiction of local air districts, who can and should implement these measures.

Impact AQ-3. Elevated Health Risks from Exposure of Nearby Sensitive Receptors to Toxic Air Contaminants/Hazardous Air Pollutants (TACS/HAPs) (Responsibility of Other Agencies)

Finding

As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of the mitigation measures for this impact is within the responsibility and jurisdiction of other public agencies that can and should implement the measures.

Rationale for Finding

Toxic air contaminants (TACs) and hazardous air pollutants (HAPs) resulting from the Order include diesel particulate matter (DPM) from diesel construction equipment and new pumps, pesticides/fertilizers, and asbestos. Sensitive receptors near Members could be affected by these sources.

As discussed in Chapter 3 of the PEIR, one of the goals of the nutrient management and conservation tillage management practices is to reduce the application of pesticides/fertilizers. Because the Order would result in greater likelihood of these management practices being implemented, it is reasonable to assume that pesticides/fertilizers—and thus the potential for exposure to these chemicals—would be reduced under the Order.

It is expected that construction emissions may increase relative to existing conditions, thus resulting in minor increases of DPM. Elevated levels of construction in areas where naturally occurring asbestos (NOA) is common may also increase the likelihood of exposure to asbestos. New diesel-powered pumps also would increase DPM emissions relative to existing conditions. This is considered a potentially significant impact. Implementation of **Mitigation Measures AQ-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction Emissions below the District Thresholds**, **AQ-MM-2: Apply Applicable Air District Mitigation Measures to Reduce Operational Emissions below the District Thresholds**, and **AQ-MM-3: Apply Applicable Air District Mitigation Measures to Reduce TAC/HAP Emissions**, which are described at the end of the *Impact Findings* section, should reduce this impact to a less than significant level. Mitigation Measures AQ-MM-1, AQ-MM-2, and AQ-MM-3 are within the responsibility and jurisdiction of local air districts, who can and should implement these measures.

Vegetation and Wildlife

Impact BIO-1. Loss of Downstream Habitat from Reduced Field Runoff (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, management practices that reduce field runoff would result in beneficial impacts on water quality but may adversely affect downstream wildlife and vegetation that depend on agricultural surface runoff. These practices cause water to be recirculated or used at an agronomic rate, resulting in a minimal amount of agricultural runoff. This would result in a net loss of water entering waterways and potential habitat loss along runoff ditches and downstream water bodies.

Such habitat would be seasonally present, available only during times of irrigation, and unlikely to support sensitive communities or special-status plants. While reduced runoff leads to, or is the result of, reduced surface water diversions to fields, some regions rely largely on groundwater to irrigate. While it is anticipated that the loss of sensitive communities or special-status plants resulting from reduced runoff would be small, if any, data are insufficient to determine how much loss would occur. Consequently, this is considered a potentially significant impact. **Mitigation Measure BIO-MM-2: Avoid and Minimize Impacts on Sensitive Biological Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are included at the end of the *Impact Findings* section.

Impact BIO-3. Potential Loss of Sensitive Natural Communities and Special-Status Plants from Construction Activities (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, construction impacts would result from implementation of management practices that require physical changes, such as construction of water and sediment control basins, temporary water checks, tailwater return systems, vegetated drain systems, windbreaks, wellhead protection berms, and filter strips. It is difficult to determine to what extent management practices selected under the Order would change relative to existing conditions; thus, it is not possible to quantify any construction-related effects. However, it is logical to assume that implementation of the Order would result in selection of more management practices to meet water quality goals. Consequently, implementation of the Order may result in effects on vegetation from construction activities.

In general, management practices would be implemented on existing agricultural lands and managed wetlands, which are unlikely to support native vegetation or special-status plants. However, construction that directly or indirectly affects natural vegetation communities adjacent to existing irrigated lands, particularly annual grasslands with inclusions of seasonal wetlands or vernal pools and riparian vegetation, could result in loss of sensitive wetland communities or special-status plants growing in the uncultivated or unmanaged areas. While it is anticipated that the loss of sensitive communities or special-status plants resulting from construction activities would be small, if any, data are insufficient to determine how much loss would occur. Consequently, this is considered a potentially significant impact. **Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact BIO-4. Potential Loss of Wetland Communities due to Loss of Existing Sedimentation Ponds (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, the assumed decrease in the use of surface water management practices that may be harmful to groundwater could result in abandonment or fill of tailwater sedimentation ponds in areas that currently percolate water to groundwater basins. Although they are not natural features, sedimentation ponds can develop vegetation communities that support wetland species, depending on the specific hydrologic regime of individual ponds. Ponds that hold water intermittently or seasonally may support plant species adapted to seasonal wetland conditions, and ponds that are continually flooded may support emergent vegetation adapted to permanent wetland conditions. Thus, the loss of these ponds could result in drying of artificially created wetlands and an indirect loss of wetland habitat. The loss of wetland communities resulting from abandonment or fill of retention ponds would be small but cannot be quantified. It is also important to note that implementation of one of the potential management practices under the Order—installation of tailwater return systems—would result in creation of tailwater ponds that could develop the same wetland characteristics as the abandoned or filled sedimentation ponds. Creation of new tailwater ponds could result in no net loss or potentially an increase in these wetland communities. However, the final extent of the tailwater ponds that could be created under the Order cannot be quantified. Consequently, the loss of existing sedimentation ponds is considered a potentially significant impact. **Mitigation Measure BIO-MM-2: Determine Extent of Wetland Loss and Compensate for Permanent Loss of Wetlands** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact BIO-5. Impacts to Special-Status Wildlife Species due to Loss of Existing Sedimentation Ponds (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, the assumed decrease in the use of surface water management practices that may be harmful to groundwater could result in abandonment or fill of tailwater sedimentation ponds in areas that currently percolate water to groundwater basins. Although they are not natural features, sedimentation ponds can provide habitat for special-status wildlife species. The banks of these ponds could support habitat for special-status burrowing wildlife species, including San Joaquin kit fox and western burrowing owl. Ponds that hold water intermittently or seasonally may support special-status wildlife species adapted to seasonal wetland conditions, such as vernal pool fairy shrimp and vernal pool tadpole shrimp, California red-legged frog, and California tiger salamander, depending on the proximity of these ponds to natural habitats. The ponds also provide foraging habitat for many bird species. Ponds that hold water intermittently provide foraging habitat for wading birds, and ponds that are continually flooded may support foraging and nesting habitat for waterfowl. The abandonment or fill of retention ponds would be small and cannot be quantified but could affect wildlife species that are dependent on them. However, the creation of new tailwater ponds could mitigate part or all of this impact. Because the extent of new tailwater ponds cannot be quantified, the loss of existing sedimentation ponds is considered a potentially significant impact. **Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact BIO-6. Loss of Sensitive Natural Communities and Special-Status Plants from Construction Activities and Installation of Groundwater Monitoring Wells (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, construction impacts would result from installation of groundwater monitoring wells. The placement of monitoring wells cannot be predetermined; consequently, the potential impacts on sensitive natural communities and special-status plants cannot be quantified.

In general, management practices would be implemented on existing agricultural lands and managed wetlands, resulting in a less-than-significant impact. It was assumed that groundwater monitoring well placement also could be primarily limited to agricultural land and non-sensitive habitat. However, if construction related to installation of groundwater monitoring wells required changes to managed wetlands or to natural vegetation communities that are adjacent to existing irrigated lands, there would be a potential for loss of vegetation in sensitive wetland communities or loss of special-status plants growing in the uncultivated or unmanaged areas. While it is anticipated that the loss of sensitive communities or special-status plants resulting from construction activities would be small, if any, data are insufficient to determine how much loss would occur. Consequently, this is considered a potentially significant impact. **Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact BIO-7. Loss of Special-Status Wildlife from Construction Activities and Installation of Groundwater Monitoring Wells (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, construction impacts would result from installation of groundwater monitoring wells. The placement of monitoring wells cannot be predetermined; consequently, the potential impacts on special-status wildlife species and their habitat cannot be quantified.

In general, management practices would be implemented on existing agricultural lands and managed wetlands, resulting in a less-than-significant impact. It was assumed that placement of groundwater monitoring wells also could be limited primarily to agricultural land and non-sensitive habitat. However, construction of groundwater monitoring wells that requires changes to managed wetlands or to natural vegetation communities adjacent to existing irrigated lands could result in a loss of special-status wildlife species occurring in the uncultivated or unmanaged areas. While it is anticipated that the loss of special-status wildlife species resulting from construction activities would be small, if any, data are insufficient to determine how much loss would occur. Consequently, this is considered a potentially significant impact. **Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Fisheries

Impact FISH-2. Temporary Loss or Alteration of Fish Habitat during Construction of Facilities for Management Practices (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, construction impacts would result from implementation of management practices that require physical changes to lands in the Tulare Lake Basin Area. These physical changes primarily include erosion and sediment controls with features such as construction of water and sediment control basins, temporary water checks, tailwater return systems, vegetated drain systems, windbreaks, wellhead protection berms, and filter strips. Physical changes may be associated with implementation of other management practices, such as construction of filter ditches for pesticide management. Installation of facilities for management practices such as pressurized irrigation and sediment traps is unlikely to significantly exceed the baseline disturbance that occurs during routine field preparation. Construction of features associated with management practices may temporarily reduce the amount or quality of existing fish habitat in certain limited circumstances (e.g., by encroachment onto adjacent water bodies, removal of riparian vegetation, or reduction in water quality—such as increases in sediment runoff during construction). It is difficult to determine whether the management practices selected under the Order would change relative to existing conditions, and it is not possible to quantify any construction-related effects. Implementation of the Order may result in effects on fish habitat from construction activities related to management practices.

While it is anticipated that the loss of fish habitat resulting from construction activities would be small, if any, data are insufficient to determine how much loss would occur. Consequently, this is considered a potentially significant impact. **Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact FISH-3. Permanent Loss or Alteration of Fish Habitat during Construction of Facilities for Management Practices (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

In some cases, permanent loss of fish habitat may occur as a result of construction required for implementation of management practices under the Order. Some of the impact may be due to loss of structural habitat (e.g., vegetation) whereas loss of dynamic habitat (e.g., wetted habitat) could be an issue where tailwater augments natural flows or makes seasonal streams into perennial systems. This may be of concern in areas where tailwater return flows are composed mostly of pumped groundwater. Because the extent of the loss is not known, the impact is considered potentially significant. **Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact FISH-4. Toxicity to Fish or Fish Prey from Particle-Coagulant Water Additives (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

Under the Order, polyacrylamides (PAMs) may be applied to reduce erosion and sediment runoff and thereby improve water quality (Sojka et al. 2000). Anionic PAMs are safe to aquatic life when used at prescribed rates (Sojka et al. 2000). Because neutral and cationic PAMs may be toxic to fish and their prey (Sojka et al. 2000; Mason et al. 2005), application of anionic PAMs is recommended in areas with sensitive fish species (Mason et al. 2005). This impact is considered potentially significant. **Mitigation Measure FISH-MM-2: Educate Growers on the Use of Polyacrylamides (PAMs) for Sediment Control** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact FISH-6. Temporary Loss or Alteration of Fish Habitat during Construction of Facilities for Management Practices and Groundwater Monitoring Wells (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

This impact is essentially the same as Impact FISH-2 except that, in addition to the temporary loss or alteration of habitat due to construction of management practices, further loss or alteration of fish habitat may occur from construction of groundwater monitoring wells under the Order. Accordingly, the impact is considered potentially significant. **Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Impact FISH-7. Permanent Loss or Alteration of Fish Habitat during Construction of Facilities for Management Practices and Groundwater Monitoring Wells (Less than Significant with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant environmental effect as identified in the PEIR.

Rationale for Finding

This impact is essentially the same as Impact FISH-3 except that, in addition to the temporary loss or alteration of habitat due to construction of features associated with management practices, permanent loss or alteration of fish habitat may occur from construction of groundwater monitoring wells under the Order. Accordingly, the impact is considered potentially significant. **Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat** has been incorporated into the Order to reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Agriculture Resources

Impact AG-1. Conversion of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to Nonagricultural Use (Significant and Unavoidable)

Finding

Pursuant to State CEQA Guidelines section 15091(a)(1), changes or alterations have been required in, or incorporated into, the Order, but these changes or alterations are not sufficient to reduce the significant environmental effect to less than significant as identified in the PEIR. As specified in section 15091(a)(3) of the State CEQA Guidelines, specific considerations make mitigation and alternatives infeasible. A statement of overriding consideration has been adopted, as indicated in the Statement of Overriding Considerations Supporting Approval of the Order presented below.

Rationale for Finding

Under the Order, irrigated lands operations would be required to achieve surface and groundwater quality goals, and to conduct monitoring and reporting to verify such achievement. It is anticipated many or most operations will implement new management practices to achieve these surface and groundwater quality goals. Consequently, operations under the Order will experience increased operational costs due to increased monitoring and reporting activities, as well as increased management practices, if such practices are needed to meet goals. Where such increased costs make agricultural operations unlikely or unable to continue, agriculture lands may be at risk of conversion to nonagricultural use, resulting in a significant and unavoidable impact to prime and/or unique farmland, as well as farmland of statewide importance.

As described in Attachment A of the Order under "California Water Code Sections 13141 and 13241," the Order is based mainly on components of Alternatives 2-5 of the PEIR. It follows that, because the costs of the Order are similar to the costs of Alternative 3, economic impacts of the Order, including those causing potential loss of Important Farmland, may be estimated using the analysis of Alternative 3.

The PEIR describes that, under Alternative 3, 30 thousand acres of Important Farmland within the entire Tulare Lake Basin potentially would be removed from production because of the increased costs. Applying the ratio of irrigated lands within the Tulare Lake Basin Area (est. 2,890,000 acres) to the total irrigated lands within the Tulare Lake Basin (est. 3,450,579, Table 3-3, Economics Report) [2], it is estimated that approximately 25 thousand acres of Important Farmland potentially would be removed from production under the Order. Comparatively, under Alternative 1, described as full implementation of the previous conditional waiver program, approximately 23 thousand acres of Important Farmland potentially would be removed from production (calculated using the methodology described above). It is unlikely that all of this acreage would be converted to a nonagricultural use, but it is reasonable to assume that some unknown quantity would be impacted.

Because implementation of the Order potentially would result in conversion of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to nonagricultural use, this impact is considered significant. **Mitigation Measure AG-MM-1: Assist the Agricultural Community in Identifying Sources of Financial Assistance that would Allow Growers to Keep Important Farmland in Production** has been incorporated into the Order to reduce the magnitude of the impact, but no feasible mitigation measures have been identified that would reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

[2] ICF International, 2010

Cumulative Impacts

Cumulative Cultural Resource Impacts (Less than Cumulatively Considerable with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant cumulative environmental effect as identified in the PEIR.

Rationale for Finding

Use of ground-disturbing management practices under the Long-term ILRP alternatives could result in cumulatively considerable effects to cultural resources in concert with other, non-program-related agricultural enterprises and nonagricultural development in the program area. **Mitigation Measure CUL-MM-1: Avoid Impacts to Cultural Resources** has been incorporated into the Order to reduce the Order's contribution to this impact to a level that is not cumulatively considerable. The mitigation measure calls for identification of cultural resources and minimization of impacts to identified resources. Mitigation measures are described at the end of the *Impact Findings* section.

Cumulative Climate Change Impacts (Significant and Unavoidable)

Finding

Pursuant to CEQA Guidelines section 15091(a)(1), changes or alterations have been required in, or incorporated into, the Order, but these changes or alterations are not sufficient to reduce the significant environmental effect to less than significant as identified in the PEIR. As specified in section 15091(a)(2) of the State CEQA Guidelines, implementation of **Mitigation Measure CC-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction and Operational GHG Emissions** for this impact is within the responsibility and jurisdiction of other public agencies that can and should enforce the implementation of these measures. Further, as specified in section 15091(a)(3) of the Guidelines, specific considerations make mitigation and alternatives infeasible. A statement of overriding consideration has been adopted, as indicated in the Statement of Overriding Considerations Supporting Approval of the Order presented below.

Rationale for Finding

Unlike criteria pollutant impacts, which are local and regional, climate change impacts occur at a global level. The relatively long lifespan and persistence of GHGs (as shown in Table 5.6-1 of the PEIR) require that climate change be considered a cumulative and global impact. As discussed in the PEIR, it is unlikely that any increase in global temperature or sea level could be attributed to the emissions resulting from a single project. Rather, it is more appropriate to conclude that, under the Order, GHG emissions would combine with emissions across California, the United States, and the globe to cumulatively contribute to global climate change.

Given the magnitude of state, national, and international GHG emissions (see Tables 5.6-2 through 5.6-4 of the PEIR), climate change impacts from implementation of the Order likely would be negligible. However, scientific consensus concludes that, given the seriousness of climate change, small contributions of GHGs may be cumulatively considerable. Because it is unknown to what extent, if any, climate change would be affected by the incremental GHG emissions produced by the

Order, the impact to climate change is considered cumulatively considerable. **Mitigation Measure CC-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction and Operational GHG Emissions** is within the responsibility and jurisdiction of local agencies, who can and should implement these measures. **Mitigation Measure CC-MM-2: Apply Applicable California Attorney General Mitigation Measures to Reduce Construction and Operational GHG Emissions** has been incorporated into the Order; these measures will result in lower GHG emissions levels than had they not been incorporated, but they will not completely eliminate GHG emissions that could result from the Order. No feasible mitigation measures have been identified that would reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Cumulative Vegetation and Wildlife Impacts (Significant and Unavoidable)

Finding

Pursuant to State CEQA Guidelines section 15091(a)(1), changes or alterations have been required in, or incorporated into, the Order, but these changes or alterations are not sufficient to reduce the significant environmental effect to less than significant as identified in the PEIR. As specified in section 15091(a)(3) of the State CEQA Guidelines, specific considerations make mitigation and alternatives infeasible. A statement of overriding consideration has been adopted, as indicated in the Statement of Overriding Considerations Supporting Approval of the Order presented below.

Rationale for Finding

The Central Valley of California has been subjected to extensive human impacts from land conversion, water development, population growth, and recreation. These impacts have altered the physical and biological integrity of the Central Valley, causing loss of native riparian vegetation along river systems, loss of wetlands, and loss of native habitat for plant and wildlife species. **Mitigation Measures BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources** and **BIO-MM-2: Determine Extent of Wetland Loss and Compensate for Permanent Loss of Wetlands** have been incorporated into the Order to reduce the severity of these effects. The measures are sufficient to mitigate any program-related impacts to rare or endangered plant or wildlife species, and to habitat for these species; however, the cumulative impact of the reduction in quality habitat and the take of individual listed plants or wildlife species is potentially cumulatively considerable. Mitigation measures are described at the end of the *Impact Findings* section.

Cumulative Fish Impacts (Less than Cumulatively Considerable with Mitigation)

Finding

As specified in section 15091(a)(1) of the State CEQA Guidelines, changes or alterations have been required in, or incorporated into, the Order that avoid or substantially lessen the significant cumulative environmental effect as identified in the PEIR.

Rationale for Finding

The ongoing impacts of impaired water quality from irrigated lands are likely to cumulatively affect fish, in combination with contaminants that remain in the Order's coverage area from past activities. Such activities include mining and past use of pesticides such as DDT that remain within sediments. Because many of the existing effects discussed in the section "Existing Effects of Impaired Water

Quality on Fish" are cumulative, it is difficult to determine the relative contribution of irrigated lands and other sources. For example, low dissolved oxygen (DO) in the Stockton Deepwater Ship Channel is a result of contamination from upstream nonpoint sources (possibly including agricultural runoff) and discharges from the Stockton sewage treatment plant (Lehman et al. 2004; Central Valley Regional Water Quality Control Board 2005). Application of pesticides to nonagricultural lands such as urban parks and the resultant contaminant runoff also cumulatively contribute to impacts of inputs from irrigated lands.

Given the U.S. Environmental Protection Agency's (EPA's) ongoing federal Endangered Species Act (ESA) consultation process for pesticides as a result of recent court orders, it is reasonably foreseeable that further reasonable and prudent measures would be required by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) that would improve water quality within the Tulare Lake Basin Area. Revision of water quality control plans and total maximum daily loads (TMDLs) also can be expected to improve water quality. These and other measures, in combination with the likely beneficial effects of the Order, suggest that the cumulative effects of the Order are not cumulatively considerable with implementation of mitigation measures. **Mitigation Measures FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat** and **FISH-MM-2: Educate Growers on the Use of Polyacrylamides (PAMs) for Sediment Control** have been incorporated into the Order to reduce these impacts to a less than cumulatively considerable level. Mitigation measures are described at the end of the *Impact Findings* section.

Cumulative Agriculture Resources Impacts (Significant and Unavoidable)

Finding

Pursuant to CEQA Guidelines section 15091(a)(1) , changes or alterations have been required in, or incorporated into, the Order, but these changes or alterations are not sufficient to reduce the significant environmental effect to less than significant as identified in the PEIR. As specified in section 15091(a)(3) of the Guidelines, specific considerations make mitigation and alternatives infeasible. A statement of overriding consideration has been adopted, as indicated in the Statement of Overriding Considerations Supporting Approval of the Order presented below.

Rationale for Finding

Since 1984, the average biennial net conversion of prime and unique farmland, and farmlands of statewide importance in California has been 28,344 acres (California Department of Conservation, Division of Land Resource Protection 2008). However, conversion has increased substantially since 2000, with an average biennial net conversion of 114,003 acres (California Department of Conservation, Division of Land Resource Protection 2008). During the 2002–2004 period, prime farmland, unique farmland, and farmland of statewide importance was reduced by 133,024 acres (California Department of Conservation, Division of Land Resource Protection 2006). The trend continued during the 2004–2006 period, with a net reduction of 125,495 acres (California Department of Conservation, Division of Land Resource Protection 2008).

While conversion of important farmland may not continue at the accelerated rate of the past 10 years due to decreased demand for new housing, it is reasonably foreseeable that it will continue at a rate comparable to that seen since 1984. Given the magnitude of important farmland conversion expected from implementation of the Order, the Order could result in cumulatively considerable impacts to agriculture resources. **Mitigation Measure AG-MM-1** has been incorporated into the Order to reduce the severity of these effects. While implementation of

AG-MM-1 could reduce these impacts to a level that is not a cumulatively considerable contribution to this statewide impact, such a reduction cannot be quantified. As such, the Order's contribution to this impact is potentially cumulatively considerable. No feasible mitigation measures have been identified that would reduce this impact to a less-than-significant level. Mitigation measures are described at the end of the *Impact Findings* section.

Mitigation Measures

Cultural Resources

Mitigation Measure CUL-MM-1: Avoid Impacts to Cultural Resources

The measure described below will reduce the severity of impacts on significant cultural resources, as defined and described in sections 5.3.1 and 5.3.3 of the PEIR. Avoidance of such impacts also can be achieved when Members choose the least impactful management practices that will meet the Order's water quality improvement goals and objectives. Note that these mitigation measures may not be necessary in cases where no ground-disturbing activities would be undertaken as a result of implementation of the Order.

Although cultural resource inventories and evaluations typically are conducted prior to preparation of a CEQA document, the size of the Order's coverage area and the lack of specificity regarding the location and type of management practices that would be implemented following adoption of the Order rendered conducting inventories prior to release of the draft Order untenable. Therefore, where the Order's water quality improvement goals cannot be achieved without modifying or disturbing an area of land or existing structure to a greater degree than through previously employed farming practices, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels.

- Where construction within areas that may contain cultural resources cannot be avoided through the use of alternative management practices, conduct an assessment of the potential for damage to cultural resources prior to construction; this may include the hiring of a qualified cultural resources specialist to determine the presence of significant cultural resources.
- Where the assessment indicates that damage may occur, submit a non-confidential records search request to the appropriate California Historical Resources Information Center (CHRIS) information center(s).
- Implement the recommendations provided by the CHRIS information center(s) in response to the records search request.
- Where adverse effects to cultural resources cannot be avoided, the grower's coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

In addition, California state law provides for the protection of interred human remains from vandalism and destruction. According to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (section 8100), and the disturbance of Native American cemeteries is a felony (section 7052). section 7050.5 requires that construction or excavation be stopped in the vicinity of the discovered human remains until the County Coroner has been notified, according to PRC section 5097.98, and can determine whether the remains are those of Native

American origin. If the coroner determines that the remains are of Native American origin, the coroner must contact the Native American Heritage Commission (NAHC) within 24 hours (Health and Safety Code section 7050[c]). The NAHC will identify and notify the most likely descendant (MLD) of the interred individual(s), who will then make a recommendation for means of treating or removing, with appropriate dignity, the human remains and any associated grave goods as provided in PRC section 5097.98.

PRC section 5097.9 identifies the responsibilities of the project proponent upon notification of a discovery of Native American burial remains. The project proponent will work with the MLD (determined by the NAHC) and a professional archaeologist with specialized human osteological experience to develop and implement an appropriate treatment plan for avoidance and preservation of, or recovery and removal of, the remains.

Growers implementing management practices should be aware of the following protocols for identifying cultural resources.

- If built environment resources or archaeological resources, including chipped stone (often obsidian, basalt, or chert), ground stone (often in the form of a bowl mortar or pestle), stone tools such as projectile points or scrapers, unusual amounts of shell or bone, historic debris (such as concentrations of cans or bottles), building foundations, or structures are inadvertently discovered during ground-disturbing activities, the land owner should stop work in the vicinity of the find and retain a qualified cultural resources specialist to assess the significance of the resources. If necessary, the cultural resource specialist also will develop appropriate treatment measures for the find.
- If human bone is found as a result of ground disturbance, the land owner should notify the County Coroner in accordance with the instructions described above. If Native American remains are identified and descendants are found, the descendants may—with the permission of the owner of the land or his or her authorized representative—inspect the site of the discovery of the Native American remains. The descendants may recommend to the owner or the person responsible for the excavation work means for treating or disposing of the human remains and any associated grave goods, with appropriate dignity. The descendants will make their recommendation within 48 hours of inspection of the remains. If the NAHC is unable to identify a descendant, if the descendants identified fail to make a recommendation, or if the landowner rejects the recommendation of the descendants, the landowner will inter the human remains and associated grave goods with appropriate dignity on the property in a location not subject to further and future subsurface disturbance.

Noise

Mitigation Measure NOI-MM-1: Implement Noise-Reducing Construction Practices

Growers should implement noise-reducing construction practices that comply with applicable local noise standards or limits specified in the applicable county ordinances and general plan noise elements.

Mitigation Measure NOI-MM-2: Reduce Noise Generated by Individual Well Pumps

If well pumps are installed, Members should enclose or locate them behind barriers such that noise does not exceed applicable local noise standards or limits specified in the applicable county ordinances and general plan noise elements.

Air Quality

Mitigation Measure AQ-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction Emissions below the District Thresholds

Growers should apply appropriate construction mitigation measures from the applicable air district to reduce construction emissions. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated construction emissions.

Mitigation Measure AQ-MM-2: Apply Applicable Air District Mitigation Measures to Reduce Operational Emissions below the District Thresholds

Growers should apply appropriate mitigation measures from the applicable air district to reduce operational emissions. These measures were suggested by the district or are documented in official rules and guidance reports; however, not all districts make recommendations for operational mitigation measures. Where applicable, measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated operational emissions.

Mitigation Measure AQ-MM-3: Apply Applicable Air District Mitigation Measures to Reduce TAC/HAP Emissions

Growers should apply appropriate TAC and HAP mitigation measures from the applicable air district to reduce public exposure to DPM, pesticides, and asbestos. These measures were suggested by the district or are documented in official rules and guidance reports; however, not all districts make recommendations for mitigation measures for TAC/HAP emissions. These measures will be applied on a project-level basis and may be tailored in consultation with the appropriate air district, depending on the severity of anticipated TAC/HAP emissions.

Vegetation and Wildlife

Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources

Implementation of the following avoidance and minimization measures would ensure that the construction activities related to implementation of management practices and installation of monitoring wells on irrigated lands would minimize effects on sensitive vegetation communities (such as riparian habitat and wetlands adjacent to the construction area) and special-status plants and wildlife species as defined and listed in section 5.7.3 of the PEIR. In each instance where particular management practices could result in impacts on the biological resources listed above, Members should use the least impactful effective management practice to avoid such impacts. Where the Order's water quality improvement goals cannot be achieved without incurring potential impacts, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels.

- Where detention basins are to be abandoned, retain the basin in its existing condition or ensure that sensitive biological resources are not present before modification.
- Where construction in areas that may contain sensitive biological resources cannot be avoided through the use of alternative management practices, conduct an assessment of habitat conditions and the potential for presence of sensitive vegetation communities or special-status plant and animal species prior to construction. This may include the hiring of a qualified biologist to identify riparian and other sensitive vegetation communities and/or habitat for special-status plant and animal species.
- Avoid and minimize disturbance of riparian and other sensitive vegetation communities.
- Avoid and minimize disturbance to areas containing special-status plant or animal species.
- Where adverse effects on sensitive biological resources cannot be avoided, the grower's coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

Mitigation Measure BIO-MM-2: Determine Extent of Wetland Loss and Compensate for Permanent Loss of Wetlands

Prior to implementing any management practice that will result in the permanent loss of wetlands, conduct a delineation of affected wetland areas to determine the acreage of loss in accordance with current U.S. Army Corps of Engineers (USACE) methods. For compliance with the federal Clean Water Act section 404 permit and WDRs protecting State waters from unauthorized fill, compensate for the permanent loss (fill) of wetlands and ensure no net loss of habitat functions and values. Compensation ratios will be determined through coordination with the Central Valley Water Board and USACE as part of the permitting process. Such process will include additional compliance with CEQA, to the extent that a further discretionary approval by the board would require additional CEQA review. Compensation may be a combination of mitigation bank credits and restoration/creation of habitat, as described below:

- Purchase credits for the affected wetland type (e.g., perennial marsh, seasonal wetland) at a locally approved mitigation bank and provide written evidence to the resource and regulatory agencies, as needed,that compensation has been established through the purchase of mitigation credits.
- Develop and ensure implementation of a wetland restoration plan that involves creating or enhancing the affected wetland type.

Fisheries

Mitigation Measure FISH-MM-1: Avoid and Minimize Impacts to Fish and Fish Habitat

This mitigation measure incorporates all measures identified in Mitigation Measure BIO-MM-1: Avoid and Minimize Impacts on Sensitive Biological Resources. In each instance where particular management practices could result in impacts to special-status fish species (see "Regulatory

Classification of Special-Status Species" in section 5.8.2 of the PEIR), Members should use the least impactful effective management practice to avoid such impacts. Where the Order's water quality improvement goals cannot be achieved without incurring potential impacts, individual farmers or third-party representatives will implement the following measures to reduce potential impacts to less-than-significant levels. Note that these measures may not be necessary in many cases and are dependent on the location of construction in relation to water bodies containing special-status fish.

- Where construction in areas that may contain special-status fish species cannot be avoided through the use of alternative management practices, conduct an assessment of habitat conditions and the potential for presence of special-status fish species prior to construction; this may include the hiring of a qualified fisheries biologist to determine the presence of special status fish species.
- Based on the species present in adjacent water bodies and the likely extent of construction work that may affect fish, limit construction to periods that avoid or minimize impacts to special-status fish species.
- Where construction periods cannot be altered to minimize or avoid effects on special-status fish, the grower's coverage under this Order is not authorized. The grower must then apply for its own individual waste discharge requirements. Issuance of individual waste discharge requirements would constitute a future discretionary action by the board subject to additional CEQA review.

Mitigation Measure FISH-MM-2: Educate Growers on the Use of Polyacrylamides (PAMs) for Sediment Control

The third-party will provide information to Members on the potential risks to aquatic life, including special-status fish, that may result from the use of cationic or neutral PAMs during water management activities. Information in the form of leaflets or website information will be provided to Members, encouraging the use of anionic PAMs. Application of anionic PAMs at prescribed rates will be emphasized in the information provided to Members. Adoption of the United States Department of Agriculture National Conservation Practice Standard 450 also will be recommended in the information.

Agriculture Resources

Mitigation Measure AG-MM-1: Assist the Agricultural Community in Identifying Sources of Financial Assistance that would Allow Growers to Keep Important Farmland in Production

The third-party will assist the agricultural community in identifying sources of financial assistance from existing federal, state, or local programs that promote water conservation and water quality through increased management practices. Funding received from grants, cost-sharing, or low-interest loans would offset some of the local Members expenditures for compliance with and implementation of the Order, and likely would reduce the estimated losses in irrigated acreage. Potential funding sources for this mitigation measure are discussed below. The programs described below are illustrative and are not intended to constitute a comprehensive list of funding sources.

Federal Farm Bill

Title II of the 2012 Farm Bill (the Food, Conservation, and Energy Act of 2012, in effect through 30 September 2013) authorizes funding for conservation programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program. Both of these programs provide financial and technical assistance for activities that improve water quality on agricultural lands.

State Water Resources Control Board

The Division of Financial Assistance administers water quality improvement programs for the State Water Resources Control Board (State Water Board). The programs provide grant and loan funding to reduce non-point-source pollution discharge to surface waters.

The Division of Financial Assistance currently administers two programs that improve water quality associated with agriculture—the Agricultural Drainage Management Loan Program and the Agricultural Drainage Loan Program. Both of these programs were implemented to address the management of agricultural drainage into surface water. The Agricultural Water Quality Grant Program provides funding to reduce or eliminate the discharge of non-point-source pollution from agricultural lands into surface water and groundwater. It is currently funded through bonds authorized by Proposition 84.

The State Water Board's Clean Water State Revolving Fund also has funding authorized through Proposition 84. It provides loan funds to a wide variety of point-source and non-point-source water quality control activities.

Potential Funding Provided by the Safe, Clean, and Reliable Drinking Water Supply Act

This act was placed on the ballot by the Legislature as SBX 7-2 and was originally scheduled for voter approval in November 2010. In August of 2010, the Legislature removed this issue from the 2010 ballot with the intent to re-introduce it in November of 2012. In July 2012, the Legislature approved a bill to take the measure off the 2012 ballot and put it on the 2014 ballot. If approved by the public, the new water bond would provide grant and loan funding for a wide range of water-related activities, including improving agricultural water quality, conservation and watershed protection, and groundwater protection and water quality. The majority of public funds allocated by the bond would go through a rigorous competitive process to ensure dollars would go to a public benefit. Additionally, this water bond is expected to leverage more than $30 billion in additional investments in local, regional, and state wide infrastructure for water supply, water quality, and environmental restoration enhancements. The actual amount and timing of funding availability will depend on its passage, on the issuance of bonds and the release of funds, and on the kinds of programs and projects proposed and approved for funding.

Other Funding Programs

Other state and federal funding programs have been available in recent years to address agricultural water quality improvements. Integrated Regional Water Management grants were authorized and funded by Proposition 50 and now by Proposition 84. These are administered jointly by the State Water Board and the California Department of Water Resources. Proposals can include agricultural water quality improvement projects. The Bureau of Reclamation also can provide assistance and cost-sharing for water conservation projects that help reduce discharges.

Cumulative Impacts

Mitigation Measure CC-MM-1: Apply Applicable Air District Mitigation Measures to Reduce Construction and Operational GHG Emissions

Several of the standard mitigation measures provided by Central Valley local air districts to reduce criteria pollutant emissions would also help to minimize GHG emissions (please see section 5.6.5 of the PEIR). Measures to reduce vehicle trips and promote use of alternative fuels, as well as clean diesel technology and construction equipment retrofits, should be considered by Members.

Mitigation Measure CC-MM-2: Apply Applicable California Attorney General Mitigation Measures to Reduce Construction and Operational GHG Emissions

A 2008 report by the California Attorney General's office entitled *The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level* identifies various example measures to reduce GHG emissions at the project level (California Department of Justice 2008). The following mitigation measures and project design features were compiled from the California Attorney General's Office report. They are not meant to be exhaustive but to provide a sample list of measures that could be incorporated into future project design. Only those measures applicable to the Order are included.

Solid Waste Measures

- Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).
- Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers.
- Recover by-product methane to generate electricity.

Transportation and Motor Vehicles

- Limit idling time for commercial vehicles, including delivery and construction vehicles.
- Use low- or zero-emission vehicles, including construction vehicles.

Feasibility of Alternatives Considered in the EIR

The following text presents findings relative to the project alternatives. Findings about the feasibility of project alternatives must be made whenever the project within the responsibility and jurisdiction of the lead agency will have a significant environmental effect.

In July 2010, the Central Valley Water Board released, for public review, the Draft PEIR and Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program (Economics Report). In these reports, Alternatives 1-6 were evaluated considering environmental and economic impacts, and consistency with applicable state policies and law.[3] In

[3] Economic impacts of Alternatives 1-5 have been evaluated in the Economics Report. Staff was also able to use that analysis to estimate costs of the recommended program alternative (Alternative 6), since the recommended program alternative fell within the range of the five alternatives. This cost estimate is found in Appendix A of the PEIR.

Volume II: Appendix A of the PEIR, at page 136, each alternative was found to achieve some of the program evaluation measures but not others. As is shown in Table 11 of Appendix A, no single alternative of Alternatives 1-5 achieved complete consistency with all evaluation measures. However, after review of each of the alternatives and their common elements (lead entity, monitoring type), it was clear that a program that more completely satisfied the evaluation measures could be developed by selecting from the best-performing elements of the proposed alternatives. Alternative 6, described in Appendix A of the Draft PEIR, was developed by selecting these best-performing elements and became the draft staff recommended alternative.

In consideration of comments received concerning Alternative 6 during the Draft PEIR review process, staff developed the recommended ILRP Framework, and prepared the *Staff Report on Recommended Irrigated Lands Regulatory Framework,* or 'ILRP Framework Report' (Central Valley Water Board 2011). The Central Valley Water Board did not adopt the Framework, but advised staff to use the Framework as a starting point to support the development of ILRP Orders. The Framework is based upon the sixth alternative, and is composed of elements from the range of alternatives evaluated in the PEIR. The requirements of the Order were developed considering the Framework as a starting point per Central Valley Water Board direction (Central Valley Water Board hearing, June 2011). Project-level review of the requirements in the Order has revealed that the requirements of the Order most closely resemble those described for Alternatives 4 and 2 of the PEIR, but do include elements from Alternatives 2-5.

The Order implements the long-term irrigated lands program for irrigated lands in the Tulare Lake Basin Area. The Alternatives in the PEIR have been developed for implementation throughout the entire Central Valley Region. The Order is intended to serve as a single implementing order in a series of orders that will implement the long-term irrigated lands program for the entire Central Valley. The findings below summarize why particular program alternatives are not being pursued.

Alternative 1: Full Implementation of the Current Program - No Project

Under Alternative 1, the Central Valley Water Board would renew the current program and continue to implement it into the future. This would be considered the "No Project" Alternative per CEQA guidance at Title 14 California Code of Regulations (CCR) section 15126.6(e)(3)(A): "When the project is the revision of an existing land use or regulatory plan, policy or ongoing operation, the 'No Project' Alternative will be the continuation of the existing plan, policy, or operation into the future." Given the reasonably foreseeable nature of the extension or renewal of the ongoing waiver, which would allow continuation of the existing program, Alternative 1 is best characterized as the "No Project" Alternative. This approach best serves the purpose of allowing the Central Valley Water Board to compare the impacts of revising the ILRP with those of continuing the existing program (14 CCR section 15126.6[e][1]).

Third-party groups would continue to function as lead entities representing growers (owners of irrigated lands, wetland managers, nursery owners, and water districts). This alternative is based on continuing watershed monitoring to determine whether operations are causing water quality problems. Where monitoring indicates a problem, third-party groups and growers would be required to implement management practices to address the problem and work toward compliance with applicable water quality standards. This alternative would not establish any new Central Valley Water Board requirements for discharges to groundwater from irrigated agricultural lands.

Monitoring under this alternative would be the same as the watershed-based monitoring required under the current ILRP. Under this monitoring scheme, third-party groups would work with the Central Valley Water Board to develop monitoring plans for Central Valley Water Board approval. These plans would specify monitoring parameters and site locations.

Finding

An order based on Alternative 1 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and it would not meet all of the goals and objectives of the program (program goals and objectives are described in Appendix A of the PEIR). Because Alternative 1 does not address discharges of waste from agricultural lands to groundwater, it would not be fully consistent with Program Goals 1 and 2:

- **Goal 1**—Restore and/or maintain the highest reasonable quality of State waters considering all the demands being placed on the water.
- **Goal 2**—Minimize waste discharge from irrigated agricultural lands that could degrade the quality of State waters.

In addition, the lack of a groundwater discharge component to this alternative makes it inconsistent with Goal 4 of the program:

- **Goal 4**—Ensure that irrigated agricultural discharges do not impair access by Central Valley communities and residents to safe and reliable drinking water.

Alternative 1 is also inconsistent with sections 13263 and 13269 of the California Water Code, the State Water Board's nonpoint source (NPS) program, and the State's antidegradation policy. These inconsistencies are documented in detail in the (PEIR), Appendix A, at pages 96-130. The Order is considered superior to Alternative 1 for implementation in the Tulare Lake Basin Area.

Alternative 2: Third-Party Lead Entity

Under Alternative 2, the Central Valley Water Board would develop a single mechanism or a series of regulatory mechanisms (WDRs or conditional waivers of WDRs) to regulate waste discharges from irrigated agricultural lands to ground and surface waters.

Third-party groups would function as lead entities representing growers. Regulation of discharges to surface water would be similar to Alternative 1 (the current ILRP). However, this alternative allows for a reduction in monitoring under lower threat circumstances and where watershed or area management objective plans are being developed. This alternative also includes requirements for development of groundwater quality management plans (GQMPs) to minimize discharge of waste to groundwater from irrigated lands. Under Alternative 2, local groundwater management plans or integrated regional water management plans could be utilized, all, or in part for ILRP GQMPs, with Central Valley Water Board approval. This alternative relies on coordination with the California Department of Pesticide Regulation (DPR) for regulating discharges of pesticides to groundwater.

Growers would be required to track implemented management practices and submit the results to the third-party group. Surface water monitoring under this alternative would be similar to Alternative 1. The third-party group would report summary results to the Central Valley Water Board. The third-party group would be required to summarize the results of groundwater and surface water monitoring and tracking in an annual monitoring report to the Central Valley Water Board.

Finding

An order based wholly on Alternative 2 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and because it would not as consistently meet the program's goals and objectives as would the Order. As indicated in Appendix A, pages 96–130 of the PEIR, Alternative 2 would be consistent with most of the programs goals and objectives, but would be only partially consistent with the State Water Board's nonpoint source policy and the state's antidegradation policy. Alternative 2 includes third-party GQMPs, but does not require groundwater quality monitoring. The Order is considered superior to Alternative 2 for implementation in the Tulare Lake Basin Area.

Alternative 3: Individual Farm Water Quality Management Plans

Under Alternative 3, growers would have the option of working directly with the Central Valley Water Board or another implementing entity (e.g., county agricultural commissioners [CACs]) in development of an individual farm water quality management plan (FWQMP). Growers would individually apply for a conditional waiver or WDRs that would require Central Valley Water Board approval of their FWQMP.

On-farm implementation of effective water quality management practices would be the mechanism to reduce or eliminate waste discharged to state waters. This alternative would provide incentive for individual growers to participate by providing growers with Central Valley Water Board certification that they are implementing farm management practices to protect state waters. This alternative relies on coordination with DPR for regulating discharges of pesticides to groundwater.

Unless specifically required in response to water quality problems, owners/operators would not be required to conduct water quality monitoring of adjacent receiving waters or underlying groundwater. Required monitoring would include evaluation of management practice effectiveness. The Central Valley Water Board, or a designated third-party entity, would conduct annual site inspections on a selected number of operations. They also would review available applicable water quality monitoring data as additional means of monitoring the implementation of management practices and program effectiveness.

Finding

An order based wholly on Alternative 3 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and because it would not as consistently meet the ILRP's goals and objectives as would the Order. As indicated in Appendix A, pages 96–130 of the PEIR, Alternative 3 would be only partially consistent with the Central Valley Water Board's program objectives (Objectives 4 and 5) to coordinate with other programs such as TMDL development, CV-SALTS and WDRs for dairies; and promote coordination with other agriculture-related regulatory and non-regulatory programs of the DPR, the California Department of Public Health (DPH), and other agencies. These objectives are:

- **Objective 4**—Coordinate with other Central Valley Water Board programs, such as the Grassland Bypass Project WDRs for agricultural lands, total maximum daily load development, CV-Salts, and WDRs for dairies.
- **Objective 5**—Promote coordination with other regulatory and non-regulatory programs associated with agricultural operations (e.g., DPR, DPH Drinking Water Program, the California Air Resources Board, the California Department of Food and Agriculture, Resource Conservation Districts, the University of California Extension, Natural Resource Conservation Service, National Organic Program, California Agricultural Commissioners, State Water Board Groundwater Ambient Monitoring and Assessment program, U.S. Geological Survey, and local groundwater programs [Senate Bill (SB) 1938, AB 3030, Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness.

Alternative 3 makes it more difficult to coordinate with these programs because it involves direct interaction by the Central Valley Water Board with individual growers, rather than with third-party entities. Also, the lack of mandatory surface and groundwater quality monitoring and the primary reliance on visual inspection of management practices reduces this alternative's ability to be consistent with the State Water Board's nonpoint source program. The Order is considered superior to Alternative 3 for implementation in the Tulare Lake Basin Area.

Alternative 4: Direct Oversight with Regional Monitoring

Under Alternative 4, the Central Valley Water Board would develop WDRs and/or a conditional waiver of WDRs for waste discharge from irrigated agricultural lands to groundwater and surface water. As in Alternative 3, growers would apply directly to the Central Valley Water Board to obtain coverage ("direct oversight"). As in Alternative 3, growers would be required to develop and implement individual FWQMPs to minimize discharge of waste to groundwater and surface water from irrigated agricultural lands. Alternative 4 would also allow for formation of responsible legal entities that could serve a group of growers who discharge to the same general location and thus could share monitoring locations. In such cases, the legal entity would be required to assume responsibility for the waste discharges of member growers, to be approved by the Central Valley Water Board, and ultimately to be responsible for compliance with ILRP requirements.

Discharge of waste to groundwater and surface water would be regulated using a tiered approach. Fields would be placed in one of three tiers based on their threat to water quality. The tiers represent fields with minimal (Tier 1), low (Tier 2), and high (Tier 3) potential threat to water quality. Requirements to avoid or minimize discharge of waste would be the least comprehensive for Tier 1 fields and the most comprehensive for Tier 3 fields. This would allow for less regulatory oversight for low-threat operations while establishing necessary requirements to protect water quality from higher-threat discharges. This alternative relies on coordination with DPR for regulating discharges of pesticides to groundwater.

For monitoring, growers would have the option of enrolling in a third-party group regional monitoring program. In cases where responsible legal entities were formed, these entities would be responsible for conducting monitoring. All growers would be required to track nutrient, pesticide, and implemented management practices and submit the results to the Central Valley Water Board (or an approved third-party monitoring group) annually. Other monitoring requirements would depend on designation of the fields as Tier 1, Tier 2, or Tier 3. Similar to Alternative 3, this alternative also includes requirements for inspection of regulated operations.

Finding

An order based wholly on Alternative 4 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and because it would not as consistently meet the Program's goals and objectives as would the Order. As indicated in Appendix A, pages 96–130 of the PEIR, Alternative 4 would meet most of the Program goals and objectives. However, it relies on Central Valley Water Board staff interaction directly with each irrigated agricultural operation, making it less effective at meeting the coordination objectives (Objectives 4 and 5) (page 103 of Appendix A in the PEIR):

- **Objective 4**—Coordinate with other Central Valley Water Board programs, such as the Grassland Bypass Project WDRs for agricultural lands, total maximum daily load development, CV-Salts, and WDRs for dairies.
- **Objective 5**—Promote coordination with other regulatory and non-regulatory programs associated with agricultural operations (e.g., DPR, DPH Drinking Water Program, the California Air Resources Board, the California Department of Food and Agriculture, Resource Conservation Districts, the University of California Extension, Natural Resource Conservation Service, National Organic Program, California Agricultural Commissioners, State Water Board Groundwater Ambient Monitoring and Assessment program, U.S. Geological Survey, and local groundwater programs [SB 1938, AB 3030, Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness.

Alternative 4 makes it more difficult to coordinate with these programs because it involves direct interaction by the Central Valley Water Board with individual growers, rather than with third-party entities. The Order is considered superior to Alternative 4 for implementation in the Tulare Lake Basin Area.

Alternative 5: Direct Oversight with Farm Monitoring

Alternative 5 would consist of general WDRs designed to protect groundwater and surface water from discharges associated with irrigated agriculture. All irrigated agricultural operations would be required to individually apply for and obtain coverage under the general WDRs working directly with the Central Valley Water Board ("direct oversight"). This alternative would include requirements to (1) develop and implement a FWQMP; (2) monitor (a) discharges of tailwater, drainage water, and storm water to surface water; (b) applications of irrigation water, nutrients, and pesticides; and (c) groundwater; (3) keep records of (a) irrigation water; (b) pesticide applications; and (c) the nutrients applied, harvested, and moved off the site; and (4) submit an annual monitoring report to the Central Valley Water Board. Similar to Alternative 3, Alternative 5 also includes requirements for inspection of regulated operations.

Finding

An order based wholly on Alternative 5 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and it would not as consistently meet the Program's goals and objectives as would the Order. As indicated in Appendix A, pages 96–130 of the PEIR, Alternative 5 would be only partially consistent with the Central Valley Water Board's Program objectives (Objectives 4 and 5) to coordinate with other programs such as TMDL development, CV-SALTS and WDRs for dairies; and promote coordination with other agriculture-related regulatory and non-regulatory programs of the DPR, the California Department of Public Health, and other agencies. These objectives are:

- **Objective 4**—Coordinate with other Central Valley Water Board programs, such as the Grassland Bypass Project WDRs for agricultural lands, total maximum daily load development, CV-Salts, and WDRs for dairies.
- **Objective 5**—Promote coordination with other regulatory and non-regulatory programs associated with agricultural operations (e.g., DPR, DPH Drinking Water Program, the California Air Resources Board, the California Department of Food and Agriculture, Resource Conservation Districts, the University of California Extension, Natural Resource Conservation Service, National Organic Program, California Agricultural Commissioners, State Water Board Groundwater Ambient Monitoring and Assessment program, U.S. Geological Survey, and local groundwater programs [SB 1938, AB 3030, Integrated Regional Water Management Plans]) to minimize duplicative regulatory oversight while ensuring program effectiveness.

Alternative 5 makes it more difficult to coordinate with these programs because it involves direct interaction by the Central Valley Water Board with individual growers, rather than with third-party entities.

Also, an order based on Alternative 5, due to its high relative cost as compared to the Order, would not be consistent with Program Goal 3:

- **Goal 3**—Maintain the economic viability of agriculture in California's Central Valley.

As indicated in the Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program (ICF International 2010), the program costs funded by growers and operators would be significantly higher than other alternatives (see Economics Report Tables 2-18 through 2-22). This high cost could affect the viability of thousands of acres of irrigated agricultural land throughout the Central Valley. The Order is considered superior to Alternative 5 for implementation in the Tulare Lake Basin Area.

Alternative 6: Staff Recommended Alternative in the Draft PEIR

Under Alternative 6, 8–12 general WDRs or conditional waivers of WDRs would be developed that would be geographic and/or commodity-based. The alternative would establish requirements for waste discharge from irrigated agricultural lands to groundwater and surface water. Similar to Alternatives 1 and 2, third-party groups would be responsible for general administration of the ILRP. The alternative would establish prioritization factors for determining the type of requirements and monitoring that would be applied. The prioritization would be applied geographically as a two tier system, where Tier 1 areas would be "low priority," and Tier 2 would be "high priority."

Program requirements, monitoring and management would be dependent on the priority (Tier 1 or 2). Generally, this alternative requires regional management plans to address water quality concerns and regional monitoring to provide feedback on whether the practices implemented are working to solve identified water quality concerns. In Tier 1 areas, irrigated agricultural operations and third-party groups would be required to describe management objectives to be achieved, report on management practices implemented, and make an assessment of ground and surface water quality every 5 years. In Tier 2 areas, irrigated agricultural operations and third-party groups would be required to develop and implement ground and/or surface water quality management plans, as appropriate to address water quality concerns, report on management practices, and provide annual regional ground and surface water quality monitoring. Similar to Alternative 2, Alternative 6 would allow local groundwater management plans or integrated regional water management plans to substitute, all, or in part for ILRP GQMPs, with Central Valley Water Board approval.

Alternative 6 would establish a time schedule for compliance for addressing surface and groundwater quality problems. The schedule would require compliance with water quality objectives within five to ten years for surface water problems and demonstrated improvement within five to ten years for groundwater problems.

Finding

An order based wholly on Alternative 6 is not being pursued to regulate irrigated agricultural operations in the Tulare Lake Basin Area instead of the Order because it would not substantially reduce or eliminate any of the significant adverse effects of the Order (listed in the findings above) and does not adequately reflect the clarifications and minor adjustments that were requested in comments on the Draft PEIR. The Order is considered superior to Alternative 6 for implementation in the Tulare Lake Basin Area.

Statement of Overriding Considerations Supporting Approval of the Waste Discharge Requirements General Order for Growers Within the Tulare Lake Basin Area that are Members of A Third-Party Group

Pursuant to the requirements of CEQA (PRC sections 21002, 21002.1, 21081) and State CEQA Guidelines (15 CCR 15093), the Central Valley Water Board finds that approval of the Order, whose potential environmental impacts have been evaluated in the PEIR, and as indicated in the above findings, will result in the occurrence of significant effects which are not avoided or substantially lessened, as described in the above findings. These significant effects include:

- Conversion of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to nonagricultural use.
- Cumulative climate change.
- Cumulative vegetation and wildlife impacts.
- Cumulative conversion of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance to nonagricultural use.

Pursuant to PRC section 21081(b), specific overriding economic, legal, social, technological, or other benefits outweigh the unavoidable adverse environmental effects. The specific reasons to support this approval, given the potential for significant unavoidable adverse impacts, are based on the following.

Economic Benefits

The water quality improvements expected to occur in both surface and groundwater throughout the Tulare Lake Basin Area as a result of implementing the Order is expected to create broad economic benefits for residents of the state. Control of pollutants contained in agricultural discharges, as summarized in pages 18–21 of Appendix A in the PEIR and documented in detail in the *Irrigated Lands Regulatory Program Existing Conditions Report*, should reduce water treatment costs for some communities in the Central Valley. Pages 5-3–5-5 of the *Draft Technical Memorandum Concerning the Economic Analysis of the Irrigated Lands Regulatory Program* (ICF International 2010) identifies the potential costs of upgrading wells or treating well water that is affected by nitrate contamination. The nitrate contamination is believed to be coming from a variety of sources, including fertilizers used on agricultural lands.

Consistency with NPS Policy and State Water Board Resolution 68-16 (Antidegradation Policy)

Waste discharges from irrigated agricultural operations have the potential to affect surface and groundwater quality. As documented in the *Irrigated Lands Regulatory Program Existing Conditions Report*, many state waters have been adversely affected due in part to waste discharges from irrigated agriculture. State policy and law require that the Central Valley Water Board institute requirements that will implement Water Quality Control Plans (California Water Code sections 13260, 13269), the State Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy) and applicable antidegradation requirements (State Water Board Resolution 68-16). The Order is a necessary component of the Central Valley Water Board's efforts to be consistent with state policy and law through its regulation of discharges from irrigated agriculture. As documented in the PEIR Hydrology and Water Quality analysis, implementation of a long-term ILRP, of which the Order is an implementing mechanism, will improve water quality through development of farm management practices that reduce discharges of waste to state waters.

After balancing the above benefits of the Order against its unavoidable environmental risks, the specific economic, legal, and social benefits of the proposal outweigh the unavoidable adverse environmental effects, and these adverse environmental effects are considered acceptable, consistent with the Order, Central Valley Water Board Order R5-2013-0120.

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ATTACHMENT E TO ORDER R5-2013-0120
DEFINITIONS, ACRONYMS & ABBREVIATIONS

WASTE DISHARGE REQUIREMENTS GENERAL ORDER
FOR
GROWERS WITHIN THE TULAR LAKE BASIN AREA
THAT ARE MEMBERS OF A THIRD-PARTY GROUP

The following definitions, acronyms and abbreviations apply to this Order as related to discharges of waste from irrigated lands. All other terms shall have the same definitions as prescribed by the Porter-Cologne Water Quality Control Act (California Water Code Division 7), unless specified otherwise.

1. Antidegradation Policy– State Water Board Resolution 68-16, "*Statement of Policy with Respect to Maintaining High Quality Waters in California*," requires existing high quality water to be maintained until it has been demonstrated that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of water, and will not result in water quality less than that prescribed in the Basin Plan. The Central Valley Water Board must establish standards in its orders for discharges to high quality waters that result in the implementation of best practicable treatment or control of the discharge necessary to avoid pollution or nuisance and to maintain the highest water quality consistent with maximum benefit to the people of the state. Resolution 68-16 has been approved by the USEPA to be consistent with the federal anti-degradation policy.

2. Aquifer – A geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs (40 CFR Part 257.3-4).

3. Back flow prevention devices– Back flow prevention devices are installed at the well or pump to prevent contamination of groundwater or surface water when fertilizers, pesticides, fumigants, or other chemicals are applied through an irrigation system. Back flow prevention devices used to comply with this Order must be those approved by USEPA, DPR, DPH, or the local public health or water agency.[1]

4. Basin Plan – The Basin Plan is the Central Valley Regional Water Quality Control Plan for the Tulare Lake Basin. The Basin Plan describes how the quality of the surface and groundwater in the Central Valley Region should be managed to ensure reasonable protection of beneficial uses. The Basin Plan includes beneficial uses, water quality objectives, and a program of implementation.

5. Certified Nitrogen Management Specialist – Certified nitrogen management plan specialists include Professional Soil Scientists, Professional Agronomists, Crop Advisors[2] certified by the American Society of Agronomy, or Technical Service Providers certified in nutrient management

[1] California Department of Public Health, Approved Backflow Prevention Devices List at http://www.cdph.ca.gov/certlic/drinkingwater/pages/publications.aspx. Requirements for backflow prevention for pesticide application are located in 6 CCR §6610.

[2] Should the California Department of Food and Agriculture and the California Certified Crop Adviser's establish a specific nitrogen management certification, any Certified Crop Adviser who certifies a nitrogen management plan must have a nitrogen management certification.

in California by the National Resource Conservation Service (NRCS); or other specialist approved by the Executive Officer.

6. Degradation – Any measurable adverse change in water quality.

7. Durov Diagrams – A graphical representation of water quality. The Durov diagram is an alternative to the Piper diagram. The Durov diagram plots the major ions as percentages of milli-equivalents in two base triangles. The total cations and the total anions are set equal to 100% and the data points in the two triangles are projected onto a square grid which lies perpendicular to the third axis in each triangle. This plot reveals useful properties and relationships for large sample groups. The main purpose of the Durov diagram is to show clustering of data points to indicate samples that have similar compositions.

8. Exceedance – For the purposes of this Order, an exceedance is a reading using a field instrument or detection by a California state-certified analytical laboratory where the detected result indicates an impact to the beneficial use of the receiving water when compared to a water quality objective for the parameter or constituent. Exceedances will be determined based on available data and application of the appropriate averaging period. The appropriate averaging period may be defined in the Basin Plan, as part of the water quality criteria established by the USEPA, or as part of the water quality criteria being used to interpret a narrative water quality objective. If averaging periods are not defined as part of the water quality objective or the water quality criteria being used, then the Central Valley Water Board Executive Officer may use its best professional judgment to determine an appropriate period.

9. Farming Operation – A distinct farming business, organized as a sole proprietorship, partnership, corporation, limited liability company, cooperative, or other business entity that owns or operates irrigated lands.

10. Farm Operator – The person or entity, including, but not limited to a farm/ranch manager, lessee or sub-lessee, responsible for or otherwise directing farming operations in decisions that may result in a discharge of waste to surface water or groundwater. If a person or entity rents land to others or has land worked on shares by others, the person or entity is considered the operator only of the land which is retained for their own operation.

11. Fertigation – The process of applying fertilizer through an irrigation system by injecting the fertilizer into the irrigation water.

12. Groundwater – Water in the ground that is in the zone of saturation. The upper surface of the saturate zone is called the water table.

13. High vulnerability area (groundwater) – Areas identified in the approved Groundwater Quality Assessment Report "…where known groundwater quality impacts exist for which irrigated agricultural operations are a potential contributor or where conditions make groundwater more vulnerable to impacts from irrigated agricultural activities." (see section IV.A.3 of the MRP) or areas that meet any of the following requirements for the preparation of a Groundwater Quality Management Plan (see section VIII.I of the Order): (1) there is a confirmed exceedance[3] (considering applicable averaging periods) of a water quality objective or applicable water quality trigger limit (trigger limits are described in section VII of the MRP) in a groundwater well and

[3] A "confirmed exceedance of a water quality objective in a groundwater well" means that the monitoring data are determined to be of the appropriate quality and quantity necessary to verify that an exceedance has occurred.

irrigated agriculture may cause or contribute to the exceedance; (2) the Basin Plan requires development of a groundwater quality management plan for a constituent or constituents discharged by irrigated agriculture; or (3) the Executive Officer determines that irrigated agriculture may be causing or contributing to a trend of degradation of groundwater that may threaten applicable Basin Plan beneficial uses.

14. High vulnerability area (surface water) – Areas that meet any of the following requirements for the preparation of a Surface Water Quality Management Plan (see section VIII.I of the Order): (1) an applicable water quality objective or applicable water quality trigger limit is exceeded (considering applicable averaging periods) twice in a three year period for the same constituent at a monitoring location (trigger limits are described in section VII of the MRP) and irrigated agriculture may cause or contribute to the exceedances; (2) the Basin Plan requires development of a surface water quality management plan for a constituent or constituents discharged by irrigated agriculture; or (3) the Executive Officer determines that irrigated agriculture may be causing or contributing to a trend of degradation of surface water that may threaten applicable Basin Plan beneficial uses.

15. Hydraulic conductivity – The volume of water that will move through a medium (generally soil) in a unit of time under a unit hydraulic gradient through a unit area measured perpendicular to the direction of flow (a measure of a soils ability to transmit water).

16. Hydraulic gradient – The change in total hydraulic head per unit distance in a given direction yielding a maximum rate of decrease in hydraulic head.

17. Hydraulic Head - The height relative to a datum plane (generally sea level) of a column of water that can be supported by the hydraulic pressure at a given point in a groundwater system. For a well, the hydraulic head is equal to the distance between the water level in the well and the datum plane (sea level).

18. Impaired water body – A surface water body that is not attaining water quality standards and is identified on the State Water Board’s Clean Water Act section 303(d) list.

19. Irrigated lands – Land irrigated to produce crops or pasture for commercial purposes;[4] nurseries; and privately and publicly managed wetlands.

20. Irrigation return flow/runoff – Surface and subsurface water which leaves the field following application of irrigation water.

21. Kriging – A group of geostatistical techniques to interpolate the value of a random field (e.g., contaminant level in groundwater) at an unobserved location from observations of its value at nearby locations.

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[4] For the purposes of this Order, commercial irrigated lands are irrigated lands that have one or more of the following characteristics:

- The landowner or operator holds a current Operator Identification Number/ Permit Number for pesticide use reporting;
- The crop is sold to a third party including, but not limited to, (1) an industry cooperative, (2) harvest crew/company, or (3) a direct marketing location, such as farmers’ markets;
- The landowner or operator files federal taxes using federal Department of Treasury Internal Revenue Service Form 1040, Schedule F *Profit or Loss from Farming*.

22. Low vulnerability area (surface and groundwater) – are all areas not designated as high vulnerability for either surface or groundwater.

23. Management practices to protect water quality – A practice or combination of practices that is the most effective and practicable (including technological, economic, and institutional considerations) means of controlling nonpoint pollutant sources at levels protective of water quality.

24. Member – Owners and operators of irrigated lands within the Tulare Lake Basin Area that are members of a third-party group implementing this Order.

25. Monitoring – Monitoring undertaken in connection with assessing water quality conditions, and factors that may affect water quality conditions. Monitoring includes, but is not limited to, water quality monitoring undertaken in connection with agricultural activities, monitoring to identify short and long-term trends in water quality, nutrient monitoring, active inspections of operations, and management practice implementation and effectiveness monitoring. The purposes of monitoring include, but are not limited to, verifying the adequacy and effectiveness of the Order's requirements, and evaluating each Member's compliance with the requirements of the Order.

26. Nonpoint source waste discharge– The Tulare Lake Basin Plan states that "*A nonpoint source discharge usually refers to waste emanating from diffused locations.*" Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. The term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act. The Clean Water Act (CWA) defines a point source as a discernible, confined, and discrete conveyance, such as a pipe, ditch, or channel. Irrigated agricultural return flows and agricultural storm water runoff are excluded from the CWA's definition of point source. Nonpoint pollution sources generally are sources of water pollution that do not meet the definition of a point source as defined by the CWA.

27. Nuisance – "Nuisance" is defined in section 13050 of the Water Code as "…*anything which meets all of the following requirements:*

    (1) Is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.

    (2) Affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.

    (3) Occur during, or as a result of, the treatment or disposal of wastes."

28. Nutrient – Any element taken in by an organism which is essential to its growth and which is used by the organism in elaboration of its food and tissue.

29. Off-property discharge – The discharge or release of waste beyond the boundaries of the agricultural operation or to water bodies that run through the agricultural operation.

30. Nutrient consumption – A total quantity of a nutrient taken up by crop plants (to be distinguished from the total applied). Expressed as nutrient mass per land area, i.e., pounds/acre, nutrient consumption is typically described on an annual or crop cycle basis. Nutrients are contributed

and lost from cropland through various human and natural processes[5]. Considering nitrogen as an example, sources of nitrogen available for plant consumption include applied fertilizers (including compost and animal manures), nitrogen fixed from the atmosphere in the roots of leguminous plants, nitrogen released through the decomposition of soil organic matter and crop residues, and nitrogen applied in irrigation water. Nitrogen can be removed from the field in harvested material, returned to the soil through crop residue incorporation, incorporated into permanent structures of perennial crops, leached beyond the root zone in irrigation or storm water, released to the atmosphere through denitrification, volatilization or crop residue burning.

31. Perched groundwater – Groundwater separated from an underlying body of groundwater by an unsaturated zone.

32. Piper Diagram – A graphical representation of the chemistry of a water sample. The relative abundance of cations as percentages of milli-equivalents per liter (meq/L) of sodium, potassium, calcium, and magnesium are first plotted on the cation triangle. The relative abundance of chloride, sulfate, bicarbonate, and carbonate is then plotted on the anion triangle. The two data points on the cation and anion triangles are then combined into the quadrilateral field that shows the overall chemical property of the water sample.

33. Pollution – Defined in section 13050(l)(1) of the Porter-Cologne Water Quality Control Act as "…*an alteration of the quality of the waters of the state by waste to a degree which unreasonably affects either of the following: (A) The waters for beneficial uses. (B) Facilities which serve these beneficial uses*."

34. Qualified scientist – A person who has earned a professional degree in a scientific discipline that relates to engineering, environmental science, or chemistry with additional experience related to pesticides and water quality. This person should be familiar with the related local, state, and federal regulations.

35. Receiving waters – Surface water or groundwater that receives or has the potential to receive discharges of waste from irrigated lands.

36. Requirements of applicable water quality control plans – Water quality objectives, prohibitions, total maximum daily load implementation plans, or other requirements contained in water quality control plans adopted by the Central Valley Water Board and approved according to applicable law.

37. Small Farming Operation –Refers to Farming Operations that operate less than 60 total acres of irrigated land within the Tulare Lake Basin Area. A parcel is not part of a Small Farming Operation if the total acres of irrigated land within the Tulare Lake Basin Area managed by the Farming Operation and any of its Subsidiary or Affiliated Operations is 60 acres or greater.

38. Stiff Diagram - A graphical representation of the chemistry of a water sample. A polygon shaped figure created from four parallel horizontal axes using the equivalent charge concentrations (meq/L) of cations and anions. Cations are plotted on the left of the vertical zero axis and anions are plotted on the right.

39. Stormwater runoff – The runoff of precipitation from irrigated lands.

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[5] Descriptions of sources and losses of plant nutrients are available through UC Davis and UC Cooperative Extension. For example see Peacock, B. Pub. NG2-96, UCCE Tulare County http://cetulare.ucanr.edu/files/82026.pdf

40. Subsidiary or Affiliated Operation – a Subsidiary or Affiliated Operation of a specified Farming Operation means a Farming Operation of which the principal(s) of the specified Farming Operation or the shares possessed by the specified Farming Operation have a controlling interest. A controlling interest is having 50 percent or more of the voting or management authority of the operation.

41. Subsurface drainage – Water generated by installing and operating drainage systems to lower the water table below irrigated lands. Subsurface drainage systems, deep open drainage ditches, or drainage wells can generate this drainage.

42. Surface water – Water pooled or collected at or above ground level. Surface waters include, but are not limited to, natural streams, lakes, wetlands, creeks, constructed agricultural drains, agricultural dominated waterways, irrigation and flood control channels, or other non-stream tributaries. Surface waters include all waters of the United States and their tributaries, interstate waters and their tributaries, intrastate waters, and all impoundments of these waters. For the purposes of this Order, surface waters do not include water in agricultural fields.

43. Tailwater – The runoff of irrigation water from an irrigated field.

44. Total Maximum Daily Load (TMDL) - From the Code of Federal Regulations (CFR), 40 CFR 130.2(i), a TMDL is: "*The sum of the individual WLAs [wasteload allocations] for point sources and LAs [load allocations] for nonpoint sources and natural background. … TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. …*".

45. Toxicity – Refers to the toxic effect to aquatic organisms from waste contained in an ambient water quality sample.

46. Unsaturated Zone – The unsaturated zone is characterized by pore spaces that are incompletely filled with water. The amount of water present in an unsaturated zone varies widely and is highly sensitive to climatic factors.

47. Vadose Zone – See unsaturated zone.

48. Waste – Includes sewage and any and all other waste substances, liquid, solid, gaseous, or radioactive, associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation, including waste placed within containers of whatever nature prior to, and for purposes of, disposal as defined in California Water Code section 13050(d). Wastes from irrigated lands that conform to this definition include, but are not limited to, earthen materials (such as soil, silt, sand, clay, rock), inorganic materials (such as metals, salts, boron, selenium, potassium, nitrogen, phosphorus), organic materials such as pesticides, and biological materials, such as pathogenic organisms. Such wastes may directly impact beneficial uses (e.g., toxicity of metals to aquatic life) or may impact water temperature, pH, and dissolved oxygen.

49. Waste discharges from irrigated lands – The discharge or release of waste to surface water or groundwater. Waste discharges to surface water include, but are not limited to, irrigation return flows, tailwater, drainage water, subsurface (tile) drains, stormwater runoff flowing from irrigated lands, aerial drift, and overspraying of pesticides. Waste can be discharged to groundwater through pathways including, but not limited to, percolation of irrigation or storm water through the subsurface, backflow of waste into wells (e.g., backflow during chemigation), discharges into

unprotected wells and dry wells, and leaching of waste from tailwater ponds or sedimentation basins to groundwater.

A discharge of waste subject to the Order is one that could directly or indirectly reach waters of the state, which includes both surface waters and groundwaters. Direct discharges may include, for example, discharges directly from piping, tile drains, wells, ditches or sheet flow to waters of the state, or percolation of wastes through the soil to groundwater. Indirect discharges may include aerial drift or discharges from one parcel to another parcel and then to waters of the state. See also the definition for “waste”.

50. Waters of the State – Is defined in Water Code section 13050 as “*any surface water or groundwater, including saline waters, within the boundaries of the State*.”

51. Water Quality Criteria – Levels of water quality required under section 303(c) of the Clean Water Act that are expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes. The *California Toxics Rule* adopted by USEPA in April 2000 sets numeric water quality criteria for non-ocean surface waters of California for a number of toxic pollutants.

52. Water Quality Objectives – Defined in Water Code section 13050 as “*limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specified area.*” Water quality objectives may be either numerical or narrative and serve as water quality criteria for purposes of section 303 of the Clean Water Act.

53. Water quality problem – Exceedance of an applicable water quality objective or a trend of degradation that may threaten applicable Basin Plan beneficial uses.

54. Water Quality Standards – Provision of state or federal law that consist of the designated beneficial uses of a waterbody, the numeric and narrative water quality criteria that are necessary to protect the uses of that particular waterbody, and an antidegradation statement. Water quality standards include water quality objectives in the Central Valley Water Board’s two Basin Plans, water quality criteria in the California Toxics Rule and National Toxics Rule adopted by USEPA, and/or water quality objectives in other applicable State Water Board plans and policies. Under section 303 of the Clean Water Act, each state is required to adopt water quality standards.

Acronyms and Abbreviations

2012 Farm Bill	Food, Conservation, and Energy Act of 2012
Basin Plan	*Water Quality Control Plan for the Tulare Lake Basin*
BPAW	Basin Plan Amendment Workplan
BPTC	best practicable treatment or control
CAC	county agricultural commissioner
CCA	Certified Crop Adviser
CCR	California Code of Regulations
CDFA	California Department of Food and Agriculture
CEDEN	California Environmental Data Exchange Network
Central Valley Water Board	California Regional Water Quality Control Board, Central Valley Region
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
COC	constituent of concern
CRHR	California Register of Historic Resources
CTR	California Toxics Rule
CV RDC	Central Valley Regional Data Center
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWC	California Water Code
DO	dissolved oxygen
DPH	California Department of Public Health
DPM	diesel particulate matter
DPR	California Department of Pesticide Regulation
DWR	California Department of Water Resources
ECR	Existing Conditions Report
EDD	electronic data deliverable
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	federal Endangered Species Act
ESJ WQC	East San Joaquin Water Quality Coalition
FWQMP	farm water quality management plan
GAMA	Groundwater Ambient Monitoring and Assessment
GAR or GQAR	Groundwater Quality Assessment Report
GeoTracker ESI	GeoTracker Electronic Submittal of Information Online System
GIS	Geographic Information System
GMAW	Groundwater Monitoring Advisory Workgroup
GPS	Global Positioning System
GQMP	groundwater quality management plan
GWPA	Groundwater Protection Area
HAPs	hazardous air pollutants
ILRP	Irrigated Lands Regulatory Program
MCL	Maximum contaminant level

MDL	method detection limit
MLD	most likely descendant
MMRP	mitigation monitoring and reporting program
MPEP	Management Practice Evaluation Program
MPER	Management Plan Evaluation Report
MRP	monitoring and reporting program
MRPP	monitoring and reporting program plan
MWICR	Monitoring Well Installation Completion Report
MWISP	Monitoring Well Installation and Sampling Plan
NAD83	North American Datum 1983
NAHC	Native American Heritage Commission
NAVD88	North American Vertical Datum 1988
NMFS	National Marine Fisheries Service
NOA	notice of applicability
NOC	notice of certification
NOI	notice of intent
NOT	notice of termination
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NPS Policy	State Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTR	National Toxics Rule
PAMs	polyacrylamides
PCPA	Pesticide Contamination and Prevention Act
PEIR	Long-Term Irrigated Lands Regulatory Program Final Program EIR (Final and Draft) (Certified by Resolution R5-2011-0017)
PRC	California Public Resources Code
PUR	pesticide use report, CA DPR
QAPP	quality assurance project plan
QA/QC	quality assurance and quality control
RCD	Resource Conservation District
RL	reporting limit
RWD	report of waste discharge
SB	Senate Bill
SIP	*Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of CA* (State Implementation Plan)
SQMP	surface water quality management plan
State Water Board	State Water Resources Control Board
SWAMP	surface water ambient monitoring program
TAC	toxic air contaminant
TDS	total dissolved solids
TIE	toxicity identification evaluation

TMDL	total maximum daily load
TOC	total organic carbon
TRS	township, range, and section
TSS	total suspended solids
TST	test of significant toxicity (USEPA method)
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WDRs	waste discharge requirements

APPENDIX B

Literature Review: Water Quality Criteria

APPENDIX B

LITERATURE REVIEW: WATER QUALITY CRITERIA

The California Regional Water Quality Control Board (Regional Board) originally adopted the *Tulare Lake Basin Plan* in 1975, which established beneficial uses of surface water and groundwater and specified water quality criteria to protect those beneficial uses. Beneficial uses of groundwater are established in the *Tulare Lake Basin Plan* for Detail Analysis Units (DAUs): the WWQC are within the following DAUs; DAU 259 and DAU 246. The designated beneficial uses of groundwater in DAU 259 and DAU 246 are municipal and domestic supply (MUN), agricultural supply (AGR) and industrial service supply (IND).

As a component of the *Groundwater Assessment Report* for the Westside Water Quality Coalition (WWQC), Amec Foster Wheeler reviewed available references to define water quality criteria for the beneficial uses of MUN, AGR and IND. The review has been limited primarily to salts. However, groundwater in the area of the WWQC also contains naturally elevated concentrations of the metal arsenic; as such, arsenic has been included in this review.

1.0 MUNICIPAL AND DOMESTIC SUPPLY (MUN)

The Tulare Basin Plan provides numeric and narrative water quality criteria for MUN. The designated numeric water quality criteria for MUN are:

> At a minimum, waters designated MUN shall not contain concentrations of chemical constituents in excess of maximum contaminant levels (MCLs)…or Secondary Maximum Contaminant Levels (SMCLs)…

The narrative water quality criteria are described in the Tulare Basin Plan, as follows:

> Groundwaters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.

Following is a summary of the numeric criteria and published water quality criteria for MUN to address the narrative criteria.

The U. S. Environmental Protection Agency (EPA) and California Department of Public Health (CDPH) have established MCLs for a variety of constituents (Section 64444, Title 22, California Code of Regulations [CCR]), including arsenic:

Constituent	Maximum Contaminant Level
Arsenic (µg/L)	10

TDS is a measure of ionic salt concentration in water. EC is a related measure of salt conductance in water (typically EC in μmohs/cm = 1.5 x TDS in mg/L). The EPA has established an SMCL for TDS in drinking water:

Constituent	Secondary Maximum Contaminant Level
Total Dissolved Solids (mg/L)	500

The CDPH has established a range of SMCLs for TDS and EC in drinking water (Section 64449, Title 22, CCR):

	Secondary Maximum Contaminant Levels		
Constituent	**Recommended**	**Upper Level**	**Short-Term**
Total Dissolved Solids (mg/L)	500	1,000	1,500
Electrical Conductance (μmhos/cm)	900	1,600	2,200

The *Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals* (EPA, 2013) indicates that elevated TDS can cause aesthetic effects (bad taste and unpleasant odor), cosmetic effects (skin or tooth discoloration), and technical effects (staining of household fixtures, corrosion, and scaling deposits). TDS concentrations as high as sea water (35,000 mg/L TDS) are toxic to humans in drinking water (NOAA, 2013):

> While humans can safely ingest small amounts of salt, the salt content in seawater is much higher than what can be processed by the human body….to get rid of all the excess salt taken in by drinking seawater, you have to urinate more water than you drank. Eventually, you die of dehydration even as you become thirstier.

In 2003, the World Health Organization evaluated *Total Dissolved Solids in Drinking Water* (WHO, 2003) and concluded:

> No recent data on health effects associated with the ingestion of TDS in drinking-water appear to exist. In areas where the TDS content of the water supply is very high, the individual constituents should be identified and the local public health authorities consulted. No health-based guideline value is proposed for TDS.

Neither EPA nor CDPH have established an MCL of SMCL for the cations of calcium, magnesium, potassium and sodium. EPA has evaluated sodium in drinking water and calculated a health advisory (EPA, 2003):

Constituent	Drinking Water Health Advisory
Sodium (mg/L)	20

For persons on sodium-restricted diets, sodium concentrations greater than 120 mg/L could be problematic (i.e., could cause an increase in blood pressure) if sodium levels in

> water remained elevated for a significant period of time. EPA requires Public Water Systems that exceed 20 mg/L to notify local and State public health officials. The EPA guidance was developed for those individuals restricted to a total sodium intake of 500 mg/day and should not be extrapolated to the entire population.

Neither EPA nor CDPH have adopted an MCL or SMCL for the anions of bicarbonate and carbonate. The EPA has established SMCLs for chloride and sulfate in drinking water:

Constituent	Secondary Maximum Contaminant Level
Chloride (mg/L)	250
Sulfate (mg/L)	250

The EPA and CDPH have adopted a range of SMCLs for chloride and sulfate (Section 64449, Title 22, CCR):

	Secondary Maximum Contaminant Levels		
Constituent	Recommended	Upper Level	Short-Term
Chloride (mg/L)	250	500	600
Sulfate (mg/L)	250	500	600

The SMCLs for chloride are based on aesthetic effects (taste, odor, color, etc), rather than on chronic toxicity. More recently, the World Health Organization reevaluated chloride in drinking water (WHO, 2003). WHO found:

> Chloride toxicity has not been observed in humans except in the special case of impaired sodium chloride metabolism, e.g. in congestive heart failure. Healthy individuals can tolerate the intake of large quantities of chloride provided that there is a concomitant intake of fresh water.

The SMCLs for sulfate are also based on aesthetic effects. In 2003, the EPA reevaluated sulfate in drinking water (EPA 2003). EPA found:

> The available data demonstrate that sulfate induces a laxative effect following acute exposures to relatively high concentrations. The concentrations of sulfate that induced these effects varied, but all occurred at concentrations >500 mg/L. At this time, it is not possible to characterize a dose-response relationship for laxative effects due to short- or long-term exposure to sulfate. A panel of the Centers for Disease Control and Prevention (CDC) favored a health advisory for situations where sulfate levels in drinking water are greater than 500 mg/L.

Boron in water is usually considered a minor cation. Neither EPA nor CDPH have established an MCL or SMCL for boron. CDPH has identified Boron as an “unregulated chemical requiring monitoring” and established a notification level and a response level for boron in drinking water:

Constituent	Notification Level	Response Level
Boron (mg/L)	1	10

> The babies of some pregnant women who drink water containing boron in excess of the notification level may have an increased risk of developmental effects, based on studies in laboratory animals. (CDPH, 2013b)

EPA has reevaluated boron in drinking water (EPA, 2008). Based on that reevaluation, EPA established a health advisory for boron in drinking water:

Constituent	Drinking Water Health Advisory
Boron (mg/L)	5 - Adults 2 - Children

> Many studies have been conducted to elucidate the mechanism by which boron produces testicular lesions. Despite the number of studies that have been conducted, the mechanism of boron testicular toxicity remains unknown.

Based on the above tables we will assume that groundwater exceeding an EC of 1,600 μmhos/cm, a TDS concentration of 1,000 mg/L, a sodium concentration of 20 mg/L, a sulfate concentration of 500 mg/L, a magnesium concentration of 500 mg/L, or a boron concentration of 5 mg/L is not currently suitable for use as a source for MUN and would not be suitable in the future without expensive desalination treatment.

2.0 WATER QUALITY CRITERIA FOR AGRICULTURE (AGR)

The Basin Plan does not specify numeric water quality criteria for protection of AGR, and as such, the narrative water quality criteria would apply:

> Groundwaters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.

2.1 AGR-Irrigation

A variety of publications have evaluated water quality for agricultural uses, including irrigation and livestock/poultry uses (CDM Smith, 2012 and Kennedy/Jenks, 2013). For purposes of this evaluation, we will consider AGR primarily related to *Water Quality for Agriculture* (FAO, 1994). Elevated salinity in irrigation water can cause plant toxicity and reduce yield, as well as affecting soil structure and water infiltration. FAO developed water quality criteria separately for agricultural irrigation, stock watering, and poultry watering. For this review, Amec Foster Wheeler has summarized irrigation water quality guidelines published in *Water Quality for Agriculture*:

Constituent	Irrigation Problem	Restriction on Irrigation Use
Electrical Conductance	Salinity	<700 µmhos/cm – None >3,000 µmhos/cm – Severe
Total Dissolved Solids	Salinity	<450 mg/L – None >2,000 mg/L – Severe
Boron	Crop Sensitivity	<0.7 mg/L – None >3 mg/L – Severe >15 mg/L – Cotton/Asparagus
Arsenic	Toxicity	<100 µg/L – Recommended

FAO did not consider irrigation water quality for halophytes, plants that are highly salt tolerant. The WWQC has indicated that halophytes are not grown commercially in the area. Since halophytes are not commercially grown within the WWQC, water quality suitable for halophytes is not considered herein. Based on the above table, we assume that groundwater exceeding an EC of 3,000 µmhos/cm, a TDS concentration of 2,000 mg/L and/or a boron concentration of 15 mg/L is not currently suitable for use as AGR-Irrigation and would not be suitable in the future without substantial dilution with potable water.

2.2 AGR-Livestock

Livestock are reportedly less sensitive to elevated salinity than is irrigated agriculture. Water quality effects associated with salinity include a laxative effect, non-palatable water, diminished productivity, and potentially toxic effects from certain ions.

Kennedy/Jenks recently completed a literature review of salinity in stock water (2013). Noted was the wide range of upper salt concentrations recommended by state, US and international agencies. Kennedy/Jenks selected, from those references, salt concentrations that represent “no health effects” concentrations for the livestock and poultry, based on the published references:

Constituent	Restriction on Livestock and Poultry Use
Electrical Conductance	<3,800 µmhos/cm – Recommended >7,500 µmhos/cm – Potential Health Effects
Total Dissolved Solids	<2,500 mg/L – Recommended >5,000 mg/L – Potential Health Effects
Sodium	>2,000 mg/L – Potential Health Effects
Chloride	>1,500 mg/L – Potential Health Effects
Sulfate	>1,000 mg/L – Potential Health Effects (Diet Dependent)
Boron	>7 mg/L – Potential Health Effects

FAO (1994) looked at water quality restrictions from salts in salt for livestock and poultry, separately. Following are the FAO water quality criteria for livestock:

Constituent	Restriction on Livestock Use
Electrical Conductance	<5,000 µmhos/cm - Recommended 5,000 to 8,000 µmhos/cm – Satisfactory 8,000 to 16,000 µmhos/cm – Limited Use >16,000 µmhos/cm – Not Recommended
Magnesium	<250 mg/L – Recommended for Swine, Horses, Cows <400 mg/L – Beef Cattle <500 mg/L – Adult Sheep (dry feed)
Boron	<5 mg/L – Recommended
Arsenic	<200 µg/L – Recommended

> Livestock drinking water with an electrical conductivity (ECw) less than 5 dS/m (<5,000 µmhos/cm) should be satisfactory under almost any circumstances. This recognized that minor physiological upset might occur with water near this limit, but there was little chance that economic losses or serious physiological disturbances would occur. While all attempts should be made to stay within the criteria recommended above, there are situations where it will be necessary to use poorer quality water for short or long periods of time. (The above Table)…gives guidelines for those situations where poorer quality supplies must be used. These guidelines have a small margin of safety but their use probably does not eliminate all risk of economic loss.

The Agricultural Research Service also looked at *Livestock Water Quality* (USDA, 2013). USDA recommendations for livestock watering are:

Constituent	Restriction on Livestock Use
Total Dissolved Solids	<1,000 mg/L – Generally Safe 1,000 to 3,000 mg/L – Reduced Performance 3,000 to 5,000 mg/L – Performance & Health Slump >5,000 mg/L – Unsuitable
Sulfate	<500 mg/L – Safe 500 to 1,500 mg/L – Generally Safe 1,500 to 3,000 mg/L – Marginal 3,000 to 4,000 mg/L – Poor Quality <4,000 mg/L – Dangerous

> Water quality, especially sulfates, can affect animal gain and health. The primary symptom of high salinity water is diarrhea. (Above 3,000 mg/L sulfate)…Sporadic cases of polio are probable, especially in confined cattle.

Based on the above tables we will assume that groundwater exceeding an EC of 8,000 µmhos/cm, a TDS concentration of 5,000 mg/L, a sulfate concentration of 3,000 mg/L, a magnesium concentration of 500 mg/L, or a boron concentration of 5 mg/L is not currently suitable for use as AGR-Livestock and would not be suitable in the future without expensive desalination treatment or substantial dilution with potable water.

2.3 AGR-Poultry

Poultry have somewhat different water quality recommendations than for stock watering (FAO, 1994):

Constituent	Restriction on Poultry Use
Electrical Conductance	<5,000 µmhos/cm – Recommended >5,000 µmhos/cm – Unfit
Magnesium	<250 mg/L – Recommended for Poultry >400 mg/L – Unfit
Boron	<5 mg/L – Recommended
Arsenic	<200 µg/L - Recommended

Based on the above table we will assume that groundwater exceeding an EC of 5,000 µmhos/cm, a magnesium concentration of 400 mg/L or a boron concentration of 5 mg/L is not currently suitable for use as AGR-Poultry and would not be suitable in the future without expensive desalination treatment or substantial dilution with potable water.

Livestock and poultry can tolerate a much higher salinity water supply than can irrigated crops, at least in the short-term. However, for beneficial use designations in the Tulare Lake Basin Plan, crop irrigation, stock watering and poultry watering are bundled together under AGR beneficial use definition. Despite the water quality limitations for irrigation with groundwater within the WWQC, some of that groundwater would still be usable for limited livestock watering, in accordance with the FAO (1994) guidelines. Considering the disparity between the above water quality criteria for irrigation, livestock and poultry, the RWQCB should consider separately designating AGR water quality criteria for irrigation and for livestock/poultry watering.

3.0 WATER QUALITY CRITERIA FOR INDUSTRIAL SERVICE SUPPLY

The Tulare Basin Plan defines IND as follows:

> Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

IND uses of groundwater occur at mining operations, food processing operations, and at oil field operations within the WWQC. For food processing, imported surface water from the California

Aqueduct is used for water supply. Groundwater below the WWQC is or has been used for mining and oil field operations. However, the quality of the groundwater would not typically limit mining or oil field uses of water.

4.0 WATER QUALITY CRITERIA SUMMARY TABLE

Based on numeric and narrative water quality criteria of the Tulare Lake Basin Plan and the evaluation summarized above, AMEC has prepared the attached Table B-1 to summarize the potentially applicable numeric water quality criteria for groundwater below the WWQC.

5.0 REFERENCES

California Department of Public Health, 2013, Drinking Water Notification Levels and Response Levels: An Overview, http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Notificationlevels.pdf (CDPH, 2013).

California Regional Water Quality Control Board, 2004, Water Quality Control Plan for the Tulare Lake Basin, Second Edition, August 17 (Regional Board, 2004).

CDM Smith, 2012, Salinity Effects on Agricultural Irrigation Related Uses of Water, August 10, (CDM Smith, 2012).

Kennedy/Jenks Consultants, 2013, Salt and Nutrients: Literature Review for Stock Drinking Water Final Report, May 20 (Kennedy/Jenks, 2013).

National Oceanic and Atmospheric Administration, 2013, Can Humans Drink Sea Water, http://oceanservice.noaa.gov/facts/drinksw.html (NOAA, 2013).

Food and Agricultural Organization of the United Nations, 1994, Water Quality for Agriculture, FAO Irrigation and Drainage Paper, No. 29 (FAO, 1994).

U. S. Department of Agriculture, Agricultural Research Service, 2013, Livestock Water Quality (USDA, 2013).

U. S. Environmental Protection Agency, 2003, Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sulfate, February (EPA, 2003).

U. S. Environmental Protection Agency, 2003, Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sodium, February (EPA, 2003).

U. S. Environmental Protection Agency, 2003, Drinking Water Health Advisory For Boron, May (EPA, 2008).

U. S. Environmental Protection Agency, 2013, Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals, http://water.epa.gov/drink/contaminants/secondarystandards.cfm (EPA, 2013).

World Health Organization, 2003, Chloride in Drinking Water (WHO, 2003).

World Health Organization, 2003, Total Dissolved Solids in Drinking Water (WHO, 2003).

TABLE B-1

WATER QUALITY CRITERIA[1]

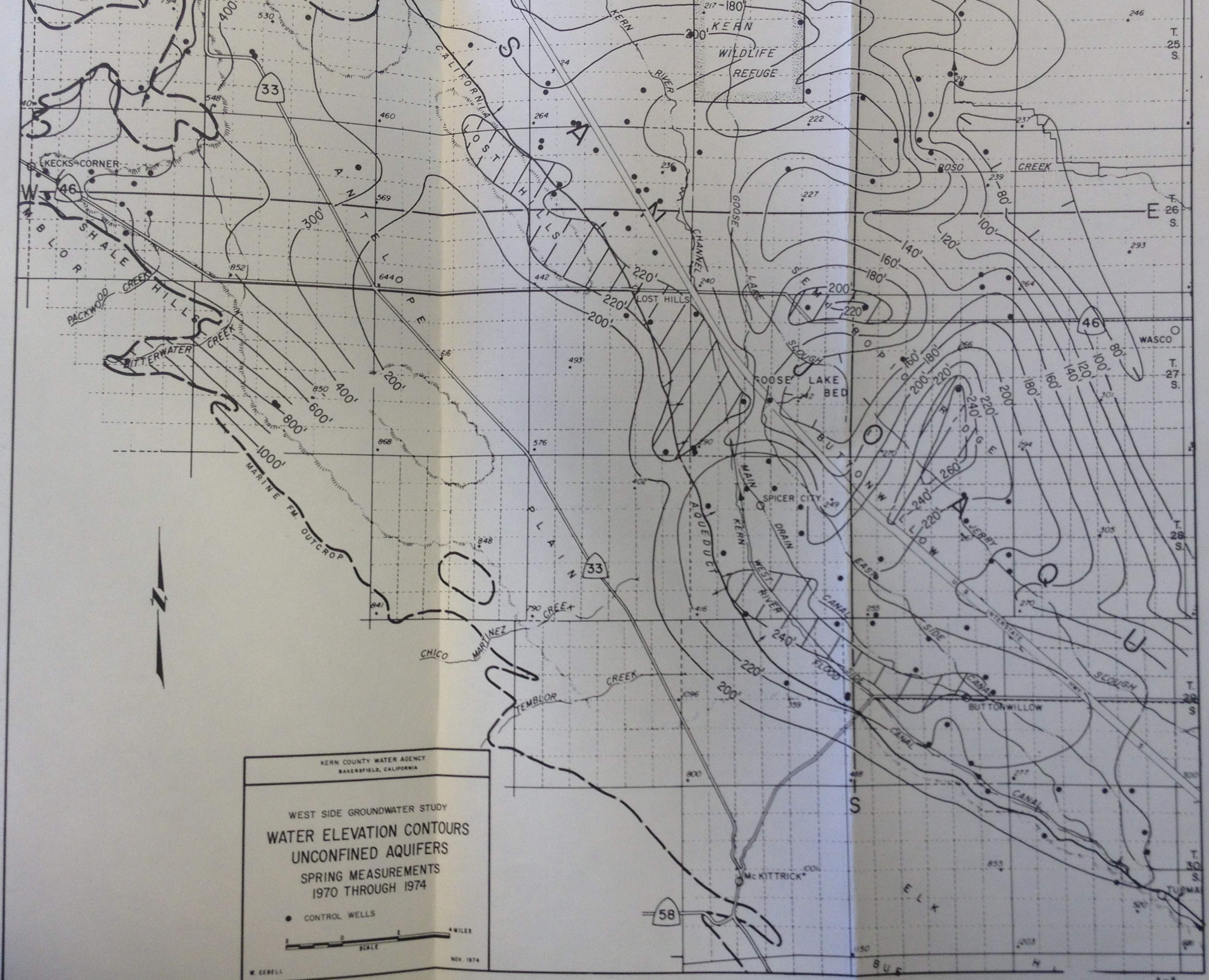
Westside Districts Groundwater Study
Westside Water Quality Coalition
Kern and Kings Counties, California

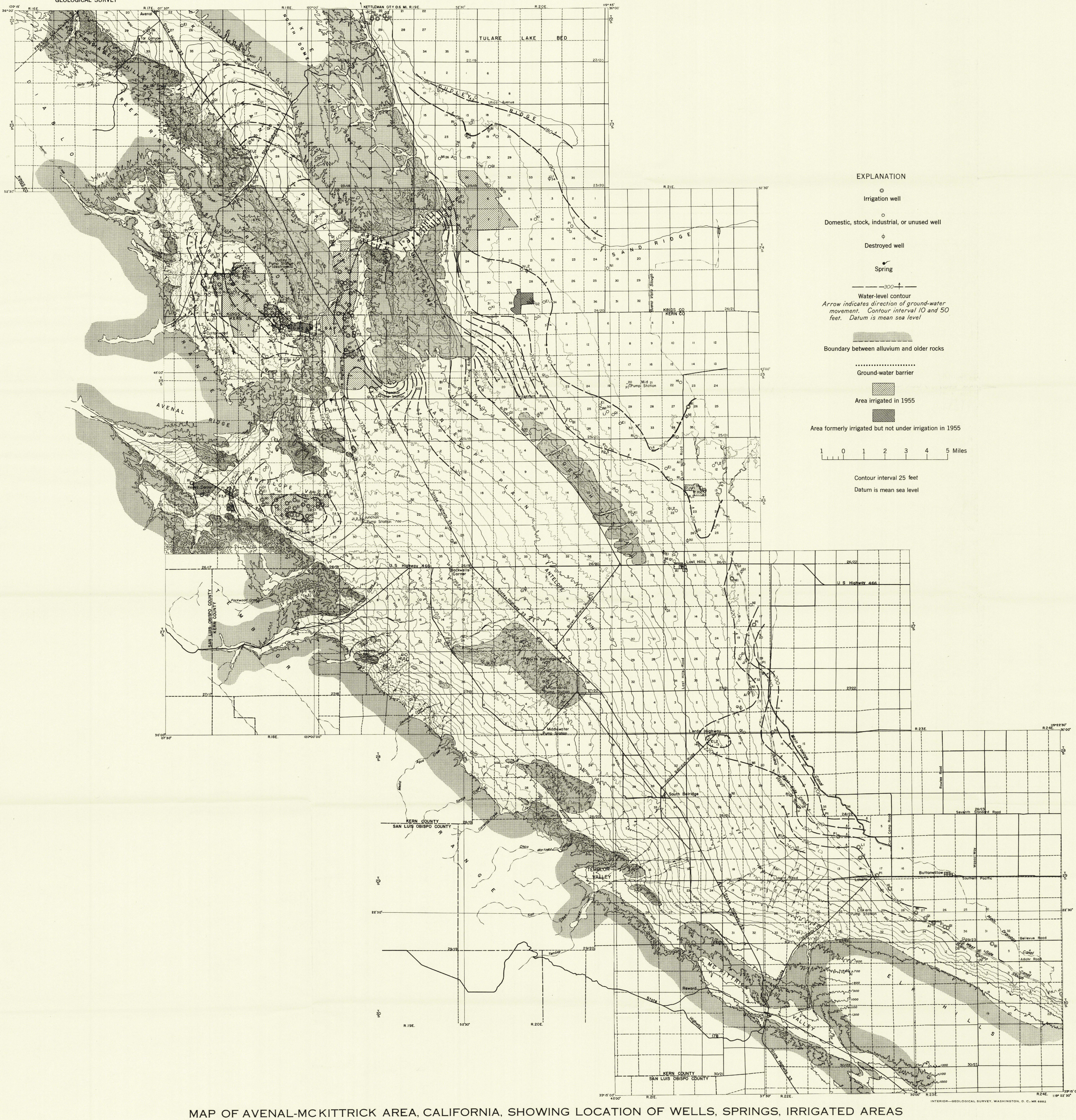
Constituent	Units	MUN[2]	AGR Irrigation[3]	AGR Livestock[3]	AGR Poultry[3]	IND[4]
Electrical Conductance	µmohs/cm	1,600	3,000	8,000	5,000	na
Total Dissolved Solids	mg/L	1,000	2,000	5,000	na	na
Arsenic	µg/L	10	100	200	200	na
Boron	mg/L	5	15	5	5	na
Chloride	mg/L	500	na	na	na	na
Magnesium	mg/L	na	500	500	400	na
Sodium	mg/L	20 [4]	na	na	na	na
Sulfate	mg/L	500	na	3,000	na	na

1. MUN - municipal supply, AGR - agricultural supply, IND - industrial service supply, mg/L - milligrams per liter, µmhos/cm - micromhos per centimeter, µg/L - micrograms per liter, na - not available or not applicable.
2. Secondary Maximum Contaminant Levels for electrical conductance, total dissolved solids, chloride and . sulfate (Section 64449, Title 22, CCR). Maximum Contaminant Level for arsenic (Section 64444, Title 22, CCR) Health Advisories for boron and sodium (EPA, 2003 and 2008).
3. *Water Quality for Agriculture* , FAO Paper 29 (NATO, 1994), except for AGR-Livestock TDS and sulfate from Livestock Water Quality (USDA, 2013).
4. "Uses of water for industrial activities that do not depend primarily on water quality..." (RWQCB, 2004).
5. "The EPA guidance was developed for those individuals restricted to a total sodium intake of 500 mg/day…" (EPA, 2003)

APPENDIX C

Historical Groundwater Maps


KERN COUNTY WATER AGENCY
BAKERSFIELD, CALIFORNIA
WEST SIDE GROUNDWATER STUDY
WATER ELEVATION CONTOURS
UNCONFINED AQUIFERS
SPRING MEASUREMENTS
1970 THROUGH 1974
CONTROL WELLS
SCALE
NOV. 1974
KERN WILDLIFE REFUGE
KERN RIVER
CALIFORNIA
LOST HILLS
ANTELOPE PLAIN
KECKS CORNER
SHALE HILLS
PACKWOOD CREEK
BITTERWATER CREEK
MARINE FM. OUTCROP
CHICO MARTINEZ CREEK
TEMBLOR CREEK
McKITTRICK
GOOSE LAKE CHANNEL
GOOSE LAKE SLOUGH
GOOSE LAKE BED
SEMITROPIC RIDGE
BUTTONWILLOW RIDGE
SPICER CITY
MAIN DRAIN
CALIFORNIA AQUEDUCT
KERN WEST RIVER FLOOD SIDE CANAL
EAST SIDE CANAL
JERRY SLOUGH
BUTTONWILLOW
POSO CREEK
WASCO
SAN JOAQUIN
ELK HILLS
TUPMAN
T. 25 S.
T. 26 S.
T. 27 S.
T. 28 S.
T. 29 S.
T. 30 S.
33
46
58



MAP OF AVENAL-MCKITTRICK AREA, CALIFORNIA, SHOWING LOCATION OF WELLS, SPRINGS, IRRIGATED AREAS AND WATER-LEVEL CONTOURS FOR THE AUTUMN OF 1955

APPENDIX D

Groundwater Analytical Results

BSK Associates
Engineers & Laboratories

A3E1723

06/04/2013

Invoice
A313017

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Dear Gary Kramer,

Thank you for selecting BSK Associates for your analytical testing needs. We have prepared this report in response to your request for analytical services. Enclosed are the results of analyses for samples received by the laboratory on 05/21/2013 17:00.

If additional clarification of any information is required, please contact your Client Services Representative, Renea Rangell at (800) 877-8310 or (559) 497-2888.

BSK ASSOCIATES

Renea Rangell

Renea Rangell
Client Services Manager

BSK Associates Engineers & Laboratories

06/04/2013

Case Narrative

Work Order Information

Client Name:	AMEC E&I	**Submitted by:**	Eric Escobar
Client Code:	AMECG2535	**Shipped by:**	Walk-In
Work Order:	A3E1723	**COC Number:**	
Project:	Westside Districts	**TAT:**	10
Client Project:	FR1216043A.0004	**PO #:**	C012202691

Sample Receipt Conditions

Cooler: **Default Cooler** **Temp. ºC:** 5.3

Containers Intact
COC/Labels Agree
Received On Wet Ice
Sample(s) arrived at lab on same day sampled.
Packing Material - Bubble Wrap
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Report Manager	Report Format
Gary Kramer	Final.rpt
Diana Babshoff	Final.rpt

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-01 **Client Project:** FR1216043A.0004
Sample Date: 05/21/2013 08:50 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-001

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**120**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**120**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1700**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**6500**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**43**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.38**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.76**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**74**		meq/L					
***Mass Balance-Dissolved Cations**		**73**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.25	mg/L	5	A305492	05/22/13 10:33	05/22/13 10:33	DL01
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 10:49	05/22/13 10:49	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 10:49	05/22/13 10:49	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 10:49	05/22/13 10:49	DL01
pH (1)	SM 4500-H+ B	**7.6**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**21.6**							
***Sodium Absorption Ratio**		**6.8**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**1100**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**4700**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305560	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**2.0**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**23**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**17**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**550**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**2100**	0.41	mg/L					

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-01
Sample Date: 05/21/2013 08:50
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-001

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**170**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.17**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**69**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**4.3**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**55**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**33**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**710**	2.0	mg/L	2	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**25.9**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.762**	±				
***MDA95**		**1.16**	pCi/L				

BSK Associates Engineers & Laboratories

Certificate of Analysis

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1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-02
Sample Date: 05/21/2013 09:02
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-002

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**83**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**83**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**790**	20	mg/L	20	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**3700**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**42**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.36**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.58**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**44**		meq/L					
***Mass Balance-Dissolved Cations**		**41**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	ND	4.4	mg/L	20	A305501	05/22/13 10:59	05/22/13 10:59	DL01
Nitrate as NO3	EPA 300.0	ND	20	mg/L	20	A305501	05/22/13 10:59	05/22/13 10:59	DL01
Nitrite as N	EPA 300.0	ND	1.0	mg/L	20	A305501	05/22/13 10:59	05/22/13 10:59	DL01
pH (1)	SM 4500-H+ B	**7.8**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**21.8**							
***Sodium Absorption Ratio**		**5.1**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**950**	40	mg/L	20	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**2700**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305560	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**3.1**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**16**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**9.1**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**310**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1200**	0.41	mg/L					

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-02 **Client Project:** FR1216043A.0004
Sample Date: 05/21/2013 09:02 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-002

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**100**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.16**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**68**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**2.4**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**20**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**34**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**400**	1.0	mg/L	1	A305601	05/24/13	05/29/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Vanadium - Dissolved (1)**	EPA 200.8	**29**	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**23.7**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.730**	±				
***MDA95**		**1.16**	pCi/L				

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-03
Sample Date: 05/21/2013 09:19
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-003

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**12**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**87**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**87**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**420**	10	mg/L	10	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**3000**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**51**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.38**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.46**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**36**		meq/L					
***Mass Balance-Dissolved Cations**		**34**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	ND	2.2	mg/L	10	A305501	05/22/13 11:08	05/22/13 11:08	DL01
Nitrate as NO3	EPA 300.0	ND	10	mg/L	10	A305501	05/22/13 11:08	05/22/13 11:08	DL01
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305501	05/22/13 11:08	05/22/13 11:08	DL01
pH (1)	SM 4500-H+ B	**7.8**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.3**							
***Sodium Absorption Ratio**		**6.0**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**1100**	40	mg/L	20	A305569	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**2300**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305560	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**22**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**11**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**6.7**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**220**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**820**	0.41	mg/L					

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Report Issue Date: 06/04/2013 16:49
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Received Time: 17:00

Lab Sample ID: A3E1723-03
Sample Date: 05/21/2013 09:19
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-003

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**68**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
*Manganese - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**110**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**2.3**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**10**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**45**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**400**	1.0	mg/L	1	A305601	05/24/13	05/29/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Vanadium - Dissolved (1)**	EPA 200.8	**21**	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**10.5**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.492**	±				
***MDA95**		**1.16**	pCi/L				

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Report Issue Date: 06/04/2013 16:49
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Lab Sample ID: A3E1723-04
Sample Date: 05/21/2013 09:50
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-004

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**92**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**92**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1100**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**4800**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**67**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.28**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.57**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**51**		meq/L					
***Mass Balance-Dissolved Cations**		**50**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 12:15	05/22/13 12:15	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 12:15	05/22/13 12:15	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 12:15	05/22/13 12:15	DL01
pH (1)	SM 4500-H+ B	**7.8**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.3**							
***Sodium Absorption Ratio**		**12**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**860**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**3200**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.2**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**27**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**60**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**6.5**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**280**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**810**	0.41	mg/L					

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Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-04
Sample Date: 05/21/2013 09:50
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-004

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**26**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.96**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**78**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**4.3**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**20**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**50**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**780**	2.0	mg/L	2	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**9.38**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.467**	±				
***MDA95**		**1.16**	pCi/L				

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Report Issue Date: 06/04/2013 16:49
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Lab Sample ID: A3E1723-05
Sample Date: 05/21/2013 10:35
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-005

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**180**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**180**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1900**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**6800**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**49**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.24**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**1.1**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**75**		meq/L					
***Mass Balance-Dissolved Cations**		**75**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.25	mg/L	5	A305492	05/22/13 10:33	05/22/13 10:33	DL01
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 12:24	05/22/13 12:24	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 12:24	05/22/13 12:24	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 12:24	05/22/13 12:24	DL01
pH (1)	SM 4500-H+ B	**7.7**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.1**							
***Sodium Absorption Ratio**		**8.4**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**800**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**5000**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.7**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**26**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**93**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**10**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**640**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1900**	0.41	mg/L					

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Report Issue Date: 06/04/2013 16:49
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Lab Sample ID: A3E1723-05
Sample Date: 05/21/2013 10:35
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-005

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Iron - Dissolved (1)**	EPA 200.7	**0.14**	0.030	mg/L	1	A305601	05/24/13	05/30/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**79**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**2.0**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**41**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**5.7**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**40**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**54**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**850**	10	mg/L	10	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**17.7**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.632**	±				
***MDA95**		**1.16**	pCi/L				

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Report Issue Date: 06/04/2013 16:49
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Lab Sample ID: A3E1723-06
Sample Date: 05/21/2013 11:03
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-006

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**160**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**160**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1600**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**6100**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**46**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.25**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**1.0**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**68**		meq/L					
***Mass Balance-Dissolved Cations**		**69**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.25	mg/L	5	A305492	05/22/13 10:33	05/22/13 10:33	DL01
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 12:34	05/22/13 12:34	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 12:34	05/22/13 12:34	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 12:34	05/22/13 12:34	DL01
pH (1)	SM 4500-H+ B	**7.7**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.4**							
***Sodium Absorption Ratio**		**7.4**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**880**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**4500**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.6**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**28**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**96**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**9.7**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**600**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1800**	0.41	mg/L					

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-06
Sample Date: 05/21/2013 11:03
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-006

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**85**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**1.9**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**47**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**5.3**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**37**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**59**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**730**	2.0	mg/L	2	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**12.7**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.539**	±				
***MDA95**		**1.16**	pCi/L				

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-07
Sample Date: 05/21/2013 11:33
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-007

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**12**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**58**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**58**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**870**	20	mg/L	20	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**3600**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**65**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.28**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.26**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**36**		meq/L					
***Mass Balance-Dissolved Cations**		**35**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	ND	4.4	mg/L	20	A305501	05/22/13 13:02	05/22/13 13:02	DL01
Nitrate as NO3	EPA 300.0	ND	20	mg/L	20	A305501	05/22/13 13:02	05/22/13 13:02	DL01
Nitrite as N	EPA 300.0	ND	1.0	mg/L	20	A305501	05/22/13 13:02	05/22/13 13:02	DL01
pH (1)	SM 4500-H+ B	**7.8**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.6**							
***Sodium Absorption Ratio**		**9.1**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**510**	40	mg/L	20	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**2200**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.0**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**32**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**52**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**4.3**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**210**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**600**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-07
Sample Date: 05/21/2013 11:33
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-007

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**17**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.51**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**44**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**3.8**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**16**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**51**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**510**	1.0	mg/L	1	A305601	05/24/13	05/29/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**4.42**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.330**	±				
***MDA95**		**1.16**	pCi/L				

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-08
Sample Date: 05/21/2013 11:57
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-008

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**12**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**58**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**58**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**620**	10	mg/L	10	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**2900**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**64**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.25**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.20**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**29**		meq/L					
***Mass Balance-Dissolved Cations**		**28**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	ND	2.2	mg/L	10	A305501	05/22/13 13:12	05/22/13 13:12	DL01
Nitrate as NO3	EPA 300.0	ND	10	mg/L	10	A305501	05/22/13 13:12	05/22/13 13:12	DL01
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305501	05/22/13 13:12	05/22/13 13:12	DL01
pH (1)	SM 4500-H+ B	**7.8**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.2**							
***Sodium Absorption Ratio**		**7.9**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**510**	20	mg/L	10	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**1800**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.3**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**33**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**45**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**3.8**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**180**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**510**	0.41	mg/L					

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Certificate of Analysis

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-08
Sample Date: 05/21/2013 11:57
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-008

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**14**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.48**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**22**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**3.8**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**13**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**51**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**410**	1.0	mg/L	1	A305601	05/24/13	05/29/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	**0.060**	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**6.62**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.397**	±				
***MDA95**		**1.16**	pCi/L				

Certificate of Analysis

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Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-09 **Client Project:** FR1216043A.0004
Sample Date: 05/21/2013 13:05 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-009

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**190**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**190**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**200**	5.0	mg/L	5	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**1800**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**50**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.68**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.65**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**20**		meq/L					
***Mass Balance-Dissolved Cations**		**19**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305492	05/22/13 10:33	05/22/13 10:33	
Nitrate as N	EPA 300.0	**16**	1.1	mg/L	5	A305501	05/22/13 13:21	05/22/13 13:21	
Nitrate as NO3	EPA 300.0	**69**	5.0	mg/L	5	A305501	05/22/13 13:21	05/22/13 13:21	
Nitrite as N	EPA 300.0	ND	0.25	mg/L	5	A305501	05/22/13 13:21	05/22/13 13:21	DL01
pH (1)	SM 4500-H+ B	**8.2**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.2**							
***Sodium Absorption Ratio**		**4.4**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**450**	10	mg/L	5	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**1300**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**17**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**1.6**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**59**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**470**	0.41	mg/L					

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Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-09
Sample Date: 05/21/2013 13:05
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-009

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**78**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
*Manganese - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**44**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	ND	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**28**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**39**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**220**	1.0	mg/L	1	A305601	05/24/13	05/29/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**2.76**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.269**	±				
***MDA95**		**1.16**	pCi/L				

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Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-10
Sample Date: 05/21/2013 13:57
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-010

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**310**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**310**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1200**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**5800**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**64**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.24**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**1.3**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**66**		meq/L					
***Mass Balance-Dissolved Cations**		**66**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 10:42	05/23/13 10:42	
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 11:56	05/22/13 11:56	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 11:56	05/22/13 11:56	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 11:56	05/22/13 11:56	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.1**							
***Sodium Absorption Ratio**		**12**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**1300**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**4000**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**6.0**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**23**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**3.3**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**400**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	**0.051**	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1200**	0.41	mg/L					

Certificate of Analysis

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-10
Sample Date: 05/21/2013 13:57
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-010

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**43**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**3.1**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**84**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**3.8**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**22**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**24**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**970**	10	mg/L	10	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**12.1**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.528**	±				
***MDA95**		**1.16**	pCi/L				

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Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-11
Sample Date: 05/21/2013 14:11
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-011

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A305808	05/30/13	05/30/13	
Alkalinity as CaCO3	SM 2320 B	**98**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Bicarbonate as CaCO3	SM 2320 B	**98**	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305482	05/21/13	05/21/13	
Chloride	EPA 300.0	**1400**	50	mg/L	50	A305501	05/22/13	05/22/13	
Conductivity @ 25C	SM 2510 B	**5100**	1.0	umhos/cm	1	A305482	05/21/13	05/21/13	
***Exchangeable Sodium Percentage**		**64**		%	1	A305947	06/04/13	06/04/13	
Fluoride	SM 4500-F C	**0.30**	0.10	mg/L	1	A305752	05/29/13	05/29/13	
Langelier Index	SM 2330 B	**0.77**				A305808	05/30/13	05/30/13	
***Mass Balance-Anions**		**52**		meq/L					
***Mass Balance-Dissolved Cations**		**52**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 10:42	05/23/13 10:42	
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305501	05/22/13 12:05	05/22/13 12:05	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305501	05/22/13 12:05	05/22/13 12:05	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305501	05/22/13 12:05	05/22/13 12:05	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305482	05/21/13	05/21/13	
pH Temperature in °C		**22.7**							
***Sodium Absorption Ratio**		**11**				A305879	06/03/13	06/03/13	
Sulfate as SO4	EPA 300.0	**470**	100	mg/L	50	A305501	05/22/13	05/22/13	
Total Dissolved Solids	SM 2540C	**3200**	5.0	mg/L	1	A305500	05/22/13	05/24/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.3**	1.0	mg/L	1	A305564	05/23/13	05/28/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Arsenic - Dissolved (1)	EPA 200.8	**10**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Barium - Dissolved (1)	EPA 200.8	**34**	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
***Boron - Dissolved (1)**	EPA 200.7	**0.80**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
Calcium - Dissolved (1)	EPA 200.7	**330**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	
Hardness as CaCO3, Dissolved	SM 2340B	**940**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/04/2013 16:49
Received Date: 05/21/2013
Received Time: 17:00

Lab Sample ID: A3E1723-11
Sample Date: 05/21/2013 14:11
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-011

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305601	05/24/13	05/29/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305601	05/24/13	05/30/13	
Magnesium - Dissolved (1)	EPA 200.7	**32**	0.10	mg/L	1	A305601	05/24/13	05/29/13	
***Manganese - Dissolved (1)**	EPA 200.7	**1.1**	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305601	05/24/13	05/30/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**19**	10	ug/L	1	A305601	05/24/13	05/30/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Potassium - Dissolved (1)	EPA 200.7	**2.9**	2.0	mg/L	1	A305601	05/24/13	05/29/13	
Selenium - Dissolved (1)	EPA 200.8	**29**	2.0	ug/L	1	A305601	05/24/13	05/30/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**23**	0.20	mg/L	1	A305601	05/24/13	05/29/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305601	05/24/13	05/29/13	
Sodium - Dissolved (1)	EPA 200.7	**770**	2.0	mg/L	2	A305601	05/24/13	05/30/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305601	05/24/13	05/30/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305601	05/24/13	05/30/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305601	05/24/13	05/29/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**22.6**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.713**	±				
***MDA95**		**1.16**	pCi/L				

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305482				Analyst: CEG		Prepared: 05/21/2013					
Blank (A305482-BLK1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	ND	3.0	mg/L							05/21/13	
Bicarbonate as CaCO3	ND	3.0	mg/L							05/21/13	
Carbonate as CaCO3	ND	3.0	mg/L							05/21/13	
Conductivity @ 25C	ND	1.0	umhos/cm							05/21/13	
Hydroxide as CaCO3	ND	3.0	mg/L							05/21/13	
Blank Spike (A305482-BS1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	100	3.0	mg/L	100		102	80-120			05/21/13	
Blank Spike Dup (A305482-BSD1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	100	3.0	mg/L	100		103	80-120	2	20	05/21/13	
Duplicate (A305482-DUP1) SM 2320 B - Quality Control						**Source: A3E1634-01**					
Alkalinity as CaCO3	130	3.0	mg/L		130			0	10	05/21/13	
Bicarbonate as CaCO3	130	3.0	mg/L		130			0	10	05/21/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/21/13	
Conductivity @ 25C	290	1.0	umhos/cm		290			0	20	05/21/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/21/13	
pH (1)	8.1		pH Units		8.1			0	20	05/21/13	
Duplicate (A305482-DUP2) SM 2320 B - Quality Control						**Source: A3E1633-02**					
Alkalinity as CaCO3	86	3.0	mg/L		84			2	10	05/21/13	
Bicarbonate as CaCO3	86	3.0	mg/L		84			2	10	05/21/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/21/13	
Conductivity @ 25C	500	1.0	umhos/cm		500			0	20	05/21/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/21/13	
pH (1)	8.1		pH Units		8.1			0	20	05/21/13	
Batch: A305492				Analyst: CCH		Prepared: 05/22/2013					
Blank (A305492-BLK1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	ND	0.050	mg/L							05/22/13	
Blank Spike (A305492-BS1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	1.0	0.050	mg/L	1.0		100	80-120			05/22/13	
Blank Spike Dup (A305492-BSD1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	0.98	0.050	mg/L	1.0		98	80-120	2	20	05/22/13	
Matrix Spike (A305492-MS1) SM 5540 C - Quality Control						**Source: A3E1634-01**					
MBAS, Calculated as LAS, mol wt 340	0.99	0.050	mg/L	1.0	ND	99	80-120			05/22/13	
Matrix Spike Dup (A305492-MSD1) SM 5540 C - Quality Control						**Source: A3E1634-01**					
MBAS, Calculated as LAS, mol wt 340	1.0	0.050	mg/L	1.0	ND	101	80-120	2	20	05/22/13	
Batch: A305500				Analyst: DEH		Prepared: 05/22/2013					
Blank (A305500-BLK1) SM 2540C - Quality Control											

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305500				Analyst: DEH		Prepared: 05/22/2013					
Blank (A305500-BLK1) SM 2540C - Quality Control											
Total Dissolved Solids	ND	5.0	mg/L							05/24/13	
Blank (A305500-BLK2) SM 2540C - Quality Control											
Total Dissolved Solids	ND	5.0	mg/L							05/24/13	
Duplicate (A305500-DUP1) SM 2540C - Quality Control						**Source: A3E1684-01**					
Total Dissolved Solids	360	5.0	mg/L		350			0	20	05/24/13	
Duplicate (A305500-DUP2) SM 2540C - Quality Control						**Source: A3E1723-09**					
Total Dissolved Solids	1300	5.0	mg/L		1300			0	20	05/24/13	
Batch: A305501				Analyst: AJT		Prepared: 05/22/2013					
Blank (A305501-BLK1) EPA 300.0 - Quality Control											
Chloride	ND	1.0	mg/L							05/22/13	
Nitrate as N	ND	0.22	mg/L							05/22/13	
Nitrate as NO3	ND	1.0	mg/L							05/22/13	
Nitrite as N	ND	0.050	mg/L							05/22/13	
Sulfate as SO4	ND	2.0	mg/L							05/22/13	B2.0
Blank Spike (A305501-BS1) EPA 300.0 - Quality Control											
Chloride	51	1.0	mg/L	50		101	90-110			05/22/13	
Nitrate as N	11	0.22	mg/L	11		100	90-110			05/22/13	
Nitrate as NO3	50	1.0	mg/L	50		101	90-110			05/22/13	
Nitrite as N	0.49	0.050	mg/L	0.50		99	90-110			05/22/13	
Sulfate as SO4	50	2.0	mg/L	50		101	90-110			05/22/13	
Blank Spike Dup (A305501-BSD1) EPA 300.0 - Quality Control											
Chloride	50	1.0	mg/L	50		101	90-110	0	20	05/22/13	
Nitrate as N	11	0.22	mg/L	11		100	90-110	0	20	05/22/13	
Nitrate as NO3	50	1.0	mg/L	50		100	90-110	0	20	05/22/13	
Nitrite as N	0.49	0.050	mg/L	0.50		98	90-110	1	20	05/22/13	
Sulfate as SO4	50	2.0	mg/L	50		100	90-110	0	20	05/22/13	
Matrix Spike (A305501-MS1) EPA 300.0 - Quality Control						**Source: A3E1661-12**					
Chloride	110	2.0	mg/L	100	11	101	80-120			05/22/13	
Nitrate as N	27	0.44	mg/L	23	4.7	101	80-120			05/22/13	
Nitrate as NO3	120	2.0	mg/L	100	21	101	80-120			05/22/13	
Nitrite as N	0.99	0.10	mg/L	1.0	ND	99	80-120			05/22/13	
Sulfate as SO4	110	4.0	mg/L	100	11	100	80-120			05/22/13	
Matrix Spike (A305501-MS2) EPA 300.0 - Quality Control						**Source: A3E1744-01**					
Chloride	140	2.0	mg/L	100	39	98	80-120			05/22/13	
Nitrate as N	22	0.44	mg/L	23	ND	99	80-120			05/22/13	
Nitrate as NO3	99	2.0	mg/L	100	ND	99	80-120			05/22/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	101	80-120			05/22/13	
Sulfate as SO4	130	4.0	mg/L	100	27	99	80-120			05/22/13	

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305501				Analyst: AJT		Prepared: 05/22/2013					
Matrix Spike Dup (A305501-MSD1)	**EPA 300.0 - Quality Control**					**Source: A3E1661-12**					
Chloride	110	2.0	mg/L	100	11	101	80-120	0	20	05/22/13	
Nitrate as N	27	0.44	mg/L	23	4.7	100	80-120	0	20	05/22/13	
Nitrate as NO3	120	2.0	mg/L	100	21	100	80-120	0	20	05/22/13	
Nitrite as N	0.99	0.10	mg/L	1.0	ND	99	80-120	0	20	05/22/13	
Sulfate as SO4	110	4.0	mg/L	100	11	100	80-120	0	20	05/22/13	
Matrix Spike Dup (A305501-MSD2)	**EPA 300.0 - Quality Control**					**Source: A3E1744-01**					
Chloride	140	2.0	mg/L	100	39	99	80-120	0	20	05/22/13	
Nitrate as N	22	0.44	mg/L	23	ND	99	80-120	1	20	05/22/13	
Nitrate as NO3	99	2.0	mg/L	100	ND	99	80-120	1	20	05/22/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	101	80-120	0	20	05/22/13	
Sulfate as SO4	130	4.0	mg/L	100	27	100	80-120	1	20	05/22/13	
Batch: A305551				Analyst: CCH		Prepared: 05/23/2013					
Blank (A305551-BLK1)	**SM 5540 C - Quality Control**										
MBAS, Calculated as LAS, mol wt 340	ND	0.050	mg/L							05/23/13	
Blank Spike (A305551-BS1)	**SM 5540 C - Quality Control**										
MBAS, Calculated as LAS, mol wt 340	0.95	0.050	mg/L	1.0		95	80-120			05/23/13	
Blank Spike Dup (A305551-BSD1)	**SM 5540 C - Quality Control**										
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0		96	80-120	1	20	05/23/13	
Matrix Spike (A305551-MS1)	**SM 5540 C - Quality Control**					**Source: A3E1823-02**					
MBAS, Calculated as LAS, mol wt 340	0.92	0.050	mg/L	1.0	ND	92	80-120			05/23/13	
Matrix Spike (A305551-MS2)	**SM 5540 C - Quality Control**					**Source: A3E1848-01**					
MBAS, Calculated as LAS, mol wt 340	0.97	0.050	mg/L	1.0	ND	97	80-120			05/23/13	
Matrix Spike Dup (A305551-MSD1)	**SM 5540 C - Quality Control**					**Source: A3E1823-02**					
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0	ND	96	80-120	5	20	05/23/13	
Matrix Spike Dup (A305551-MSD2)	**SM 5540 C - Quality Control**					**Source: A3E1848-01**					
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0	ND	96	80-120	1	20	05/23/13	
Batch: A305560				Analyst: LJL		Prepared: 05/23/2013					
Blank (A305560-BLK2)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	ND	1.0	mg/L							05/28/13	
Blank Spike (A305560-BS2)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	9.9	1.0	mg/L	10		99	90-110			05/28/13	
Blank Spike Dup (A305560-BSD2)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	9.3	1.0	mg/L	10		93	90-110	6	10	05/28/13	
Matrix Spike (A305560-MS2)	**EPA 351.2 - Quality Control**					**Source: A3E1723-03**					

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305560				Analyst: LJL		Prepared: 05/23/2013					
Matrix Spike (A305560-MS2) EPA 351.2 - Quality Control						**Source: A3E1723-03**					
Total Kjeldahl Nitrogen	9.7	1.0	mg/L	10	ND	97	90-110			05/28/13	
Matrix Spike Dup (A305560-MSD2) EPA 351.2 - Quality Control						**Source: A3E1723-03**					
Total Kjeldahl Nitrogen	9.9	1.0	mg/L	10	ND	99	90-110	2	10	05/28/13	
Batch: A305564				Analyst: LJL		Prepared: 05/23/2013					
Blank (A305564-BLK1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	ND	1.0	mg/L							05/28/13	
Blank Spike (A305564-BS1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	9.5	1.0	mg/L	10		95	90-110			05/28/13	
Blank Spike Dup (A305564-BSD1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	9.5	1.0	mg/L	10		95	90-110	1	10	05/28/13	
Matrix Spike (A305564-MS1) EPA 351.2 - Quality Control						**Source: A3E1723-11**					
Total Kjeldahl Nitrogen	11	1.0	mg/L	10	1.3	94	90-110			05/28/13	
Matrix Spike Dup (A305564-MSD1) EPA 351.2 - Quality Control						**Source: A3E1723-11**					
Total Kjeldahl Nitrogen	11	1.0	mg/L	10	1.3	98	90-110	4	10	05/28/13	
Batch: A305569				Analyst: AJT		Prepared: 05/23/2013					
Blank (A305569-BLK1) EPA 300.0 - Quality Control											
Sulfate as SO4	ND	2.0	mg/L							05/23/13	
Blank Spike (A305569-BS1) EPA 300.0 - Quality Control											
Sulfate as SO4	51	2.0	mg/L	50		102	90-110			05/23/13	
Blank Spike Dup (A305569-BSD1) EPA 300.0 - Quality Control											
Sulfate as SO4	51	2.0	mg/L	50		102	90-110	0	20	05/23/13	
Matrix Spike (A305569-MS1) EPA 300.0 - Quality Control						**Source: A3E1879-01**					
Sulfate as SO4	100	4.0	mg/L	100	ND	101	80-120			05/23/13	
Matrix Spike (A305569-MS2) EPA 300.0 - Quality Control						**Source: A3E1885-03**					
Sulfate as SO4	100	4.0	mg/L	100	ND	101	80-120			05/23/13	
Matrix Spike Dup (A305569-MSD1) EPA 300.0 - Quality Control						**Source: A3E1879-01**					
Sulfate as SO4	100	4.0	mg/L	100	ND	102	80-120	1	20	05/23/13	
Matrix Spike Dup (A305569-MSD2) EPA 300.0 - Quality Control						**Source: A3E1885-03**					
Sulfate as SO4	100	4.0	mg/L	100	ND	102	80-120	0	20	05/23/13	
Batch: A305752				Analyst: CCH		Prepared: 05/29/2013					
Blank (A305752-BLK1) SM 4500-F C - Quality Control											

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305752				Analyst: CCH		Prepared: 05/29/2013					
Blank (A305752-BLK1) SM 4500-F C - Quality Control											
Fluoride	ND	0.10	mg/L							05/29/13	
Blank Spike (A305752-BS1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		101	90-110			05/29/13	
Blank Spike Dup (A305752-BSD1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		101	90-110	0	20	05/29/13	
Matrix Spike (A305752-MS1) SM 4500-F C - Quality Control						**Source: A3E1723-03**					
Fluoride	1.4	0.10	mg/L	1.0	0.38	101	80-120			05/29/13	
Matrix Spike (A305752-MS2) SM 4500-F C - Quality Control						**Source: A3E1737-01**					
Fluoride	1.2	0.10	mg/L	1.0	0.15	103	80-120			05/29/13	
Matrix Spike Dup (A305752-MSD1) SM 4500-F C - Quality Control						**Source: A3E1723-03**					
Fluoride	1.4	0.10	mg/L	1.0	0.38	102	80-120	1	20	05/29/13	
Matrix Spike Dup (A305752-MSD2) SM 4500-F C - Quality Control						**Source: A3E1737-01**					
Fluoride	1.2	0.10	mg/L	1.0	0.15	104	80-120	1	20	05/29/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305601				Analyst: NRE		Prepared: 05/24/2013					
Blank (A305601-BLK2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	ND	0.050	mg/L							05/29/13	
Boron - Dissolved (1)	ND	0.10	mg/L							05/29/13	
Calcium - Dissolved (1)	ND	0.10	mg/L							05/29/13	
Copper - Dissolved (1)	ND	0.050	mg/L							05/29/13	
Iron - Dissolved (1)	0.031	0.030	mg/L							05/29/13	B2.1
Magnesium - Dissolved (1)	ND	0.10	mg/L							05/29/13	
Manganese - Dissolved (1)	ND	0.010	mg/L							05/29/13	
Potassium - Dissolved (1)	ND	2.0	mg/L							05/29/13	
Silica (SiO2) - Dissolved (1)	ND	0.20	mg/L							05/29/13	
Silver - Dissolved (1)	ND	0.010	mg/L							05/29/13	
Sodium - Dissolved (1)	ND	1.0	mg/L							05/29/13	
Zinc - Dissolved (1)	ND	0.050	mg/L							05/29/13	
Blank (A305601-BLK3)	**EPA 200.7 - Quality Control**										
Iron - Dissolved (1)	ND	0.030	mg/L							05/30/13	
Blank Spike (A305601-BS2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20		92	85-115			05/29/13	
Boron - Dissolved (1)	0.59	0.10	mg/L	0.60		98	85-115			05/29/13	
Calcium - Dissolved (1)	9.7	0.10	mg/L	10		97	85-115			05/29/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20		98	85-115			05/29/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0		96	85-115			05/29/13	
Magnesium - Dissolved (1)	9.5	0.10	mg/L	10		95	85-115			05/29/13	
Manganese - Dissolved (1)	0.19	0.010	mg/L	0.20		96	85-115			05/29/13	
Potassium - Dissolved (1)	9.6	2.0	mg/L	10		96	85-115			05/29/13	
Silica (SiO2) - Dissolved (1)	2.2	0.20	mg/L	2.1		101	85-115			05/29/13	
Silver - Dissolved (1)	0.092	0.010	mg/L	0.10		92	85-115			05/29/13	
Sodium - Dissolved (1)	9.8	1.0	mg/L	10		98	85-115			05/29/13	
Zinc - Dissolved (1)	0.19	0.050	mg/L	0.20		96	85-115			05/29/13	
Blank Spike (A305601-BS3)	**EPA 200.7 - Quality Control**										
Iron - Dissolved (1)	2.0	0.030	mg/L	2.0		100	85-115			05/30/13	
Blank Spike Dup (A305601-BSD2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20		90	85-115	2	20	05/29/13	
Boron - Dissolved (1)	0.59	0.10	mg/L	0.60		98	85-115	0	20	05/29/13	
Calcium - Dissolved (1)	9.6	0.10	mg/L	10		96	85-115	1	20	05/29/13	
Copper - Dissolved (1)	0.19	0.050	mg/L	0.20		97	85-115	1	20	05/29/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0		96	85-115	0	20	05/29/13	
Magnesium - Dissolved (1)	9.5	0.10	mg/L	10		95	85-115	0	20	05/29/13	
Manganese - Dissolved (1)	0.19	0.010	mg/L	0.20		97	85-115	0	20	05/29/13	
Potassium - Dissolved (1)	9.6	2.0	mg/L	10		96	85-115	0	20	05/29/13	
Silica (SiO2) - Dissolved (1)	2.2	0.20	mg/L	2.1		101	85-115	1	20	05/29/13	
Silver - Dissolved (1)	0.092	0.010	mg/L	0.10		92	85-115	0	20	05/29/13	
Sodium - Dissolved (1)	9.8	1.0	mg/L	10		98	85-115	0	20	05/29/13	
Zinc - Dissolved (1)	0.19	0.050	mg/L	0.20		96	85-115	0	20	05/29/13	
Blank Spike Dup (A305601-BSD3)	**EPA 200.7 - Quality Control**										

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
Batch: A305601				Analyst: NRE		Prepared: 05/24/2013						
Blank Spike Dup (A305601-BSD3)	**EPA 200.7 - Quality Control**											
Iron - Dissolved (1)	2.0	0.030	mg/L	2.0		100	85-115	0	20	05/30/13		
Matrix Spike (A305601-MS3)	**EPA 200.7 - Quality Control**					**Source: A3E1723-01**						
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20	ND	90	70-130			05/29/13		
Boron - Dissolved (1)	18	0.10	mg/L	0.60	17	155	70-130			05/29/13	MS01	***High***
Calcium - Dissolved (1)	570	0.10	mg/L	10	550	211	70-130			05/29/13	MS01	***High***
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	102	70-130			05/29/13		
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	95	70-130			05/29/13		
Magnesium - Dissolved (1)	190	0.10	mg/L	10	170	128	70-130			05/29/13		
Manganese - Dissolved (1)	0.36	0.010	mg/L	0.20	0.17	96	70-130			05/29/13		
Potassium - Dissolved (1)	15	2.0	mg/L	10	4.3	104	70-130			05/29/13		
Silica (SiO2) - Dissolved (1)	36	0.20	mg/L	2.1	33	125	70-130			05/29/13		
Silver - Dissolved (1)	0.092	0.010	mg/L	0.10	ND	92	70-130			05/29/13		
Zinc - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	84	70-130			05/29/13		
Matrix Spike (A305601-MS4)	**EPA 200.7 - Quality Control**					**Source: A3E1723-06**						
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	94	70-130			05/29/13		
Boron - Dissolved (1)	10	0.10	mg/L	0.60	9.7	128	70-130			05/29/13		
Calcium - Dissolved (1)	600	0.10	mg/L	10	600	57	70-130			05/29/13	MS02	***Low***
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	101	70-130			05/29/13		
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	97	70-130			05/29/13		
Magnesium - Dissolved (1)	95	0.10	mg/L	10	85	105	70-130			05/29/13		
Manganese - Dissolved (1)	2.1	0.010	mg/L	0.20	1.9	96	70-130			05/29/13		
Potassium - Dissolved (1)	16	2.0	mg/L	10	5.3	103	70-130			05/29/13		
Silica (SiO2) - Dissolved (1)	61	0.20	mg/L	2.1	59	118	70-130			05/29/13		
Silver - Dissolved (1)	0.091	0.010	mg/L	0.10	ND	91	70-130			05/29/13		
Zinc - Dissolved (1)	0.18	0.050	mg/L	0.20	ND	88	70-130			05/29/13		
Matrix Spike Dup (A305601-MSD3)	**EPA 200.7 - Quality Control**					**Source: A3E1723-01**						
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20	ND	89	70-130	0	20	05/29/13		
Boron - Dissolved (1)	17	0.10	mg/L	0.60	17	104	70-130	2	20	05/29/13		
Calcium - Dissolved (1)	560	0.10	mg/L	10	550	149	70-130	1	20	05/29/13	MS01	***High***
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	100	70-130	2	20	05/29/13		
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	93	70-130	2	20	05/29/13		
Magnesium - Dissolved (1)	180	0.10	mg/L	10	170	93	70-130	2	20	05/29/13		
Manganese - Dissolved (1)	0.35	0.010	mg/L	0.20	0.17	93	70-130	2	20	05/29/13		
Potassium - Dissolved (1)	14	2.0	mg/L	10	4.3	101	70-130	2	20	05/29/13		
Silica (SiO2) - Dissolved (1)	35	0.20	mg/L	2.1	33	100	70-130	2	20	05/29/13		
Silver - Dissolved (1)	0.090	0.010	mg/L	0.10	ND	90	70-130	3	20	05/29/13		
Zinc - Dissolved (1)	0.16	0.050	mg/L	0.20	ND	82	70-130	2	20	05/29/13		
Matrix Spike Dup (A305601-MSD4)	**EPA 200.7 - Quality Control**					**Source: A3E1723-06**						
Aluminum - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	87	70-130	8	20	05/29/13		
Boron - Dissolved (1)	10	0.10	mg/L	0.60	9.7	95	70-130	2	20	05/29/13		
Calcium - Dissolved (1)	600	0.10	mg/L	10	600	46	70-130	0	20	05/29/13	MS02	***Low***
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	100	70-130	1	20	05/29/13		
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	94	70-130	3	20	05/29/13		
Magnesium - Dissolved (1)	94	0.10	mg/L	10	85	90	70-130	2	20	05/29/13		

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305601				Analyst: NRE		Prepared: 05/24/2013					
Matrix Spike Dup (A305601-MSD4)	**EPA 200.7 - Quality Control**					**Source: A3E1723-06**					
Manganese - Dissolved (1)	2.1	0.010	mg/L	0.20	1.9	78	70-130	2	20	05/29/13	
Potassium - Dissolved (1)	15	2.0	mg/L	10	5.3	101	70-130	2	20	05/29/13	
Silica (SiO2) - Dissolved (1)	60	0.20	mg/L	2.1	59	70	70-130	2	20	05/29/13	
Silver - Dissolved (1)	0.088	0.010	mg/L	0.10	ND	88	70-130	3	20	05/29/13	
Zinc - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	87	70-130	1	20	05/29/13	
Blank (A305601-BLK1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	ND	2.0	ug/L							05/30/13	
Arsenic - Dissolved (1)	ND	2.0	ug/L							05/30/13	
Barium - Dissolved (1)	ND	5.0	ug/L							05/30/13	
Beryllium - Dissolved (1)	ND	1.0	ug/L							05/30/13	
Cadmium - Dissolved (1)	ND	1.0	ug/L							05/30/13	
Chromium - Dissolved (1)	ND	10	ug/L							05/30/13	
Lead - Dissolved (1)	ND	5.0	ug/L							05/30/13	
Mercury - Dissolved (1)	ND	0.20	ug/L							05/30/13	
Molybdenum - Dissolved (1)	ND	10	ug/L							05/30/13	
Nickel - Dissolved (1)	ND	10	ug/L							05/30/13	
Selenium - Dissolved (1)	ND	2.0	ug/L							05/30/13	
Thallium - Dissolved (1)	ND	1.0	ug/L							05/30/13	
Vanadium - Dissolved (1)	ND	10	ug/L							05/30/13	
Blank Spike (A305601-BS1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	220	2.0	ug/L	200		108	85-115			05/30/13	
Arsenic - Dissolved (1)	190	2.0	ug/L	200		95	85-115			05/30/13	
Barium - Dissolved (1)	200	5.0	ug/L	200		98	85-115			05/30/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200		98	85-115			05/30/13	
Cadmium - Dissolved (1)	190	1.0	ug/L	200		95	85-115			05/30/13	
Chromium - Dissolved (1)	200	10	ug/L	200		100	85-115			05/30/13	
Lead - Dissolved (1)	190	5.0	ug/L	200		95	85-115			05/30/13	
Mercury - Dissolved (1)	4.6	0.20	ug/L	5.0		93	85-115			05/30/13	
Molybdenum - Dissolved (1)	200	10	ug/L	200		100	85-115			05/30/13	
Nickel - Dissolved (1)	190	10	ug/L	200		97	85-115			05/30/13	
Selenium - Dissolved (1)	180	2.0	ug/L	200		88	85-115			05/30/13	
Thallium - Dissolved (1)	180	1.0	ug/L	200		92	85-115			05/30/13	
Vanadium - Dissolved (1)	210	10	ug/L	200		104	85-115			05/30/13	
Blank Spike Dup (A305601-BSD1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	220	2.0	ug/L	200		109	85-115	1	20	05/30/13	
Arsenic - Dissolved (1)	200	2.0	ug/L	200		98	85-115	3	20	05/30/13	
Barium - Dissolved (1)	200	5.0	ug/L	200		99	85-115	1	20	05/30/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200		101	85-115	3	20	05/30/13	
Cadmium - Dissolved (1)	190	1.0	ug/L	200		96	85-115	1	20	05/30/13	
Chromium - Dissolved (1)	200	10	ug/L	200		102	85-115	2	20	05/30/13	
Lead - Dissolved (1)	200	5.0	ug/L	200		98	85-115	3	20	05/30/13	
Mercury - Dissolved (1)	4.9	0.20	ug/L	5.0		98	85-115	5	20	05/30/13	
Molybdenum - Dissolved (1)	210	10	ug/L	200		104	85-115	3	20	05/30/13	
Nickel - Dissolved (1)	200	10	ug/L	200		100	85-115	3	20	05/30/13	
Selenium - Dissolved (1)	180	2.0	ug/L	200		91	85-115	3	20	05/30/13	

BSK Associates Engineers & Laboratories

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305601				Analyst: MAS		Prepared: 05/24/2013					
Blank Spike Dup (A305601-BSD1)	**EPA 200.8 - Quality Control**										
Thallium - Dissolved (1)	190	1.0	ug/L	200		96	85-115	4	20	05/30/13	
Vanadium - Dissolved (1)	220	10	ug/L	200		108	85-115	4	20	05/30/13	
Matrix Spike (A305601-MS1)	**EPA 200.8 - Quality Control**					**Source: A3E1723-01**					
Antimony - Dissolved (1)	220	2.0	ug/L	200	ND	108	70-130			05/30/13	
Arsenic - Dissolved (1)	210	2.0	ug/L	200	2.0	104	70-130			05/30/13	
Barium - Dissolved (1)	210	5.0	ug/L	200	23	96	70-130			05/30/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200	ND	100	70-130			05/30/13	
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	87	70-130			05/30/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	106	70-130			05/30/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	90	70-130			05/30/13	
Mercury - Dissolved (1)	4.6	0.20	ug/L	5.0	ND	89	70-130			05/30/13	
Molybdenum - Dissolved (1)	290	10	ug/L	200	69	111	70-130			05/30/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	94	70-130			05/30/13	
Selenium - Dissolved (1)	260	2.0	ug/L	200	55	103	70-130			05/30/13	
Thallium - Dissolved (1)	170	1.0	ug/L	200	ND	87	70-130			05/30/13	
Vanadium - Dissolved (1)	240	10	ug/L	200	ND	122	70-130			05/30/13	
Matrix Spike (A305601-MS2)	**EPA 200.8 - Quality Control**					**Source: A3E1723-06**					
Antimony - Dissolved (1)	210	2.0	ug/L	200	ND	105	70-130			05/30/13	
Arsenic - Dissolved (1)	240	2.0	ug/L	200	28	105	70-130			05/30/13	
Barium - Dissolved (1)	280	5.0	ug/L	200	96	92	70-130			05/30/13	
Beryllium - Dissolved (1)	210	1.0	ug/L	200	ND	107	70-130			05/30/13	
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	84	70-130			05/30/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	106	70-130			05/30/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	88	70-130			05/30/13	
Mercury - Dissolved (1)	4.4	0.20	ug/L	5.0	ND	88	70-130			05/30/13	
Molybdenum - Dissolved (1)	270	10	ug/L	200	47	111	70-130			05/30/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	93	70-130			05/30/13	
Selenium - Dissolved (1)	240	2.0	ug/L	200	37	101	70-130			05/30/13	
Thallium - Dissolved (1)	170	1.0	ug/L	200	ND	86	70-130			05/30/13	
Vanadium - Dissolved (1)	240	10	ug/L	200	ND	118	70-130			05/30/13	
Matrix Spike Dup (A305601-MSD1)	**EPA 200.8 - Quality Control**					**Source: A3E1723-01**					
Antimony - Dissolved (1)	210	2.0	ug/L	200	ND	107	70-130	1	20	05/30/13	
Arsenic - Dissolved (1)	210	2.0	ug/L	200	2.0	105	70-130	0	20	05/30/13	
Barium - Dissolved (1)	210	5.0	ug/L	200	23	94	70-130	1	20	05/30/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200	ND	101	70-130	1	20	05/30/13	
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	85	70-130	2	20	05/30/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	106	70-130	0	20	05/30/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	90	70-130	0	20	05/30/13	
Mercury - Dissolved (1)	4.7	0.20	ug/L	5.0	ND	91	70-130	2	20	05/30/13	
Molybdenum - Dissolved (1)	290	10	ug/L	200	69	112	70-130	1	20	05/30/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	94	70-130	0	20	05/30/13	
Selenium - Dissolved (1)	260	2.0	ug/L	200	55	102	70-130	1	20	05/30/13	
Thallium - Dissolved (1)	170	1.0	ug/L	200	ND	86	70-130	1	20	05/30/13	
Vanadium - Dissolved (1)	240	10	ug/L	200	ND	121	70-130	1	20	05/30/13	

BSK Associates Engineers & Laboratories

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual

Batch: A305601 Analyst: MAS Prepared: 05/24/2013

Matrix Spike Dup (A305601-MSD2) **EPA 200.8 - Quality Control** **Source: A3E1723-06**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Antimony - Dissolved (1)	210	2.0	ug/L	200	ND	106	70-130	1	20	05/30/13	
Arsenic - Dissolved (1)	240	2.0	ug/L	200	28	106	70-130	0	20	05/30/13	
Barium - Dissolved (1)	280	5.0	ug/L	200	96	95	70-130	2	20	05/30/13	
Beryllium - Dissolved (1)	220	1.0	ug/L	200	ND	108	70-130	1	20	05/30/13	
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	84	70-130	0	20	05/30/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	106	70-130	0	20	05/30/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	89	70-130	1	20	05/30/13	
Mercury - Dissolved (1)	4.3	0.20	ug/L	5.0	ND	87	70-130	1	20	05/30/13	
Molybdenum - Dissolved (1)	270	10	ug/L	200	47	111	70-130	0	20	05/30/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	95	70-130	2	20	05/30/13	
Selenium - Dissolved (1)	240	2.0	ug/L	200	37	101	70-130	0	20	05/30/13	
Thallium - Dissolved (1)	170	1.0	ug/L	200	ND	87	70-130	1	20	05/30/13	
Vanadium - Dissolved (1)	240	10	ug/L	200	ND	118	70-130	0	20	05/30/13	

BSK Associates Engineers & Laboratories

Radiological Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305555				Analyst: KKC		Prepared: 05/23/2013					
Blank (A305555-BLK1) EPA 00-02 - Quality Control											
1.65 Sigma Uncertainty	ND		±							05/24/13	
Gross Alpha	ND	3	pCi/L							05/24/13	
MDA95	ND	0.00	pCi/L							05/24/13	
Blank Spike (A305555-BS1) EPA 00-02 - Quality Control											
Gross Alpha	32.0	3	pCi/L	30		107	80-120			05/24/13	
Blank Spike Dup (A305555-BSD1) EPA 00-02 - Quality Control											
Gross Alpha	32.3	3	pCi/L	30		108	80-120	1	50	05/24/13	
Matrix Spike (A305555-MS1) EPA 00-02 - Quality Control						**Source: A3E1634-01**					
Gross Alpha	89.4	3	pCi/L	120	ND	74	70-130			05/24/13	
Matrix Spike (A305555-MS2) EPA 00-02 - Quality Control						**Source: A3E1825-01**					
Gross Alpha	119	3	pCi/L	120	16.0	86	70-130			05/24/13	
Matrix Spike Dup (A305555-MSD1) EPA 00-02 - Quality Control						**Source: A3E1634-01**					
Gross Alpha	99.3	3	pCi/L	120	ND	82	70-130	11	50	05/24/13	
Matrix Spike Dup (A305555-MSD2) EPA 00-02 - Quality Control						**Source: A3E1825-01**					
Gross Alpha	100	3	pCi/L	120	16.0	70	70-130	17	50	05/24/13	

BSK Associates Engineers & Laboratories

Certificate of Analysis

06/04/2013

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
- Sample(s) received, prepared, and analyzed within the method specified criteria unless otherwise noted within this report.
- The results relate only to the samples analyzed in accordance with test(s) requested by the client on the Chain of Custody document. Any analytical quality control exceptions to method criteria that are to be considered when evaluating these results have been flagged and are defined in the data qualifiers section.
- All results are expressed on wet weight basis unless otherwise specified.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Results contained in this analytical report must be reproduced in its entirety.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- BSK Analytical Laboratories certifies that the test results contained in this report meet all requirements of the NELAC Standards for applicable certified drinking water chemistry analyses unless qualified or noted in the Case Narrative.
- Analytical data contained in this report may be used for regulatory purposes to meet the requirements of the Federal or State drinking water, wastewater, and hazardous waste programs.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- * - This is not a NELAP accredited analyte.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing for each certificattion.**

State of California - ELAP	1180	State of Nevada	CA000792009A
State of California - ELAP (Rancho Cordova)	2435	State of Hawaii	04227CA
State of California - NELAP	04227CA	State of Oregon	4017
State of Washington	C997	State of Oregon - NWTPH	4021

Definitions and Flags for Data Qualifiers

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected at RL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	Picocuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable				

MS02 Matrix spike recovery was low; the associated blank spike recovery was acceptable.

MS01 Matrix spike recovery was high; the associated blank spike recovery was acceptable.

DL01	Sample required dilution due to matrix or high concentration of non-target analyte.
B2.1	Analyte detected in associated method blank below the reporting limit. No material impact on reported result as sample is ND for this parameter.
B2.0	Analyte present in the method blank above the method detection limit (MDL). Laboratory does not determine batch acceptance on detections below the reporting limit (RL).

A3E1723

AMEC E&I

AMECG253

05212013

Turnaround: Standard

Due Date: 06/05/2013

CHAIN-OF-CUSTODY RECORD

1,4,5,3

FRE 15983

PROJECT NAME: Westside Water District			DATE: 5/21/13 PAGE 1 OF 1
PROJECT NUMBER: FR1216043A.0004	LABORATORY NAME: BSK	CLIENT INFORMATION: AMEC	REPORTING REQUIREMENTS: AMEC Geomatrix EDD Deliverable
RESULTS TO: Gary Kramer	LABORATORY ADDRESS: 1414 Stanislaw St	1281 E Alluvial	A3E1723 AMECG2535 05/21/2013 10
TURNAROUND TIME: Standard	Fresno, CA	Fresno CA 937	
SAMPLE SHIPMENT METHOD: In Person	LABORATORY CONTACT: Renee Rangell		NO
	LABORATORY PHONE NUMBER: 559-497-2888		

SAMPLERS (SIGNATURE): Eric Escobar

ANALYSES

DATE	TIME	SAMPLE NUMBER	EPA 300.0	EPA 200.7	EPA 200.8	SM2510B	SM2540C	SM2320B	SM2340B	EPA 331.2	EPA 00--02	SM4500-H+B	Sodium adsorption ratio Exchangables Sodium percentage Total Cations Total anions Cation, Anion Balance Langelier Sat. Index	CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Preservative Type	Cooled	MS/MSD	No. of Containers	ADDITIONAL COMMENTS
5/21/13	0850	W-001	X	X	X	X	X	X	X	X	X	X	X	2x1L, 1x250mL	W	N		Y		3	Lab filtered
5/21/13	0902	W-002												//	W	N		Y		3	//
5/21/13	0919	W-003												//	W	N		Y		3	//
5/21/13	0950	W-004												//	W	N		Y		3	//
5/21/13	1035	W-005												//	W	N		Y		3	//
5/21/13	1103	W-006												//	W	N		Y		3	//
5/21/13	1133	W-007												//	W	N		Y		3	//
5/21/13	1157	W-008												//	W	N		Y		3	//
5/21/13	1305	W-009												//	W	N		Y		3	//
5/21/13	1357	W-010												//	W	N		Y		3	//
5/21/13	1411	W-011	X	X	X	X	X	X	X	X	X	X	X	//	W	N		Y		3	Lab filtered

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE: Eric Escobar	5/21/13	1700	SIGNATURE: [signature]	5/21/13	1700
PRINTED NAME: Eric Escobar			PRINTED NAME: BSK		
COMPANY: AMEC			COMPANY:		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		

TOTAL NUMBER OF CONTAINERS: 33

SAMPLING COMMENTS: If any questions contact Gary Kramer at 264-2535. Lab filter samples for dissolved metals
- Bill AMEC for Sample analysis
- Results to Gary Kramer
- AMEC Geomatrix EDD deliverable
- High EC may be present EC range 1000-10000 umhos/cm

WET, BC

1281 East Alluvial Ave., Suite 101
Fresno, California 93720-2659
Tel 559.264.2535 Fax 559.264.7431

amec

A3E1723
AMECG2535

05/21/2013
10

Sample Integrity 5.21.13

BSK Bottles: Yes No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 10°C	Yes No NA	Were correct containers and preservatives received for the tests requested?	Yes No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No NA	Were there bubbles in the VOA vials? (Volatiles Only)	Yes No NA
Did all bottles arrive unbroken and intact?	Yes No	Was a sufficient amount of sample received?	Yes No
Did all bottle labels agree with COC?	Yes No	Do samples have a hold time <72 hours?	Yes No
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No NA	Was PM notified of discrepancies? PM: By/Time:	Yes No NA

Bottles Received "—" means preservation/chlorine checks are either N/A or are performed in the lab

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	1-11						
Bacti $Na_2S_2O_3$	—	—							
None (P) White Cap	—	—	1C						
Cr6 Buffer (P) Blue Cap	pH 9-9.5	Y N							
HNO_3 (P) Red Cap	—	—	1C						
H_2SO_4 (P) Yellow Cap	pH ≤ 2	Y N	1A			JMD			
NaOH (P) Green Cap	Cl, pH ≥12	Y N							
NaOH + ZnAc (P)	pH ≥ 9	Y N							
Dissolved Oxygen 300ml (g)	—	—							
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—							
H_2SO_4 (AG) Yellow Label O&G, Diesel	—	—				5.21.13			
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—							
$Na_2S_2O_3$ (AG) Blue Label 547, 515, 525, 548	—	—							
$Na_2S_2O_3$ (AG) Blue Label THMs 524.2 or 524.3	—	—							
$Na_2S_2O_3$ (CG) Blue Label 504, 505	—	—							
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH = 3	Y N							
NH_4Cl (AG) Purple Label 552	—	—							
EDA (AG) Brown Label DBPs	—	—							
Ascorbic + Maleic (AG) Lt Green Label 524.3	—	—							
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—							
Buffer pH 4 (CG)	—	—							
None (CG)	—	—							
H_3PO_4 (CG) Salmon Label	—	—							
Other:									
Asbestos 1Liter Plastic w/ Foil	—	—							
Low Level Hg / Metals Double Baggie	—	—							
Bottled Water	—	—							
Clear Glass Jar: 250 / 500 / 1 Liter	—	—							
Soil Tube Brass / Steel / Plastic	—	—							
Tedlar Bag / Plastic Bag	—	—							

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

Labeled by: JMD @ 1744 Labels checked by: JMD @ 17:45 RUSH Paged by:_______ @_______

BSK Associates Engineers & Laboratories

A3E1843

06/06/2013

Invoice

A313288

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Dear Gary Kramer,

Thank you for selecting BSK Associates for your analytical testing needs. We have prepared this report in response to your request for analytical services. Enclosed are the results of analyses for samples received by the laboratory on 05/22/2013 17:15.

If additional clarification of any information is required, please contact your Client Services Representative, Renea Rangell at (800) 877-8310 or (559) 497-2888.

BSK ASSOCIATES

Renea Rangell

Renea Rangell
Client Services Manager

BSK Associates Engineers & Laboratories

06/06/2013

Case Narrative

Work Order Information

Client Name:	AMEC E&I	**Submitted by:**	Eric Escobar
Client Code:	AMECG2535	**Shipped by:**	Walk-In
Work Order:	A3E1843	**COC Number:**	
Project:	Westside Districts	**TAT:**	10
Client Project:	FR1216043A.0004	**PO #:**	C012202691

Sample Receipt Conditions

Cooler: **Default Cooler** **Temp. ºC:** 4.3

Containers Intact
COC/Labels Agree
Preservation Confirmed
Received On Wet Ice
Sample(s) arrived at lab on same day sampled.
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Cooler: **New Cooler** **Temp. ºC:** 0.0

Containers Intact
COC/Labels Agree
Preservation Confirmed
Received On Wet Ice
Sample(s) arrived at lab on same day sampled.
Packing Material - Other
Sample(s) were received in temperature range.
Initial receipt at BSK-FAL

Report Manager	Report Format
Gary Kramer	Final.rpt
Diana Babshoff	Final.rpt

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-01
Sample Date: 05/22/2013 10:22
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-012

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**670**	30	mg/L	10	A305561	05/23/13	05/23/13	
Bicarbonate as CaCO3	SM 2320 B	**670**	30	mg/L	10	A305561	05/23/13	05/23/13	
Carbonate as CaCO3	SM 2320 B	ND	30	mg/L	10	A305561	05/23/13	05/23/13	
Hydroxide as CaCO3	SM 2320 B	ND	30	mg/L	10	A305561	05/23/13	05/23/13	
Chloride	EPA 300.0	**7800**	200	mg/L	200	A305569	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**21000**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**60**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.13**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**1.2**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**280**		meq/L					
***Mass Balance-Dissolved Cations**		**260**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	**0.76**	0.10	mg/L	2	A305551	05/23/13 10:42	05/23/13 10:42	
Nitrate as N	EPA 300.0	ND	44	mg/L	200	A305569	05/23/13 15:57	05/23/13 15:57	DL01
Nitrate as NO3	EPA 300.0	ND	200	mg/L	200	A305569	05/23/13 15:57	05/23/13 15:57	DL01
Nitrite as N	EPA 300.0	ND	10	mg/L	200	A305569	05/23/13 15:57	05/23/13 15:57	DL01
pH (1)	SM 4500-H+ B	**7.0**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.4**							
***Sodium Absorption Ratio**		**22**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**2200**	400	mg/L	200	A305569	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**18000**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.6**	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	4.0	ug/L	2	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**36**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	2	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**45**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**1300**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**5100**	0.41	mg/L					

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-01 **Client Project:** FR1216043A.0004
Sample Date: 05/22/2013 10:22 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-012

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**5100**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**460**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**1.1**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	**0.42**	0.20	ug/L	1	A305603	05/24/13	06/04/13	
*Molybdenum - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**14**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**210**	4.0	ug/L	2	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**43**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**3600**	100	mg/L	100	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**479**	pCi/L	A305837	05/31/13	06/03/13	
***1.65 Sigma Uncertainty**		**1.03**	±				
***MDA95**		**1.25**	pCi/L				

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-02
Sample Date: 05/22/2013 10:25
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-013

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**620**	30	mg/L	10	A305561	05/23/13	05/23/13	
Bicarbonate as CaCO3	SM 2320 B	**620**	30	mg/L	10	A305561	05/23/13	05/23/13	
Carbonate as CaCO3	SM 2320 B	ND	30	mg/L	10	A305561	05/23/13	05/23/13	
Hydroxide as CaCO3	SM 2320 B	ND	30	mg/L	10	A305561	05/23/13	05/23/13	
Chloride	EPA 300.0	**7600**	200	mg/L	200	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**21000**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**57**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.13**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**1.1**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**270**		meq/L					
***Mass Balance-Dissolved Cations**		**260**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	**0.83**	0.10	mg/L	2	A305551	05/23/13 10:42	05/23/13 10:42	
Nitrate as N	EPA 300.0	ND	44	mg/L	200	A305565	05/23/13 14:31	05/23/13 14:31	DL01
Nitrate as NO3	EPA 300.0	ND	200	mg/L	200	A305565	05/23/13 14:31	05/23/13 14:31	DL01
Nitrite as N	EPA 300.0	ND	10	mg/L	200	A305565	05/23/13 14:31	05/23/13 14:31	DL01
pH (1)	SM 4500-H+ B	**6.9**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.7**							
***Sodium Absorption Ratio**		**20**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**2100**	400	mg/L	200	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**18000**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.7**	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	4.0	ug/L	2	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**41**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	2	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**47**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**1400**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**5600**	0.41	mg/L					

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-02
Sample Date: 05/22/2013 10:25
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-013

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**5600**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**510**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**1.2**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	**0.44**	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**22**	20	ug/L	2	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**15**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**250**	4.0	ug/L	2	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**46**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**3500**	100	mg/L	100	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	20	ug/L	2	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**447**	pCi/L	A305837	05/31/13	06/03/13	
***1.65 Sigma Uncertainty**		**0.991**	±				
***MDA95**		**1.25**	pCi/L				

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-03
Sample Date: 05/22/2013 11:45
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-014

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**11**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**37**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**37**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**3100**	100	mg/L	100	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**9600**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**73**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	ND	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**-0.71**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**110**		meq/L					
***Mass Balance-Dissolved Cations**		**100**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	1.2	mg/L	25	A305551	05/23/13 10:42	05/23/13 10:42	DL01
Nitrate as N	EPA 300.0	ND	22	mg/L	100	A305565	05/23/13 14:12	05/23/13 14:12	DL01
Nitrate as NO3	EPA 300.0	ND	100	mg/L	100	A305565	05/23/13 14:12	05/23/13 14:12	DL01
Nitrite as N	EPA 300.0	ND	5.0	mg/L	100	A305565	05/23/13 14:12	05/23/13 14:12	DL01
pH (1)	SM 4500-H+ B	**6.8**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.4**							
***Sodium Absorption Ratio**		**20**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**1000**	200	mg/L	100	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**6800**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**4.4**	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**23**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**32**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**390**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1400**	0.41	mg/L					

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-03
Sample Date: 05/22/2013 11:45
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-014

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**1400**	0.41	mg/L					
***Iron - Dissolved (1)**	EPA 200.7	**15**	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**90**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**4.1**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
*Molybdenum - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**6.9**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**95**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**1.7**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**1700**	20	mg/L	20	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**6.62**	pCi/L	A305555	05/23/13	05/24/13	
***1.65 Sigma Uncertainty**		**0.397**	±				
***MDA95**		**1.16**	pCi/L				

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Gary Kramer
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1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-04
Sample Date: 05/22/2013 12:45
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-015

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**220**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**220**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**310**	20	mg/L	20	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**3200**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**52**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.25**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.79**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**39**		meq/L					
***Mass Balance-Dissolved Cations**		**38**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 10:42	05/23/13 10:42	
Nitrate as N	EPA 300.0	**6.0**	4.4	mg/L	20	A305565	05/23/13 14:22	05/23/13 14:22	
Nitrate as NO3	EPA 300.0	**26**	20	mg/L	20	A305565	05/23/13 14:22	05/23/13 14:22	
Nitrite as N	EPA 300.0	ND	1.0	mg/L	20	A305565	05/23/13 14:22	05/23/13 14:22	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.7**							
***Sodium Absorption Ratio**		**6.5**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**1200**	40	mg/L	20	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**2600**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	**5.2**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**12**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**2.8**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**150**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**890**	0.41	mg/L					

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Certificate of Analysis

Gary Kramer
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1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-04
Sample Date: 05/22/2013 12:45
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-015

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**890**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**130**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.19**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**69**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**12**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**34**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**65**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**450**	1.0	mg/L	1	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Vanadium - Dissolved (1)**	EPA 200.8	**18**	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**29.3**	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.830**	±				
***MDA95**		**2.01**	pCi/L				

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-05
Sample Date: 05/22/2013 13:10
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-016

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**220**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**220**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**220**	10	mg/L	10	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**2400**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**54**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.47**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.68**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**28**		meq/L					
***Mass Balance-Dissolved Cations**		**28**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 14:05	05/23/13 14:05	
Nitrate as N	EPA 300.0	**6.5**	2.2	mg/L	10	A305565	05/23/13 14:41	05/23/13 14:41	
Nitrate as NO3	EPA 300.0	**29**	10	mg/L	10	A305565	05/23/13 14:41	05/23/13 14:41	
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305565	05/23/13 14:41	05/23/13 14:41	DL01
pH (1)	SM 4500-H+ B	**8.0**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.7**							
***Sodium Absorption Ratio**		**5.9**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**830**	20	mg/L	10	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**1800**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**13**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**2.5**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**89**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**630**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-05 **Client Project:** FR1216043A.0004
Sample Date: 05/22/2013 13:10 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-016

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**630**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**99**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.019**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**86**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**3.3**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**45**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**49**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**340**	1.0	mg/L	1	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**11.0**	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.539**	±				
***MDA95**		**2.01**	pCi/L				

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-06
Sample Date: 05/22/2013 13:27
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-017

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**200**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**200**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**220**	10	mg/L	10	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**2300**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**52**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.49**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.60**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**27**		meq/L					
***Mass Balance-Dissolved Cations**		**25**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 14:05	05/23/13 14:05	
Nitrate as N	EPA 300.0	**6.4**	2.2	mg/L	10	A305565	05/23/13 14:50	05/23/13 14:50	
Nitrate as NO3	EPA 300.0	**28**	10	mg/L	10	A305565	05/23/13 14:50	05/23/13 14:50	
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305565	05/23/13 14:50	05/23/13 14:50	DL01
pH (1)	SM 4500-H+ B	**8.0**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.7**							
***Sodium Absorption Ratio**		**5.3**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**800**	20	mg/L	10	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**1700**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**12**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**2.1**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**81**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**600**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-06 **Client Project:** FR1216043A.0004
Sample Date: 05/22/2013 13:27 **Sampled by:** Eric Escobar
Sample Type: Grab **Matrix:** Water

Sample Description: W-017

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**600**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**97**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.013**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**65**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**2.7**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**38**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**47**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**300**	1.0	mg/L	1	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**12.1**	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.561**	±				
***MDA95**		**2.01**	pCi/L				

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Certificate of Analysis

Gary Kramer
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1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-07
Sample Date: 05/22/2013 14:00
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-018

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**140**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**140**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**280**	10	mg/L	10	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**2700**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**50**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.17**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.65**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**32**		meq/L					
***Mass Balance-Dissolved Cations**		**31**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 14:05	05/23/13 14:05	
Nitrate as N	EPA 300.0	ND	2.2	mg/L	10	A305565	05/23/13 15:00	05/23/13 15:00	DL01
Nitrate as NO3	EPA 300.0	ND	10	mg/L	10	A305565	05/23/13 15:00	05/23/13 15:00	DL01
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305565	05/23/13 15:00	05/23/13 15:00	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**22.0**							
***Sodium Absorption Ratio**		**5.7**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**1000**	40	mg/L	20	A305615	05/24/13	05/24/13	
Total Dissolved Solids	SM 2540C	**2100**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**11**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**2.5**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**170**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**760**	0.41	mg/L					

Certificate of Analysis

Gary Kramer
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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-07
Sample Date: 05/22/2013 14:00
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-018

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**760**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**80**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.47**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**67**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**3.2**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**12**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**44**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**360**	1.0	mg/L	1	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**12.1**	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.561**	±				
***MDA95**		**2.01**	pCi/L				

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Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-08
Sample Date: 05/22/2013 14:15
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-019

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**130**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**130**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**340**	20	mg/L	20	A305565	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**3100**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**48**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	**0.19**	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.73**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**39**		meq/L					
***Mass Balance-Dissolved Cations**		**37**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 14:05	05/23/13 14:05	
Nitrate as N	EPA 300.0	ND	4.4	mg/L	20	A305565	05/23/13 15:09	05/23/13 15:09	DL01
Nitrate as NO3	EPA 300.0	ND	20	mg/L	20	A305565	05/23/13 15:09	05/23/13 15:09	DL01
Nitrite as N	EPA 300.0	ND	1.0	mg/L	20	A305565	05/23/13 15:09	05/23/13 15:09	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.3**							
***Sodium Absorption Ratio**		**5.8**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**1300**	40	mg/L	20	A305565	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**2500**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305609	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**8.3**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**3.0**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**220**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**950**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-08
Sample Date: 05/22/2013 14:15
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-019

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**950**	0.41	mg/L					
***Iron - Dissolved (1)**	EPA 200.7	**0.048**	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**96**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.15**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**79**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**2.8**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**21**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**38**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**410**	1.0	mg/L	1	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**7.73**	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.467**	±				
***MDA95**		**2.01**	pCi/L				

Certificate of Analysis

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-09
Sample Date: 05/22/2013 15:28
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-020

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306071	06/05/13	06/05/13	
Alkalinity as CaCO3	SM 2320 B	**87**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Bicarbonate as CaCO3	SM 2320 B	**87**	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305518	05/22/13	05/22/13	
Chloride	EPA 300.0	**950**	20	mg/L	20	A305569	05/23/13	05/23/13	
Conductivity @ 25C	SM 2510 B	**4500**	1.0	umhos/cm	1	A305518	05/22/13	05/22/13	
***Exchangeable Sodium Percentage**		**61**		%	1	A306073	06/05/13	06/05/13	
Fluoride	SM 4500-F C	ND	0.10	mg/L	1	A305881	06/03/13	06/03/13	
Langelier Index	SM 2330 B	**0.79**				A306071	06/05/13	06/05/13	
***Mass Balance-Anions**		**52**		meq/L					
***Mass Balance-Dissolved Cations**		**50**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305551	05/23/13 14:05	05/23/13 14:05	
Nitrate as N	EPA 300.0	ND	4.4	mg/L	20	A305569	05/23/13 16:06	05/23/13 16:06	DL01
Nitrate as NO3	EPA 300.0	ND	20	mg/L	20	A305569	05/23/13 16:06	05/23/13 16:06	DL01
Nitrite as N	EPA 300.0	ND	1.0	mg/L	20	A305569	05/23/13 16:06	05/23/13 16:06	DL01
pH (1)	SM 4500-H+ B	**8.0**		pH Units	1	A305518	05/22/13	05/22/13	
pH Temperature in °C		**21.8**							
***Sodium Absorption Ratio**		**9.7**				A306071	06/05/13	06/05/13	
Sulfate as SO4	EPA 300.0	**1200**	40	mg/L	20	A305569	05/23/13	05/23/13	
Total Dissolved Solids	SM 2540C	**3000**	5.0	mg/L	1	A305617	05/24/13	05/30/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**1.7**	1.0	mg/L	1	A305611	05/24/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Arsenic - Dissolved (1)	EPA 200.8	**14**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Barium - Dissolved (1)	EPA 200.8	**37**	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
***Boron - Dissolved (1)**	EPA 200.7	**1.2**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
Calcium - Dissolved (1)	EPA 200.7	**310**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	
Hardness as CaCO3, Dissolved	SM 2340B	**960**	0.41	mg/L					

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Fresno, CA 93720

Report Issue Date: 06/06/2013 16:36
Received Date: 05/22/2013
Received Time: 17:15

Lab Sample ID: A3E1843-09
Sample Date: 05/22/2013 15:28
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Eric Escobar
Matrix: Water

Sample Description: W-020

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Hardness as CaCO3, Dissolved	SM 2340B	**960**	0.41	mg/L					
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A305603	05/24/13	06/05/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A305603	05/24/13	06/04/13	
Magnesium - Dissolved (1)	EPA 200.7	**46**	0.10	mg/L	1	A305603	05/24/13	06/05/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.41**	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A305603	05/24/13	06/04/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**30**	10	ug/L	1	A305603	05/24/13	06/04/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Potassium - Dissolved (1)	EPA 200.7	**2.8**	2.0	mg/L	1	A305603	05/24/13	06/05/13	
Selenium - Dissolved (1)	EPA 200.8	**15**	2.0	ug/L	1	A305603	05/24/13	06/04/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**28**	0.20	mg/L	1	A305603	05/24/13	06/05/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A305603	05/24/13	06/05/13	
Sodium - Dissolved (1)	EPA 200.7	**690**	2.0	mg/L	2	A305603	05/24/13	06/05/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A305603	05/24/13	06/04/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A305603	05/24/13	06/04/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A305603	05/24/13	06/05/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
*Gross Alpha	EPA 00-02	ND	pCi/L	A305837	05/31/13	06/01/13	
***1.65 Sigma Uncertainty**		**0.191**	±				
***MDA95**		**2.01**	pCi/L				

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual

Batch: A305518 Analyst: CEG Prepared: 05/22/2013

Blank (A305518-BLK1) SM 2320 B - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Alkalinity as CaCO3	ND	3.0	mg/L							05/22/13	
Bicarbonate as CaCO3	ND	3.0	mg/L							05/22/13	
Carbonate as CaCO3	ND	3.0	mg/L							05/22/13	
Conductivity @ 25C	ND	1.0	umhos/cm							05/22/13	
Hydroxide as CaCO3	ND	3.0	mg/L							05/22/13	

Blank Spike (A305518-BS1) SM 2320 B - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Alkalinity as CaCO3	110	3.0	mg/L	100		105	80-120			05/22/13	

Blank Spike Dup (A305518-BSD1) SM 2320 B - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Alkalinity as CaCO3	100	3.0	mg/L	100		105	80-120	1	20	05/22/13	

Duplicate (A305518-DUP1) SM 2320 B - Quality Control **Source: A3E1793-04**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Alkalinity as CaCO3	59	3.0	mg/L		60			3	10	05/22/13	
Bicarbonate as CaCO3	59	3.0	mg/L		60			3	10	05/22/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/22/13	
Conductivity @ 25C	490	1.0	umhos/cm		490			0	20	05/22/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/22/13	
pH (1)	7.7		pH Units		7.4			4	20	05/22/13	

Duplicate (A305518-DUP2) SM 2320 B - Quality Control **Source: A3E1823-01**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Alkalinity as CaCO3	81	3.0	mg/L		83			3	10	05/22/13	
Bicarbonate as CaCO3	81	3.0	mg/L		83			3	10	05/22/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/22/13	
Conductivity @ 25C	170	1.0	umhos/cm		170			0	20	05/22/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/22/13	
pH (1)	8.2		pH Units		8.2			0	20	05/22/13	

Batch: A305551 Analyst: CCH Prepared: 05/23/2013

Blank (A305551-BLK1) SM 5540 C - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	ND	0.050	mg/L							05/23/13	

Blank Spike (A305551-BS1) SM 5540 C - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	0.95	0.050	mg/L	1.0		95	80-120			05/23/13	

Blank Spike Dup (A305551-BSD1) SM 5540 C - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0		96	80-120	1	20	05/23/13	

Matrix Spike (A305551-MS1) SM 5540 C - Quality Control **Source: A3E1823-02**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	0.92	0.050	mg/L	1.0	ND	92	80-120			05/23/13	

Matrix Spike (A305551-MS2) SM 5540 C - Quality Control **Source: A3E1848-01**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	0.97	0.050	mg/L	1.0	ND	97	80-120			05/23/13	

Matrix Spike Dup (A305551-MSD1) SM 5540 C - Quality Control **Source: A3E1823-02**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0	ND	96	80-120	5	20	05/23/13	

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305551				Analyst: CCH		Prepared: 05/23/2013					
Matrix Spike Dup (A305551-MSD2)	**SM 5540 C - Quality Control**					**Source: A3E1848-01**					
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0	ND	96	80-120	1	20	05/23/13	
Batch: A305561				Analyst: CEG		Prepared: 05/23/2013					
Blank (A305561-BLK1)	**SM 2320 B - Quality Control**										
Alkalinity as CaCO3	ND	3.0	mg/L							05/23/13	
Bicarbonate as CaCO3	ND	3.0	mg/L							05/23/13	
Carbonate as CaCO3	ND	3.0	mg/L							05/23/13	
Hydroxide as CaCO3	ND	3.0	mg/L							05/23/13	
Blank Spike (A305561-BS1)	**SM 2320 B - Quality Control**										
Alkalinity as CaCO3	110	3.0	mg/L	100		105	80-120			05/23/13	
Blank Spike Dup (A305561-BSD1)	**SM 2320 B - Quality Control**										
Alkalinity as CaCO3	110	3.0	mg/L	100		105	80-120	0	20	05/23/13	
Duplicate (A305561-DUP1)	**SM 2320 B - Quality Control**					**Source: A3E1848-01**					
Alkalinity as CaCO3	220	3.0	mg/L		220			0	10	05/23/13	
Bicarbonate as CaCO3	220	3.0	mg/L		220			0	10	05/23/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/23/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/23/13	
Duplicate (A305561-DUP2)	**SM 2320 B - Quality Control**					**Source: A3E1861-02**					
Alkalinity as CaCO3	29	3.0	mg/L		27			5	10	05/23/13	
Bicarbonate as CaCO3	29	3.0	mg/L		27			5	10	05/23/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/23/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/23/13	
Batch: A305565				Analyst: AJT		Prepared: 05/23/2013					
Blank (A305565-BLK1)	**EPA 300.0 - Quality Control**										
Chloride	ND	1.0	mg/L							05/23/13	
Nitrate as N	ND	0.22	mg/L							05/23/13	
Nitrate as NO3	ND	1.0	mg/L							05/23/13	
Nitrite as N	ND	0.050	mg/L							05/23/13	
Sulfate as SO4	ND	2.0	mg/L							05/23/13	
Blank Spike (A305565-BS1)	**EPA 300.0 - Quality Control**										
Chloride	51	1.0	mg/L	50		102	90-110			05/23/13	
Nitrate as N	11	0.22	mg/L	11		101	90-110			05/23/13	
Nitrate as NO3	51	1.0	mg/L	50		101	90-110			05/23/13	
Nitrite as N	0.49	0.050	mg/L	0.50		99	90-110			05/23/13	
Sulfate as SO4	51	2.0	mg/L	50		102	90-110			05/23/13	
Blank Spike Dup (A305565-BSD1)	**EPA 300.0 - Quality Control**										
Chloride	51	1.0	mg/L	50		102	90-110	0	20	05/23/13	
Nitrate as N	12	0.22	mg/L	11		102	90-110	1	20	05/23/13	
Nitrate as NO3	51	1.0	mg/L	50		102	90-110	1	20	05/23/13	

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305565				Analyst: AJT		Prepared: 05/23/2013					
Blank Spike Dup (A305565-BSD1) EPA 300.0 - Quality Control											
Nitrite as N	0.50	0.050	mg/L	0.50		100	90-110	1	20	05/23/13	
Sulfate as SO4	51	2.0	mg/L	50		102	90-110	0	20	05/23/13	
Matrix Spike (A305565-MS1) EPA 300.0 - Quality Control						**Source: A3E1863-01**					
Chloride	130	2.0	mg/L	100	27	102	80-120			05/23/13	
Nitrate as N	31	0.44	mg/L	23	8.0	102	80-120			05/23/13	
Nitrate as NO3	140	2.0	mg/L	100	36	103	80-120			05/23/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	104	80-120			05/23/13	
Sulfate as SO4	120	4.0	mg/L	100	14	104	80-120			05/23/13	
Matrix Spike (A305565-MS2) EPA 300.0 - Quality Control						**Source: A3E1844-04**					
Chloride	180	2.0	mg/L	100	79	101	80-120			05/23/13	
Nitrate as N	24	0.44	mg/L	23	0.51	103	80-120			05/23/13	
Nitrate as NO3	110	2.0	mg/L	100	2.3	103	80-120			05/23/13	
Nitrite as N	0.93	0.10	mg/L	1.0	ND	93	80-120			05/23/13	
Sulfate as SO4	160	4.0	mg/L	100	63	102	80-120			05/23/13	
Matrix Spike Dup (A305565-MSD1) EPA 300.0 - Quality Control						**Source: A3E1863-01**					
Chloride	130	2.0	mg/L	100	27	102	80-120	0	20	05/23/13	
Nitrate as N	31	0.44	mg/L	23	8.0	103	80-120	0	20	05/23/13	
Nitrate as NO3	140	2.0	mg/L	100	36	103	80-120	0	20	05/23/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	103	80-120	0	20	05/23/13	
Sulfate as SO4	120	4.0	mg/L	100	14	103	80-120	0	20	05/23/13	
Matrix Spike Dup (A305565-MSD2) EPA 300.0 - Quality Control						**Source: A3E1844-04**					
Chloride	180	2.0	mg/L	100	79	100	80-120	0	20	05/23/13	
Nitrate as N	24	0.44	mg/L	23	0.51	102	80-120	1	20	05/23/13	
Nitrate as NO3	100	2.0	mg/L	100	2.3	102	80-120	1	20	05/23/13	
Nitrite as N	0.91	0.10	mg/L	1.0	ND	91	80-120	2	20	05/23/13	
Sulfate as SO4	160	4.0	mg/L	100	63	101	80-120	1	20	05/23/13	
Batch: A305569				Analyst: AJT		Prepared: 05/23/2013					
Blank (A305569-BLK1) EPA 300.0 - Quality Control											
Chloride	ND	1.0	mg/L							05/23/13	
Nitrate as N	ND	0.22	mg/L							05/23/13	
Nitrate as NO3	ND	1.0	mg/L							05/23/13	
Nitrite as N	ND	0.050	mg/L							05/23/13	
Sulfate as SO4	ND	2.0	mg/L							05/23/13	
Blank Spike (A305569-BS1) EPA 300.0 - Quality Control											
Chloride	51	1.0	mg/L	50		102	90-110			05/23/13	
Nitrate as N	12	0.22	mg/L	11		102	90-110			05/23/13	
Nitrate as NO3	51	1.0	mg/L	50		102	90-110			05/23/13	
Nitrite as N	0.50	0.050	mg/L	0.50		100	90-110			05/23/13	
Sulfate as SO4	51	2.0	mg/L	50		102	90-110			05/23/13	
Blank Spike Dup (A305569-BSD1) EPA 300.0 - Quality Control											

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Batch: A305569 Analyst: AJT Prepared: 05/23/2013

Blank Spike Dup (A305569-BSD1) EPA 300.0 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Chloride	51	1.0	mg/L	50		102	90-110	0	20	05/23/13	
Nitrate as N	12	0.22	mg/L	11		102	90-110	0	20	05/23/13	
Nitrate as NO3	51	1.0	mg/L	50		102	90-110	0	20	05/23/13	
Nitrite as N	0.50	0.050	mg/L	0.50		99	90-110	1	20	05/23/13	
Sulfate as SO4	51	2.0	mg/L	50		102	90-110	0	20	05/23/13	

Matrix Spike (A305569-MS1) EPA 300.0 - Quality Control **Source: A3E1879-01**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Chloride	120	2.0	mg/L	100	22	102	80-120			05/23/13	
Nitrate as N	25	0.44	mg/L	23	1.3	105	80-120			05/23/13	
Nitrate as NO3	110	2.0	mg/L	100	5.7	105	80-120			05/23/13	
Nitrite as N	0.14	0.10	mg/L	1.0	ND	14	80-120			05/23/13	MS02 ***Low***
Sulfate as SO4	100	4.0	mg/L	100	ND	101	80-120			05/23/13	

Matrix Spike (A305569-MS2) EPA 300.0 - Quality Control **Source: A3E1885-03**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Chloride	110	2.0	mg/L	100	6.8	102	80-120			05/23/13	
Nitrate as N	23	0.44	mg/L	23	ND	101	80-120			05/23/13	
Nitrate as NO3	100	2.0	mg/L	100	ND	101	80-120			05/23/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	102	80-120			05/23/13	
Sulfate as SO4	100	4.0	mg/L	100	ND	101	80-120			05/23/13	

Matrix Spike Dup (A305569-MSD1) EPA 300.0 - Quality Control **Source: A3E1879-01**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Chloride	130	2.0	mg/L	100	22	104	80-120	2	20	05/23/13	
Nitrate as N	25	0.44	mg/L	23	1.3	107	80-120	1	20	05/23/13	
Nitrate as NO3	110	2.0	mg/L	100	5.7	107	80-120	1	20	05/23/13	
Nitrite as N	0.14	0.10	mg/L	1.0	ND	14	80-120	0	20	05/23/13	MS02 ***Low***
Sulfate as SO4	100	4.0	mg/L	100	ND	102	80-120	1	20	05/23/13	

Matrix Spike Dup (A305569-MSD2) EPA 300.0 - Quality Control **Source: A3E1885-03**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Chloride	110	2.0	mg/L	100	6.8	102	80-120	0	20	05/23/13	
Nitrate as N	23	0.44	mg/L	23	ND	102	80-120	0	20	05/23/13	
Nitrate as NO3	100	2.0	mg/L	100	ND	102	80-120	0	20	05/23/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	103	80-120	1	20	05/23/13	
Sulfate as SO4	100	4.0	mg/L	100	ND	102	80-120	0	20	05/23/13	

Batch: A305609 Analyst: LJL Prepared: 05/24/2013

Blank (A305609-BLK1) EPA 351.2 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Total Kjeldahl Nitrogen	ND	1.0	mg/L							06/03/13	

Blank Spike (A305609-BS1) EPA 351.2 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		101	90-110			06/03/13	

Blank Spike Dup (A305609-BSD1) EPA 351.2 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		101	90-110	0	10	06/03/13	

Matrix Spike (A305609-MS1) EPA 351.2 - Quality Control **Source: A3E1843-04**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Total Kjeldahl Nitrogen	9.2	1.0	mg/L	10	ND	92	90-110			06/03/13	

General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305609				Analyst: LJL		Prepared: 05/24/2013					
Matrix Spike (A305609-MS2)	**EPA 351.2 - Quality Control**					**Source: A3E1843-08**					
Total Kjeldahl Nitrogen	13	1.0	mg/L	10	ND	134	90-110			06/03/13	MS01 ***High***
Matrix Spike Dup (A305609-MSD1)	**EPA 351.2 - Quality Control**					**Source: A3E1843-04**					
Total Kjeldahl Nitrogen	10	1.0	mg/L	10	ND	103	90-110	11	10	06/03/13	MS05
Matrix Spike Dup (A305609-MSD2)	**EPA 351.2 - Quality Control**					**Source: A3E1843-08**					
Total Kjeldahl Nitrogen	11	1.0	mg/L	10	ND	106	90-110	23	10	06/03/13	MS07
Batch: A305611				Analyst: LJL		Prepared: 05/24/2013					
Blank (A305611-BLK1)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	ND	1.0	mg/L							06/03/13	
Blank Spike (A305611-BS1)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		103	90-110			06/03/13	
Blank Spike Dup (A305611-BSD1)	**EPA 351.2 - Quality Control**										
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		100	90-110	3	10	06/03/13	
Matrix Spike (A305611-MS1)	**EPA 351.2 - Quality Control**					**Source: A3E1954-08**					
Total Kjeldahl Nitrogen	17	1.0	mg/L	10	2.1	148	90-110			06/03/13	MS01 ***High***
Matrix Spike Dup (A305611-MSD1)	**EPA 351.2 - Quality Control**					**Source: A3E1954-08**					
Total Kjeldahl Nitrogen	16	1.0	mg/L	10	2.1	142	90-110	4	10	06/03/13	MS01 ***High***
Batch: A305615				Analyst: AJT		Prepared: 05/24/2013					
Blank (A305615-BLK1)	**EPA 300.0 - Quality Control**										
Sulfate as SO4	ND	2.0	mg/L							05/24/13	
Blank Spike (A305615-BS1)	**EPA 300.0 - Quality Control**										
Sulfate as SO4	51	2.0	mg/L	50		102	90-110			05/24/13	
Blank Spike Dup (A305615-BSD1)	**EPA 300.0 - Quality Control**										
Sulfate as SO4	51	2.0	mg/L	50		103	90-110	1	20	05/24/13	
Matrix Spike (A305615-MS1)	**EPA 300.0 - Quality Control**					**Source: A3E1956-01**					
Sulfate as SO4	130	4.0	mg/L	100	32	101	80-120			05/24/13	
Matrix Spike (A305615-MS2)	**EPA 300.0 - Quality Control**					**Source: A3E1976-05**					
Sulfate as SO4	130	4.0	mg/L	100	25	103	80-120			05/24/13	
Matrix Spike Dup (A305615-MSD1)	**EPA 300.0 - Quality Control**					**Source: A3E1956-01**					
Sulfate as SO4	130	4.0	mg/L	100	32	100	80-120	1	20	05/24/13	
Matrix Spike Dup (A305615-MSD2)	**EPA 300.0 - Quality Control**					**Source: A3E1976-05**					
Sulfate as SO4	130	4.0	mg/L	100	25	104	80-120	1	20	05/24/13	

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Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305617				Analyst: DEH		Prepared: 05/24/2013					
Blank (A305617-BLK1) SM 2540C - Quality Control											
Total Dissolved Solids	ND	5.0	mg/L							05/30/13	
Blank (A305617-BLK2) SM 2540C - Quality Control											
Total Dissolved Solids	ND	5.0	mg/L							05/30/13	
Duplicate (A305617-DUP1) SM 2540C - Quality Control						**Source: A3E1844-01**					
Total Dissolved Solids	280	5.0	mg/L		280			1	20	05/30/13	
Duplicate (A305617-DUP2) SM 2540C - Quality Control						**Source: A3E1843-05**					
Total Dissolved Solids	1800	5.0	mg/L		1800			0	20	05/30/13	
Batch: A305881				Analyst: CCH		Prepared: 06/03/2013					
Blank (A305881-BLK1) SM 4500-F C - Quality Control											
Fluoride	ND	0.10	mg/L							06/03/13	
Blank Spike (A305881-BS1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		101	90-110			06/03/13	
Blank Spike Dup (A305881-BSD1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		101	90-110	0	20	06/03/13	
Matrix Spike (A305881-MS1) SM 4500-F C - Quality Control						**Source: A3E1295-01**					
Fluoride	1.2	0.10	mg/L	1.0	0.25	95	80-120			06/03/13	
Matrix Spike (A305881-MS2) SM 4500-F C - Quality Control						**Source: A3E1927-01**					
Fluoride	1.0	0.10	mg/L	1.0	ND	104	80-120			06/03/13	
Matrix Spike Dup (A305881-MSD1) SM 4500-F C - Quality Control						**Source: A3E1295-01**					
Fluoride	1.2	0.10	mg/L	1.0	0.25	96	80-120	1	20	06/03/13	
Matrix Spike Dup (A305881-MSD2) SM 4500-F C - Quality Control						**Source: A3E1927-01**					
Fluoride	1.0	0.10	mg/L	1.0	ND	105	80-120	1	20	06/03/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305603				Analyst: NRE		Prepared: 05/24/2013					
Blank (A305603-BLK2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	ND	0.050	mg/L							06/05/13	
Boron - Dissolved (1)	ND	0.10	mg/L							06/05/13	
Calcium - Dissolved (1)	ND	0.10	mg/L							06/05/13	
Copper - Dissolved (1)	ND	0.050	mg/L							06/05/13	
Iron - Dissolved (1)	ND	0.030	mg/L							06/05/13	
Magnesium - Dissolved (1)	ND	0.10	mg/L							06/05/13	
Manganese - Dissolved (1)	ND	0.010	mg/L							06/05/13	
Potassium - Dissolved (1)	ND	2.0	mg/L							06/05/13	
Silica (SiO2) - Dissolved (1)	ND	0.20	mg/L							06/05/13	
Silver - Dissolved (1)	ND	0.010	mg/L							06/05/13	
Sodium - Dissolved (1)	ND	1.0	mg/L							06/05/13	
Zinc - Dissolved (1)	ND	0.050	mg/L							06/05/13	
Blank Spike (A305603-BS2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20		92	85-115			06/05/13	
Boron - Dissolved (1)	0.60	0.10	mg/L	0.60		100	85-115			06/05/13	
Calcium - Dissolved (1)	9.9	0.10	mg/L	10		99	85-115			06/05/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20		98	85-115			06/05/13	
Iron - Dissolved (1)	2.0	0.030	mg/L	2.0		98	85-115			06/05/13	
Magnesium - Dissolved (1)	9.6	0.10	mg/L	10		96	85-115			06/05/13	
Manganese - Dissolved (1)	0.19	0.010	mg/L	0.20		97	85-115			06/05/13	
Potassium - Dissolved (1)	9.7	2.0	mg/L	10		97	85-115			06/05/13	
Silica (SiO2) - Dissolved (1)	2.3	0.20	mg/L	2.1		107	85-115			06/05/13	
Silver - Dissolved (1)	0.095	0.010	mg/L	0.10		95	85-115			06/05/13	
Sodium - Dissolved (1)	9.8	1.0	mg/L	10		98	85-115			06/05/13	
Zinc - Dissolved (1)	0.20	0.050	mg/L	0.20		99	85-115			06/05/13	
Blank Spike Dup (A305603-BSD2)	**EPA 200.7 - Quality Control**										
Aluminum - Dissolved (1)	0.18	0.050	mg/L	0.20		92	85-115	1	20	06/05/13	
Boron - Dissolved (1)	0.58	0.10	mg/L	0.60		96	85-115	4	20	06/05/13	
Calcium - Dissolved (1)	9.9	0.10	mg/L	10		99	85-115	0	20	06/05/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20		98	85-115	0	20	06/05/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0		97	85-115	1	20	06/05/13	
Magnesium - Dissolved (1)	9.6	0.10	mg/L	10		96	85-115	0	20	06/05/13	
Manganese - Dissolved (1)	0.19	0.010	mg/L	0.20		97	85-115	0	20	06/05/13	
Potassium - Dissolved (1)	9.8	2.0	mg/L	10		98	85-115	1	20	06/05/13	
Silica (SiO2) - Dissolved (1)	2.2	0.20	mg/L	2.1		104	85-115	2	20	06/05/13	
Silver - Dissolved (1)	0.095	0.010	mg/L	0.10		95	85-115	0	20	06/05/13	
Sodium - Dissolved (1)	9.9	1.0	mg/L	10		99	85-115	1	20	06/05/13	
Zinc - Dissolved (1)	0.20	0.050	mg/L	0.20		99	85-115	0	20	06/05/13	
Matrix Spike (A305603-MS3)	**EPA 200.7 - Quality Control**					**Source: A3E1843-04**					
Aluminum - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	87	70-130			06/05/13	
Boron - Dissolved (1)	3.4	0.10	mg/L	0.60	2.8	97	70-130			06/05/13	
Calcium - Dissolved (1)	150	0.10	mg/L	10	150	75	70-130			06/05/13	
Copper - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	97	70-130			06/05/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	95	70-130			06/05/13	
Magnesium - Dissolved (1)	130	0.10	mg/L	10	130	82	70-130			06/05/13	

Metals Quality Control Report

Batch: A305603 Analyst: NRE Prepared: 05/24/2013

Matrix Spike (A305603-MS3) EPA 200.7 - Quality Control **Source: A3E1843-04**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Manganese - Dissolved (1)	0.37	0.010	mg/L	0.20	0.19	92	70-130			06/05/13	
Potassium - Dissolved (1)	22	2.0	mg/L	10	12	100	70-130			06/05/13	
Silica (SiO2) - Dissolved (1)	66	0.20	mg/L	2.1	65	65	70-130			06/05/13	MS02 ***Low***
Silver - Dissolved (1)	0.095	0.010	mg/L	0.10	ND	95	70-130			06/05/13	
Sodium - Dissolved (1)	460	1.0	mg/L	10	450	78	70-130			06/05/13	
Zinc - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	93	70-130			06/05/13	

Matrix Spike Dup (A305603-MSD3) EPA 200.7 - Quality Control **Source: A3E1843-04**

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	96	70-130	10	20	06/05/13	
Boron - Dissolved (1)	3.5	0.10	mg/L	0.60	2.8	106	70-130	2	20	06/05/13	
Calcium - Dissolved (1)	160	0.10	mg/L	10	150	93	70-130	1	20	06/05/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	99	70-130	2	20	06/05/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	96	70-130	2	20	06/05/13	
Magnesium - Dissolved (1)	140	0.10	mg/L	10	130	97	70-130	1	20	06/05/13	
Manganese - Dissolved (1)	0.38	0.010	mg/L	0.20	0.19	95	70-130	2	20	06/05/13	
Potassium - Dissolved (1)	22	2.0	mg/L	10	12	102	70-130	1	20	06/05/13	
Silica (SiO2) - Dissolved (1)	67	0.20	mg/L	2.1	65	101	70-130	1	20	06/05/13	
Silver - Dissolved (1)	0.095	0.010	mg/L	0.10	ND	95	70-130	0	20	06/05/13	
Sodium - Dissolved (1)	460	1.0	mg/L	10	450	86	70-130	0	20	06/05/13	
Zinc - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	93	70-130	1	20	06/05/13	

Blank (A305603-BLK1) EPA 200.8 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Antimony - Dissolved (1)	ND	2.0	ug/L							06/04/13	
Arsenic - Dissolved (1)	ND	2.0	ug/L							06/04/13	
Barium - Dissolved (1)	ND	5.0	ug/L							06/04/13	
Beryllium - Dissolved (1)	ND	1.0	ug/L							06/04/13	
Cadmium - Dissolved (1)	ND	1.0	ug/L							06/04/13	
Chromium - Dissolved (1)	ND	10	ug/L							06/04/13	
Lead - Dissolved (1)	ND	5.0	ug/L							06/04/13	
Mercury - Dissolved (1)	ND	0.20	ug/L							06/04/13	
Molybdenum - Dissolved (1)	ND	10	ug/L							06/04/13	
Nickel - Dissolved (1)	ND	10	ug/L							06/04/13	
Selenium - Dissolved (1)	ND	2.0	ug/L							06/04/13	
Thallium - Dissolved (1)	ND	1.0	ug/L							06/04/13	
Vanadium - Dissolved (1)	ND	10	ug/L							06/04/13	

Blank Spike (A305603-BS1) EPA 200.8 - Quality Control

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Antimony - Dissolved (1)	210	2.0	ug/L	200		106	85-115			06/04/13	
Arsenic - Dissolved (1)	200	2.0	ug/L	200		98	85-115			06/04/13	
Barium - Dissolved (1)	190	5.0	ug/L	200		97	85-115			06/04/13	
Beryllium - Dissolved (1)	210	1.0	ug/L	200		107	85-115			06/04/13	
Cadmium - Dissolved (1)	190	1.0	ug/L	200		94	85-115			06/04/13	
Chromium - Dissolved (1)	210	10	ug/L	200		104	85-115			06/04/13	
Lead - Dissolved (1)	200	5.0	ug/L	200		99	85-115			06/04/13	
Mercury - Dissolved (1)	4.7	0.20	ug/L	5.0		93	85-115			06/04/13	
Molybdenum - Dissolved (1)	210	10	ug/L	200		107	85-115			06/04/13	
Nickel - Dissolved (1)	200	10	ug/L	200		98	85-115			06/04/13	
Selenium - Dissolved (1)	190	2.0	ug/L	200		93	85-115			06/04/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
Batch: A305603				Analyst: MAS		Prepared: 05/24/2013						
Blank Spike (A305603-BS1)	**EPA 200.8 - Quality Control**											
Thallium - Dissolved (1)	190	1.0	ug/L	200		95	85-115			06/04/13		
Vanadium - Dissolved (1)	210	10	ug/L	200		105	85-115			06/04/13		
Blank Spike Dup (A305603-BSD1)	**EPA 200.8 - Quality Control**											
Antimony - Dissolved (1)	220	2.0	ug/L	200		110	85-115	4	20	06/04/13		
Arsenic - Dissolved (1)	200	2.0	ug/L	200		98	85-115	0	20	06/04/13		
Barium - Dissolved (1)	190	5.0	ug/L	200		96	85-115	1	20	06/04/13		
Beryllium - Dissolved (1)	220	1.0	ug/L	200		109	85-115	1	20	06/04/13		
Cadmium - Dissolved (1)	190	1.0	ug/L	200		97	85-115	3	20	06/04/13		
Chromium - Dissolved (1)	210	10	ug/L	200		104	85-115	0	20	06/04/13		
Lead - Dissolved (1)	200	5.0	ug/L	200		99	85-115	1	20	06/04/13		
Mercury - Dissolved (1)	4.7	0.20	ug/L	5.0		94	85-115	1	20	06/04/13		
Molybdenum - Dissolved (1)	220	10	ug/L	200		108	85-115	2	20	06/04/13		
Nickel - Dissolved (1)	200	10	ug/L	200		100	85-115	2	20	06/04/13		
Selenium - Dissolved (1)	180	2.0	ug/L	200		92	85-115	1	20	06/04/13		
Thallium - Dissolved (1)	190	1.0	ug/L	200		96	85-115	1	20	06/04/13		
Vanadium - Dissolved (1)	220	10	ug/L	200		108	85-115	2	20	06/04/13		
Matrix Spike (A305603-MS1)	**EPA 200.8 - Quality Control**					**Source: A3E1843-04**						
Antimony - Dissolved (1)	200	2.0	ug/L	200	ND	98	70-130			06/04/13		
Arsenic - Dissolved (1)	190	2.0	ug/L	200	5.2	90	70-130			06/04/13		
Barium - Dissolved (1)	180	5.0	ug/L	200	12	85	70-130			06/04/13		
Beryllium - Dissolved (1)	170	1.0	ug/L	200	ND	86	70-130			06/04/13		
Cadmium - Dissolved (1)	160	1.0	ug/L	200	ND	82	70-130			06/04/13		
Chromium - Dissolved (1)	170	10	ug/L	200	ND	86	70-130			06/04/13		
Lead - Dissolved (1)	160	5.0	ug/L	200	ND	82	70-130			06/04/13		
Mercury - Dissolved (1)	4.3	0.20	ug/L	5.0	ND	86	70-130			06/04/13		
Molybdenum - Dissolved (1)	260	10	ug/L	200	69	93	70-130			06/04/13		
Nickel - Dissolved (1)	160	10	ug/L	200	ND	78	70-130			06/04/13		
Selenium - Dissolved (1)	210	2.0	ug/L	200	34	90	70-130			06/04/13		
Thallium - Dissolved (1)	160	1.0	ug/L	200	ND	79	70-130			06/04/13		
Vanadium - Dissolved (1)	210	10	ug/L	200	18	96	70-130			06/04/13		
Matrix Spike (A305603-MS2)	**EPA 200.8 - Quality Control**					**Source: A3E1843-09**						
Antimony - Dissolved (1)	ND	2.0	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Arsenic - Dissolved (1)	15	2.0	ug/L	200	14	0	70-130			06/04/13	X01	***Low***
Barium - Dissolved (1)	37	5.0	ug/L	200	37	0	70-130			06/04/13	X01	***Low***
Beryllium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Cadmium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Chromium - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Lead - Dissolved (1)	ND	5.0	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Mercury - Dissolved (1)	ND	0.20	ug/L	5.0	ND	0	70-130			06/04/13	X01	***Low***
Molybdenum - Dissolved (1)	29	10	ug/L	200	30	NR	70-130			06/04/13	X01	***Low***
Nickel - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Selenium - Dissolved (1)	15	2.0	ug/L	200	15	0	70-130			06/04/13	X01	***Low***
Thallium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***
Vanadium - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130			06/04/13	X01	***Low***

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual	
Batch: A305603				Analyst: MAS		Prepared: 05/24/2013						
Matrix Spike Dup (A305603-MSD1)	**EPA 200.8 - Quality Control**					**Source: A3E1843-04**						
Antimony - Dissolved (1)	200	2.0	ug/L	200	ND	100	70-130	3	20	06/04/13		
Arsenic - Dissolved (1)	190	2.0	ug/L	200	5.2	92	70-130	3	20	06/04/13		
Barium - Dissolved (1)	190	5.0	ug/L	200	12	88	70-130	3	20	06/04/13		
Beryllium - Dissolved (1)	180	1.0	ug/L	200	ND	90	70-130	5	20	06/04/13		
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	83	70-130	2	20	06/04/13		
Chromium - Dissolved (1)	180	10	ug/L	200	ND	90	70-130	4	20	06/04/13		
Lead - Dissolved (1)	170	5.0	ug/L	200	ND	85	70-130	3	20	06/04/13		
Mercury - Dissolved (1)	4.4	0.20	ug/L	5.0	ND	87	70-130	1	20	06/04/13		
Molybdenum - Dissolved (1)	260	10	ug/L	200	69	97	70-130	3	20	06/04/13		
Nickel - Dissolved (1)	160	10	ug/L	200	ND	80	70-130	3	20	06/04/13		
Selenium - Dissolved (1)	220	2.0	ug/L	200	34	93	70-130	2	20	06/04/13		
Thallium - Dissolved (1)	160	1.0	ug/L	200	ND	81	70-130	2	20	06/04/13		
Vanadium - Dissolved (1)	220	10	ug/L	200	18	100	70-130	4	20	06/04/13		
Matrix Spike Dup (A305603-MSD2)	**EPA 200.8 - Quality Control**					**Source: A3E1843-09**						
Antimony - Dissolved (1)	ND	2.0	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Arsenic - Dissolved (1)	14	2.0	ug/L	200	14	0	70-130	4	20	06/04/13	X01	***Low***
Barium - Dissolved (1)	37	5.0	ug/L	200	37	0	70-130	1	20	06/04/13	X01	***Low***
Beryllium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Cadmium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Chromium - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Lead - Dissolved (1)	ND	5.0	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Mercury - Dissolved (1)	ND	0.20	ug/L	5.0	ND	0	70-130		20	06/04/13	X01	***Low***
Molybdenum - Dissolved (1)	29	10	ug/L	200	30	NR	70-130	1	20	06/04/13	X01	***Low***
Nickel - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Selenium - Dissolved (1)	16	2.0	ug/L	200	15	1	70-130	8	20	06/04/13	X01	***Low***
Thallium - Dissolved (1)	ND	1.0	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***
Vanadium - Dissolved (1)	ND	10	ug/L	200	ND	0	70-130		20	06/04/13	X01	***Low***

Radiological Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305555				Analyst: KKC		Prepared: 05/23/2013					
Blank (A305555-BLK1) EPA 00-02 - Quality Control											
1.65 Sigma Uncertainty	ND		±							05/24/13	
Gross Alpha	ND	3	pCi/L							05/24/13	
MDA95	ND	0.00	pCi/L							05/24/13	
Blank Spike (A305555-BS1) EPA 00-02 - Quality Control											
Gross Alpha	32.0	3	pCi/L	30		107	80-120			05/24/13	
Blank Spike Dup (A305555-BSD1) EPA 00-02 - Quality Control											
Gross Alpha	32.3	3	pCi/L	30		108	80-120	1	50	05/24/13	
Matrix Spike (A305555-MS1) EPA 00-02 - Quality Control						**Source: A3E1634-01**					
Gross Alpha	89.4	3	pCi/L	120	ND	74	70-130			05/24/13	
Matrix Spike (A305555-MS2) EPA 00-02 - Quality Control						**Source: A3E1825-01**					
Gross Alpha	119	3	pCi/L	120	16.0	86	70-130			05/24/13	
Matrix Spike Dup (A305555-MSD1) EPA 00-02 - Quality Control						**Source: A3E1634-01**					
Gross Alpha	99.3	3	pCi/L	120	ND	82	70-130	11	50	05/24/13	
Matrix Spike Dup (A305555-MSD2) EPA 00-02 - Quality Control						**Source: A3E1825-01**					
Gross Alpha	100	3	pCi/L	120	16.0	70	70-130	17	50	05/24/13	
Batch: A305837				Analyst: KKC		Prepared: 05/31/2013					
Blank (A305837-BLK1) EPA 00-02 - Quality Control											
1.65 Sigma Uncertainty	ND		±							06/01/13	
Gross Alpha	ND	3	pCi/L							06/01/13	
MDA95	ND	0.00	pCi/L							06/01/13	
Blank (A305837-BLK2) EPA 00-02 - Quality Control											
1.65 Sigma Uncertainty	ND		±							06/03/13	
Gross Alpha	ND	3	pCi/L							06/03/13	
MDA95	ND	0.00	pCi/L							06/03/13	
Blank Spike (A305837-BS1) EPA 00-02 - Quality Control											
Gross Alpha	29.3	3	pCi/L	30		98	80-120			06/01/13	
Blank Spike (A305837-BS2) EPA 00-02 - Quality Control											
Gross Alpha	33.2	3	pCi/L	30		111	80-120			06/03/13	
Blank Spike Dup (A305837-BSD1) EPA 00-02 - Quality Control											
Gross Alpha	24.6	3	pCi/L	30		82	80-120	17	50	06/01/13	
Blank Spike Dup (A305837-BSD2) EPA 00-02 - Quality Control											
Gross Alpha	31.9	3	pCi/L	30		106	80-120	4	50	06/03/13	
Matrix Spike (A305837-MS1) EPA 00-02 - Quality Control						**Source: A3E1879-01**					
Gross Alpha	96.0	3	pCi/L	120	ND	79	70-130			06/01/13	

BSK Associates Engineers & Laboratories

Radiological Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305837				Analyst: KKC		Prepared: 05/31/2013					
Matrix Spike (A305837-MS2)	**EPA 00-02 - Quality Control**					**Source: A3E1917-01**					
Gross Alpha	123	3	pCi/L	120	ND	102	70-130			06/01/13	
Matrix Spike Dup (A305837-MSD1)	**EPA 00-02 - Quality Control**					**Source: A3E1879-01**					
Gross Alpha	110	3	pCi/L	120	ND	91	70-130	14	50	06/01/13	
Matrix Spike Dup (A305837-MSD2)	**EPA 00-02 - Quality Control**					**Source: A3E1917-01**					
Gross Alpha	115	3	pCi/L	120	ND	96	70-130	7	50	06/01/13	

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BSK Associates Engineers & Laboratories

Certificate of Analysis

06/06/2013

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
- Sample(s) received, prepared, and analyzed within the method specified criteria unless otherwise noted within this report.
- The results relate only to the samples analyzed in accordance with test(s) requested by the client on the Chain of Custody document. Any analytical quality control exceptions to method criteria that are to be considered when evaluating these results have been flagged and are defined in the data qualifiers section.
- All results are expressed on wet weight basis unless otherwise specified.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Results contained in this analytical report must be reproduced in its entirety.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- BSK Analytical Laboratories certifies that the test results contained in this report meet all requirements of the NELAC Standards for applicable certified drinking water chemistry analyses unless qualified or noted in the Case Narrative.
- Analytical data contained in this report may be used for regulatory purposes to meet the requirements of the Federal or State drinking water, wastewater, and hazardous waste programs.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- * - This is not a NELAP accredited analyte.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing for each certificattion.**

State of California - ELAP	1180	State of Nevada	CA000792009A
State of California - ELAP (Rancho Cordova)	2435	State of Hawaii	04227CA
State of California - NELAP	04227CA	State of Oregon	4017
State of Washington	C997	State of Oregon - NWTPH	4021

Definitions and Flags for Data Qualifiers

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected at RL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	Picocuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable				

X01 MS/MSD2 was not spiked

MS07 MS/MSD RPD exceeded limits as one of the matrix spikes recovered outside limits.

1414 Stanislaus Street **Fresno, CA 93706** **(559) 497-2888** **FAX (559) 485-6935** **www.bsklabs.com**

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MS05	MS/MSD RPD exceeded the method acceptance limit. Recovery met acceptance criteria.
MS02	Matrix spike recovery was low; the associated blank spike recovery was acceptable.
MS01	Matrix spike recovery was high; the associated blank spike recovery was acceptable.
DL01	Sample required dilution due to matrix or high concentration of non-target analyte.

A3E1843

AMEC E&I

AMECG253

05222013

Turnaround: Standard
Due Date: 06/07/2013

4.3, 0.0

CHAIN-OF-CUSTODY RECORD FRE 15987

PROJECT NAME: Westside Water Districts		DATE: 5/22/13	PAGE 1 OF 1
PROJECT NUMBER: FR12160434.0004	LABORATORY NAME: BSK	CLIENT INFORMATION: AMEC	REPORTING REQUIREMENTS: AMEC Geomatrix EDD Deliverable
RESULTS TO: Gary Kramer	LABORATORY ADDRESS: 1414 Stanislaus St, Fresno, CA	1281 E Alluvial Ste 101, Fresno, CA 93720	
TURNAROUND TIME: Standard	LABORATORY CONTACT: Renee Rangell		GEOTRACKER REQUIRED YES NO
SAMPLE SHIPMENT METHOD: In Person	LABORATORY PHONE NUMBER: 559-497-2888		SITE SPECIFIC GLOBAL ID NO.

SAMPLERS (SIGNATURE): [signature]

A3E1843
AMECG2535
05/22/2013
10

ANALYSES: Sodium Adsorption Ratio, Exchangeable Sodium Percentage, Total Cations, Total Anions, Cation Anion Balance, Langelier Sat. Index

	DATE	TIME	SAMPLE NUMBER	EPA 300.0	EPA 200.7	EPA 200.8	SM2510B	SM2540C	SM2320B	SM2340B	EPA 351.2	EPA 00-02	SM4500-H		CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Pres	Cool	MS/MSD	No. of containers	ADDITIONAL COMMENTS
1	5/22/13	1022	W-012	X	X	X	X	X	X	X	X	X	X	X	2x1L, 1x250mL	W	N		Y		3	Lab filtered
2	〃	1025	W-013												〃	W	N		Y		3	〃
3	〃	1145	W-014												〃	W	N		Y		3	〃
4	〃	1245	W-015												〃	W	N		Y		3	〃
5	〃	1310	W-016												〃	W	N		Y		3	〃
6	〃	1327	W-017												〃	W	N		Y		3	〃
7	〃	1400	W-018												〃	W	N		Y		3	〃
8	〃	1415	W-019												〃	W	N		Y		3	〃
9	〃 Same	1528	W-020												Same	W	N		Y		3	

TOTAL NUMBER OF CONTAINERS: 27

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE: [signature] / PRINTED NAME: Eric Escobar / COMPANY: AMEC	5/22/13	1715	SIGNATURE: / PRINTED NAME: / COMPANY:		
SIGNATURE: / PRINTED NAME: / COMPANY:			SIGNATURE: / PRINTED NAME: / COMPANY:		
SIGNATURE: / PRINTED NAME: / COMPANY:			SIGNATURE: [signature] / PRINTED NAME: Caroly Colon / COMPANY: BSK	5/22/13	1715

SAMPLING COMMENTS: for any questions call Gary Kramer 264-2535
- Lab filter samples for dissolved metals
- High EC may be present. EC Range (1,000-10,000 umhos/cm)
- Bill AMEC for sample analysis results to Gary Kramer

See attachment for detailed analyte List

1281 East Alluvial Ave., Suite 101
Fresno, California 93720-2659
Tel 559.264.2535 Fax 559.264.7431

amec

Wed

Constituent	EPA/Standard Method
Chloride, Fluoride, Sulfate, Nitrate, Nitrite	EPA 300.0
Dissolved Metals: Aluminum, Boron, Calcium, Cadmium, Chromium, Copper, Iron, Magnesium, Manganese, Potassium, Sodium, Silica	EPA 200.7
Dissolved Metals Antimony, Arsenic, Barium, Beryllium, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc.	EPA 200.8
Sodium Adsorption Ratio, Exchangeable Sodium Percentage, Total Cations, Total Anions, Cation/Anion Balance, Langelier Saturation Index	Calculated
Specific Conductance	SM 2510 B
Total Dissolved Solids	SM 2540 C
Alkalinity as CaCO3: Bicarbonate, Carbonate, Hydroxide, Total	SM 2320 B
Hardness	SM 2340 B
Kjeldahl Nitrogen as Nitrogen	EPA 351.2
Gross Alpha	EPA 00--02
pH	SM 4500-H+B

BSK Associates SR-FL-0002-09

Sample Integrity

BSK Bottles: Yes No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 10°C	Yes No NA	Were correct containers and preservatives received for the tests requested?	Yes No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No NA	Were there bubbles in the VOA vials? (Volatiles Only)	Yes No NA
Did all bottles arrive unbroken and intact?	Yes No	Was a sufficient amount of sample received?	Yes No
Did all bottle labels agree with COC?	Yes No	Do samples have a hold time <72 hours?	Yes No
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No NA	Was PM notified of discrepancies? PM: By/Time:	Yes No NA

Bottles Received

"—" means preservation/chlorine checks are either N/A or are performed in the lab

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	1-9					
Bacti $Na_2S_2O_3$	—	—						
None (P) White Cap	—	—	1C					
Cr6 Buffer (P) Blue Cap	pH 9-9.5	Y N						
HNO_3 (P) Red Cap	—	—	1C					
H_2SO_4 (P) Yellow Cap	pH ≤ 2	Y N	1A					
NaOH (P) Green Cap	Cl, pH ≥12	Y N						
NaOH + ZnAc (P)	pH ≥ 9	Y N						
Dissolved Oxygen 300ml (g)	—	—						
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—						
H_2SO_4 (AG) Yellow Label O&G, Diesel	—	—						
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—						
$Na_2S_2O_3$ (AG) Blue Label 547, 515, 525, 548	—	—						
$Na_2S_2O_3$ (AG) Blue Label THMs 524.2 or 524.3	—	—						
$Na_2S_2O_3$ (CG) Blue Label 504, 505	—	—						
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH = 3	Y N						
NH_4Cl (AG) Purple Label 552	—	—						
EDA (AG) Brown Label DBPs	—	—						
Ascorbic + Maleic (AG) Lt Green Label 524.3	—	—						
HCL (CG) 524.2 BTEX,Gas, MTBE, 8260/624	—	—						
Buffer pH 4 (CG)	—	—						
None (CG)	—	—						
H_3PO_4 (CG) Salmon Label	—	—						
Other:								
Asbestos 1Liter Plastic w/ Foil	—	—						
Low Level Hg / Metals Double Baggie	—	—						
Bottled Water	—	—						
Clear Glass Jar: 250 / 500 / 1 Liter	—	—						
Soil Tube Brass / Steel / Plastic	—	—						
Tedlar Bag / Plastic Bag	—	—						

OHC

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

Labeled by: SS @ 1811 Labels checked by: JLH @ 18:19 RUSH Paged by: ____ @

A3E2284

06/13/2013

Invoice

A313823

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Dear Gary Kramer,

Thank you for selecting BSK Associates for your analytical testing needs. We have prepared this report in response to your request for analytical services. Enclosed are the results of analyses for samples received by the laboratory on 05/30/2013 14:49.

If additional clarification of any information is required, please contact your Client Services Representative, Renea Rangell at (800) 877-8310 or (559) 497-2888.

BSK ASSOCIATES

Renea Rangell
Client Services Manager

06/13/2013

Case Narrative

Work Order Information

Client Name:	AMEC E&I	**Submitted by:**	Gary Kramer
Client Code:	AMECG2535	**Shipped by:**	Walk-In
Work Order:	A3E2284	**COC Number:**	
Project:	Westside Districts	**TAT:**	10
Client Project:	FR1216043A.0004	**PO #:**	C012202691

Sample Receipt Conditions

Cooler: **Default Cooler** **Temp. ºC:** 16.6

Containers Intact
COC/Labels Agree
Received On Wet Ice
Packing Material - Bubble Wrap
Initial receipt at BSK-FAL

Report Manager	Report Format
Gary Kramer	Final.rpt
Diana Babshoff	Final.rpt

BSK Associates Engineers & Laboratories

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/13/2013 14:20
Received Date: 05/30/2013
Received Time: 14:49

Lab Sample ID: A3E2284-01
Sample Date: 05/30/2013 10:35
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Client
Matrix: Water

Sample Description: W-021

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306213	06/10/13	06/10/13	
Alkalinity as CaCO3	SM 2320 B	**81**	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Bicarbonate as CaCO3	SM 2320 B	**81**	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Chloride	EPA 300.0	**1300**	50	mg/L	50	A305809	05/30/13	05/30/13	
Conductivity @ 25C	SM 2510 B	**6200**	1.0	umhos/cm	1	A305792	05/31/13	05/31/13	
***Exchangeable Sodium Percentage**		**69**		%	1	A306289	06/11/13	06/11/13	
Fluoride	SM 4500-F C	**0.28**	0.10	mg/L	1	A306052	06/05/13	06/05/13	
Langelier Index	SM 2330 B	**0.69**				A306236	06/10/13	06/10/13	
***Mass Balance-Anions**		**65**		meq/L					
***Mass Balance-Dissolved Cations**		**68**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305838	05/31/13 11:50	05/31/13 11:50	
Nitrate as N	EPA 300.0	ND	11	mg/L	50	A305809	05/30/13 22:05	05/30/13 22:05	DL01
Nitrate as NO3	EPA 300.0	ND	50	mg/L	50	A305809	05/30/13 22:05	05/30/13 22:05	DL01
Nitrite as N	EPA 300.0	ND	2.5	mg/L	50	A305809	05/30/13 22:05	05/30/13 22:05	DL01
pH (1)	SM 4500-H+ B	**7.9**		pH Units	1	A305792	05/31/13	05/31/13	
pH Temperature in °C		**22.1**							
***Sodium Absorption Ratio**		**15**				A306213	06/10/13	06/10/13	
Sulfate as SO4	EPA 300.0	**1200**	100	mg/L	50	A305809	05/30/13	05/30/13	
Total Dissolved Solids	SM 2540C	**3900**	5.0	mg/L	1	A305821	06/03/13	06/10/13	
***Total Kjeldahl Nitrogen**	EPA 351.2	**3.4**	1.0	mg/L	1	A305864	06/01/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Arsenic - Dissolved (1)	EPA 200.8	**18**	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Barium - Dissolved (1)	EPA 200.8	**19**	5.0	ug/L	1	A306084	06/06/13	06/10/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
***Boron - Dissolved (1)**	EPA 200.7	**3.3**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
Calcium - Dissolved (1)	EPA 200.7	**340**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	
Hardness as CaCO3, Dissolved	SM 2340B	**1000**	0.41	mg/L					

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/13/2013 14:20
Received Date: 05/30/2013
Received Time: 14:49

Lab Sample ID: A3E2284-01
Sample Date: 05/30/2013 10:35
Sample Type: Grab

Client Project: FR1216043A.0004
Sampled by: Client
Matrix: Water

Sample Description: W-021

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A306084	06/06/13	06/07/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A306084	06/06/13	06/10/13	
Magnesium - Dissolved (1)	EPA 200.7	**48**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.30**	0.010	mg/L	1	A306084	06/06/13	06/07/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A306084	06/06/13	06/10/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**61**	10	ug/L	1	A306084	06/06/13	06/10/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Potassium - Dissolved (1)	EPA 200.7	**5.6**	2.0	mg/L	1	A306084	06/06/13	06/07/13	
Selenium - Dissolved (1)	EPA 200.8	**26**	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**30**	0.20	mg/L	1	A306084	06/06/13	06/07/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A306084	06/06/13	06/07/13	
Sodium	EPA 200.7	**1100**	20	mg/L	20	A305897	06/03/13	06/07/13	
Sodium - Dissolved (1)	EPA 200.7	**1100**	10	mg/L	10	A306084	06/06/13	06/11/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**7.73**	pCi/L	A306099	06/06/13	06/07/13	
***1.65 Sigma Uncertainty**		**0.426**	±				
***MDA95**		**1.16**	pCi/L				

Certificate of Analysis

Gary Kramer
AMEC E&I
1281 E. Alluvial, Ste. 101
Fresno, CA 93720

Report Issue Date: 06/13/2013 14:20
Received Date: 05/30/2013
Received Time: 14:49

Lab Sample ID: A3E2284-02
Sample Date: 05/30/2013 11:30
Sample Type: Grab
Client Project: FR1216043A.0004
Sampled by: Client
Matrix: Water

Sample Description: W-022

General Chemistry

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
***Aggressive Index**		**13**				A306213	06/10/13	06/10/13	
Alkalinity as CaCO3	SM 2320 B	**160**	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Bicarbonate as CaCO3	SM 2320 B	**160**	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Carbonate as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Hydroxide as CaCO3	SM 2320 B	ND	3.0	mg/L	1	A305792	05/31/13	05/31/13	
Chloride	EPA 300.0	**240**	10	mg/L	10	A305809	05/30/13	05/30/13	
Conductivity @ 25C	SM 2510 B	**2700**	1.0	umhos/cm	1	A305792	05/31/13	05/31/13	
***Exchangeable Sodium Percentage**		**49**		%	1	A306289	06/11/13	06/11/13	
Fluoride	SM 4500-F C	**0.16**	0.10	mg/L	1	A306052	06/05/13	06/05/13	
Langelier Index	SM 2330 B	**0.81**				A306236	06/10/13	06/10/13	
***Mass Balance-Anions**		**31**		meq/L					
***Mass Balance-Dissolved Cations**		**32**		meq/L					
MBAS, Calculated as LAS, mol wt 340	SM 5540 C	ND	0.050	mg/L	1	A305838	05/31/13 11:50	05/31/13 11:50	
Nitrate as N	EPA 300.0	ND	2.2	mg/L	10	A305809	05/30/13 22:14	05/30/13 22:14	DL01
Nitrate as NO3	EPA 300.0	ND	10	mg/L	10	A305809	05/30/13 22:14	05/30/13 22:14	DL01
Nitrite as N	EPA 300.0	ND	0.50	mg/L	10	A305809	05/30/13 22:14	05/30/13 22:14	DL01
pH (1)	SM 4500-H+ B	**8.0**		pH Units	1	A305792	05/31/13	05/31/13	
pH Temperature in °C		**22.0**							
***Sodium Absorption Ratio**		**5.6**				A306213	06/10/13	06/10/13	
Sulfate as SO4	EPA 300.0	**1000**	40	mg/L	20	A305840	05/31/13	05/31/13	
Total Dissolved Solids	SM 2540C	**2000**	5.0	mg/L	1	A305821	06/03/13	06/10/13	
*Total Kjeldahl Nitrogen	EPA 351.2	ND	1.0	mg/L	1	A305864	06/01/13	06/03/13	

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
Aluminum - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	
Antimony - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Arsenic - Dissolved (1)	EPA 200.8	ND	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Barium - Dissolved (1)	EPA 200.8	**13**	5.0	ug/L	1	A306084	06/06/13	06/10/13	
Beryllium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
***Boron - Dissolved (1)**	EPA 200.7	**2.6**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
Cadmium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
Calcium - Dissolved (1)	EPA 200.7	**170**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
Chromium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Copper - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	
Hardness as CaCO3, Dissolved	SM 2340B	**790**	0.41	mg/L					

Certificate of Analysis

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Report Issue Date: 06/13/2013 14:20
Received Date: 05/30/2013
Received Time: 14:49

Lab Sample ID: A3E2284-02 **Client Project:** FR1216043A.0004
Sample Date: 05/30/2013 11:30 **Sampled by:** Client
Sample Type: Grab **Matrix:** Water

Sample Description: W-022

Metals

Analyte	Method	Result	RL	Units	RL Mult	Batch	Prepared	Analyzed	Qual
*Iron - Dissolved (1)	EPA 200.7	ND	0.030	mg/L	1	A306084	06/06/13	06/07/13	
Lead - Dissolved (1)	EPA 200.8	ND	5.0	ug/L	1	A306084	06/06/13	06/10/13	
Magnesium - Dissolved (1)	EPA 200.7	**91**	0.10	mg/L	1	A306084	06/06/13	06/07/13	
***Manganese - Dissolved (1)**	EPA 200.7	**0.46**	0.010	mg/L	1	A306084	06/06/13	06/07/13	
Mercury - Dissolved (1)	EPA 200.8	ND	0.20	ug/L	1	A306084	06/06/13	06/10/13	
***Molybdenum - Dissolved (1)**	EPA 200.8	**80**	10	ug/L	1	A306084	06/06/13	06/10/13	
Nickel - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Potassium - Dissolved (1)	EPA 200.7	**3.3**	2.0	mg/L	1	A306084	06/06/13	06/07/13	
Selenium - Dissolved (1)	EPA 200.8	**8.6**	2.0	ug/L	1	A306084	06/06/13	06/10/13	
Silica (SiO2) - Dissolved (1)	EPA 200.7	**46**	0.20	mg/L	1	A306084	06/06/13	06/07/13	
Silver - Dissolved (1)	EPA 200.7	ND	0.010	mg/L	1	A306084	06/06/13	06/07/13	
Sodium	EPA 200.7	**370**	1.0	mg/L	1	A305897	06/03/13	06/06/13	
Sodium - Dissolved (1)	EPA 200.7	**370**	1.0	mg/L	1	A306084	06/06/13	06/07/13	
Thallium - Dissolved (1)	EPA 200.8	ND	1.0	ug/L	1	A306084	06/06/13	06/10/13	
*Vanadium - Dissolved (1)	EPA 200.8	ND	10	ug/L	1	A306084	06/06/13	06/10/13	
Zinc - Dissolved (1)	EPA 200.7	ND	0.050	mg/L	1	A306084	06/06/13	06/07/13	

Radiological

Analyte	Method	Result	Units	Batch	Prepared	Analyzed	Qual
***Gross Alpha**	EPA 00-02	**11.0**	pCi/L	A306099	06/06/13	06/07/13	
***1.65 Sigma Uncertainty**		**0.504**	±				
***MDA95**		**1.16**	pCi/L				

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305792				Analyst: CEG		Prepared: 05/30/2013					
Blank (A305792-BLK1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	ND	3.0	mg/L							05/30/13	
Bicarbonate as CaCO3	ND	3.0	mg/L							05/30/13	
Carbonate as CaCO3	ND	3.0	mg/L							05/30/13	
Conductivity @ 25C	ND	1.0	umhos/cm							05/30/13	
Hydroxide as CaCO3	ND	3.0	mg/L							05/30/13	
Blank Spike (A305792-BS1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	100	3.0	mg/L	100		101	80-120			05/30/13	
Blank Spike Dup (A305792-BSD1) SM 2320 B - Quality Control											
Alkalinity as CaCO3	100	3.0	mg/L	100		103	80-120	2	20	05/30/13	
Duplicate (A305792-DUP1) SM 2320 B - Quality Control						**Source: A3E2251-02**					
Alkalinity as CaCO3	130	3.0	mg/L		130			0	10	05/30/13	
Bicarbonate as CaCO3	130	3.0	mg/L		130			0	10	05/30/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/30/13	
Conductivity @ 25C	1000	1.0	umhos/cm		1000			0	20	05/30/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/30/13	
pH (1)	7.9		pH Units		7.9			0	20	05/30/13	
Duplicate (A305792-DUP2) SM 2320 B - Quality Control						**Source: A3E2296-01**					
Alkalinity as CaCO3	64	3.0	mg/L		64			1	10	05/31/13	
Bicarbonate as CaCO3	64	3.0	mg/L		64			1	10	05/31/13	
Carbonate as CaCO3	ND	3.0	mg/L		ND				10	05/31/13	
Conductivity @ 25C	310	1.0	umhos/cm		310			0	20	05/31/13	
Hydroxide as CaCO3	ND	3.0	mg/L		ND				10	05/31/13	
pH (1)	8.1		pH Units		8.1			0	20	05/31/13	
Batch: A305809				Analyst: AJT		Prepared: 05/30/2013					
Blank (A305809-BLK1) EPA 300.0 - Quality Control											
Chloride	ND	1.0	mg/L							05/30/13	
Nitrate as N	ND	0.22	mg/L							05/30/13	
Nitrate as NO3	ND	1.0	mg/L							05/30/13	
Nitrite as N	ND	0.050	mg/L							05/30/13	
Sulfate as SO4	ND	2.0	mg/L							05/30/13	
Blank Spike (A305809-BS1) EPA 300.0 - Quality Control											
Chloride	50	1.0	mg/L	50		100	90-110			05/30/13	
Nitrate as N	11	0.22	mg/L	11		100	90-110			05/30/13	
Nitrate as NO3	50	1.0	mg/L	50		100	90-110			05/30/13	
Nitrite as N	0.50	0.050	mg/L	0.50		99	90-110			05/30/13	
Sulfate as SO4	50	2.0	mg/L	50		100	90-110			05/30/13	
Blank Spike Dup (A305809-BSD1) EPA 300.0 - Quality Control											
Chloride	50	1.0	mg/L	50		100	90-110	1	20	05/30/13	
Nitrate as N	11	0.22	mg/L	11		100	90-110	0	20	05/30/13	
Nitrate as NO3	50	1.0	mg/L	50		100	90-110	0	20	05/30/13	

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305809				Analyst: AJT		Prepared: 05/30/2013					
Blank Spike Dup (A305809-BSD1)	**EPA 300.0 - Quality Control**										
Nitrite as N	0.51	0.050	mg/L	0.50		101	90-110	2	20	05/30/13	
Sulfate as SO4	50	2.0	mg/L	50		100	90-110	0	20	05/30/13	
Matrix Spike (A305809-MS1)	**EPA 300.0 - Quality Control**					**Source: A3E2282-08**					
Chloride	100	2.0	mg/L	100	5.1	99	80-120			05/30/13	
Nitrate as N	25	0.44	mg/L	23	2.3	99	80-120			05/30/13	
Nitrate as NO3	110	2.0	mg/L	100	10	99	80-120			05/30/13	
Nitrite as N	0.99	0.10	mg/L	1.0	ND	99	80-120			05/30/13	
Sulfate as SO4	110	4.0	mg/L	100	6.1	99	80-120			05/30/13	
Matrix Spike (A305809-MS2)	**EPA 300.0 - Quality Control**					**Source: A3E2281-01**					
Chloride	120	2.0	mg/L	100	18	101	80-120			05/30/13	
Nitrate as N	26	0.44	mg/L	23	3.1	101	80-120			05/30/13	
Nitrate as NO3	110	2.0	mg/L	100	14	101	80-120			05/30/13	
Nitrite as N	0.96	0.10	mg/L	1.0	ND	96	80-120			05/30/13	
Sulfate as SO4	130	4.0	mg/L	100	28	102	80-120			05/30/13	
Matrix Spike Dup (A305809-MSD1)	**EPA 300.0 - Quality Control**					**Source: A3E2282-08**					
Chloride	100	2.0	mg/L	100	5.1	99	80-120	0	20	05/30/13	
Nitrate as N	25	0.44	mg/L	23	2.3	99	80-120	0	20	05/30/13	
Nitrate as NO3	110	2.0	mg/L	100	10	100	80-120	0	20	05/30/13	
Nitrite as N	1.1	0.10	mg/L	1.0	ND	105	80-120	6	20	05/30/13	
Sulfate as SO4	110	4.0	mg/L	100	6.1	100	80-120	0	20	05/30/13	
Matrix Spike Dup (A305809-MSD2)	**EPA 300.0 - Quality Control**					**Source: A3E2281-01**					
Chloride	120	2.0	mg/L	100	18	100	80-120	1	20	05/30/13	
Nitrate as N	26	0.44	mg/L	23	3.1	100	80-120	1	20	05/30/13	
Nitrate as NO3	110	2.0	mg/L	100	14	100	80-120	1	20	05/30/13	
Nitrite as N	1.0	0.10	mg/L	1.0	ND	101	80-120	5	20	05/30/13	
Sulfate as SO4	130	4.0	mg/L	100	28	101	80-120	1	20	05/30/13	
Batch: A305821				Analyst: DEH		Prepared: 06/03/2013					
Blank (A305821-BLK1)	**SM 2540C - Quality Control**										
Total Dissolved Solids	ND	5.0	mg/L							06/10/13	
Blank (A305821-BLK2)	**SM 2540C - Quality Control**										
Total Dissolved Solids	ND	5.0	mg/L							06/10/13	
Duplicate (A305821-DUP1)	**SM 2540C - Quality Control**					**Source: A3E2216-01**					
Total Dissolved Solids	740	5.0	mg/L		690			6	20	06/10/13	
Duplicate (A305821-DUP2)	**SM 2540C - Quality Control**					**Source: A3E2240-01**					
Total Dissolved Solids	540	5.0	mg/L		510			6	20	06/10/13	
Batch: A305838				Analyst: CCH		Prepared: 05/31/2013					
Blank (A305838-BLK1)	**SM 5540 C - Quality Control**										

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305838				Analyst: CCH		Prepared: 05/31/2013					
Blank (A305838-BLK1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	ND	0.050	mg/L							05/31/13	
Blank Spike (A305838-BS1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	0.99	0.050	mg/L	1.0		99	80-120			05/31/13	
Blank Spike Dup (A305838-BSD1) SM 5540 C - Quality Control											
MBAS, Calculated as LAS, mol wt 340	1.0	0.050	mg/L	1.0		100	80-120	1	20	05/31/13	
Matrix Spike (A305838-MS1) SM 5540 C - Quality Control						**Source: A3E2284-01**					
MBAS, Calculated as LAS, mol wt 340	0.98	0.050	mg/L	1.0	ND	98	80-120			05/31/13	
Matrix Spike (A305838-MS2) SM 5540 C - Quality Control						**Source: A3E1921-01RE1**					
MBAS, Calculated as LAS, mol wt 340	1.0	0.050	mg/L	1.0	ND	100	80-120			05/31/13	
Matrix Spike Dup (A305838-MSD1) SM 5540 C - Quality Control						**Source: A3E2284-01**					
MBAS, Calculated as LAS, mol wt 340	0.96	0.050	mg/L	1.0	ND	96	80-120	2	20	05/31/13	
Matrix Spike Dup (A305838-MSD2) SM 5540 C - Quality Control						**Source: A3E1921-01RE1**					
MBAS, Calculated as LAS, mol wt 340	1.0	0.050	mg/L	1.0	ND	102	80-120	2	20	05/31/13	
Batch: A305840				Analyst: AJT		Prepared: 05/31/2013					
Blank (A305840-BLK1) EPA 300.0 - Quality Control											
Sulfate as SO4	ND	2.0	mg/L							05/31/13	
Blank Spike (A305840-BS1) EPA 300.0 - Quality Control											
Sulfate as SO4	50	2.0	mg/L	50		100	90-110			05/31/13	
Blank Spike Dup (A305840-BSD1) EPA 300.0 - Quality Control											
Sulfate as SO4	50	2.0	mg/L	50		100	90-110	0	20	05/31/13	
Matrix Spike (A305840-MS1) EPA 300.0 - Quality Control						**Source: A3E2371-01**					
Sulfate as SO4	100	4.0	mg/L	100	ND	99	80-120			05/31/13	
Matrix Spike (A305840-MS2) EPA 300.0 - Quality Control						**Source: A3E2370-01**					
Sulfate as SO4	110	4.0	mg/L	100	9.3	99	80-120			05/31/13	
Matrix Spike Dup (A305840-MSD1) EPA 300.0 - Quality Control						**Source: A3E2371-01**					
Sulfate as SO4	99	4.0	mg/L	100	ND	98	80-120	1	20	05/31/13	
Matrix Spike Dup (A305840-MSD2) EPA 300.0 - Quality Control						**Source: A3E2370-01**					
Sulfate as SO4	110	4.0	mg/L	100	9.3	98	80-120	1	20	05/31/13	
Batch: A305864				Analyst: LJL		Prepared: 06/01/2013					
Blank (A305864-BLK1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	ND	1.0	mg/L							06/03/13	

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General Chemistry Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305864				Analyst: LJL		Prepared: 06/01/2013					
Blank Spike (A305864-BS1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		102	90-110			06/03/13	
Blank Spike Dup (A305864-BSD1) EPA 351.2 - Quality Control											
Total Kjeldahl Nitrogen	10	1.0	mg/L	10		102	90-110	0	10	06/03/13	
Matrix Spike (A305864-MS1) EPA 351.2 - Quality Control						**Source: A3E2184-01**					
Total Kjeldahl Nitrogen	14	1.0	mg/L	10	4.2	97	90-110			06/03/13	
Matrix Spike (A305864-MS2) EPA 351.2 - Quality Control						**Source: A3E2399-03**					
Total Kjeldahl Nitrogen	11	1.0	mg/L	10	ND	103	90-110			06/03/13	
Matrix Spike Dup (A305864-MSD1) EPA 351.2 - Quality Control						**Source: A3E2184-01**					
Total Kjeldahl Nitrogen	14	1.0	mg/L	10	4.2	101	90-110	3	10	06/03/13	
Matrix Spike Dup (A305864-MSD2) EPA 351.2 - Quality Control						**Source: A3E2399-03**					
Total Kjeldahl Nitrogen	10	1.0	mg/L	10	ND	98	90-110	5	10	06/03/13	
Batch: A306052				Analyst: CCH		Prepared: 06/05/2013					
Blank (A306052-BLK1) SM 4500-F C - Quality Control											
Fluoride	ND	0.10	mg/L							06/05/13	
Blank Spike (A306052-BS1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		100	90-110			06/05/13	
Blank Spike Dup (A306052-BSD1) SM 4500-F C - Quality Control											
Fluoride	1.0	0.10	mg/L	1.0		100	90-110	0	20	06/05/13	
Matrix Spike (A306052-MS1) SM 4500-F C - Quality Control						**Source: A3F0072-02**					
Fluoride	1.2	0.10	mg/L	1.0	0.21	102	80-120			06/05/13	
Matrix Spike (A306052-MS2) SM 4500-F C - Quality Control						**Source: A3F0137-04**					
Fluoride	1.8	0.10	mg/L	1.0	0.82	102	80-120			06/05/13	
Matrix Spike Dup (A306052-MSD1) SM 4500-F C - Quality Control						**Source: A3F0072-02**					
Fluoride	1.2	0.10	mg/L	1.0	0.21	102	80-120	0	20	06/05/13	
Matrix Spike Dup (A306052-MSD2) SM 4500-F C - Quality Control						**Source: A3F0137-04**					
Fluoride	1.8	0.10	mg/L	1.0	0.82	103	80-120	1	20	06/05/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A305897				Analyst: NRE		Prepared: 06/03/2013					
Blank (A305897-BLK2) EPA 200.7 - Quality Control											
Sodium	ND	1.0	mg/L							06/06/13	
Blank Spike (A305897-BS2) EPA 200.7 - Quality Control											
Sodium	10	1.0	mg/L	10		103	85-115			06/06/13	
Blank Spike Dup (A305897-BSD2) EPA 200.7 - Quality Control											
Sodium	10	1.0	mg/L	10		104	85-115	0	20	06/06/13	
Matrix Spike (A305897-MS3) EPA 200.7 - Quality Control						**Source: A3E2281-01**					
Sodium	49	1.0	mg/L	10	39	98	70-130			06/06/13	
Matrix Spike (A305897-MS4) EPA 200.7 - Quality Control						**Source: A3E2313-01**					
Sodium	52	1.0	mg/L	10	43	94	70-130			06/06/13	
Matrix Spike Dup (A305897-MSD3) EPA 200.7 - Quality Control						**Source: A3E2281-01**					
Sodium	48	1.0	mg/L	10	39	95	70-130	1	20	06/06/13	
Matrix Spike Dup (A305897-MSD4) EPA 200.7 - Quality Control						**Source: A3E2313-01**					
Sodium	53	1.0	mg/L	10	43	101	70-130	1	20	06/06/13	
Batch: A306084				Analyst: NRE		Prepared: 06/06/2013					
Blank (A306084-BLK2) EPA 200.7 - Quality Control											
Aluminum - Dissolved (1)	ND	0.050	mg/L							06/07/13	
Boron - Dissolved (1)	ND	0.10	mg/L							06/07/13	
Calcium - Dissolved (1)	ND	0.10	mg/L							06/07/13	
Copper - Dissolved (1)	ND	0.050	mg/L							06/07/13	
Iron - Dissolved (1)	ND	0.030	mg/L							06/07/13	
Magnesium - Dissolved (1)	ND	0.10	mg/L							06/07/13	
Manganese - Dissolved (1)	ND	0.010	mg/L							06/07/13	
Potassium - Dissolved (1)	ND	2.0	mg/L							06/07/13	
Silica (SiO2) - Dissolved (1)	ND	0.20	mg/L							06/07/13	
Silver - Dissolved (1)	ND	0.010	mg/L							06/07/13	
Sodium - Dissolved (1)	ND	1.0	mg/L							06/07/13	
Zinc - Dissolved (1)	ND	0.050	mg/L							06/07/13	
Blank Spike (A306084-BS2) EPA 200.7 - Quality Control											
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20		96	85-115			06/07/13	
Boron - Dissolved (1)	0.62	0.10	mg/L	0.60		103	85-115			06/07/13	
Calcium - Dissolved (1)	10	0.10	mg/L	10		102	85-115			06/07/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20		101	85-115			06/07/13	
Iron - Dissolved (1)	2.0	0.030	mg/L	2.0		98	85-115			06/07/13	
Magnesium - Dissolved (1)	9.8	0.10	mg/L	10		98	85-115			06/07/13	
Manganese - Dissolved (1)	0.20	0.010	mg/L	0.20		101	85-115			06/07/13	
Potassium - Dissolved (1)	10	2.0	mg/L	10		101	85-115			06/07/13	
Silica (SiO2) - Dissolved (1)	2.2	0.20	mg/L	2.1		105	85-115			06/07/13	
Silver - Dissolved (1)	0.098	0.010	mg/L	0.10		98	85-115			06/07/13	
Sodium - Dissolved (1)	9.9	1.0	mg/L	10		99	85-115			06/07/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A306084				Analyst: NRE		Prepared: 06/06/2013					
Blank Spike (A306084-BS2) EPA 200.7 - Quality Control											
Zinc - Dissolved (1)	0.21	0.050	mg/L	0.20		104	85-115			06/07/13	
Blank Spike Dup (A306084-BSD2) EPA 200.7 - Quality Control											
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20		94	85-115	2	20	06/07/13	
Boron - Dissolved (1)	0.63	0.10	mg/L	0.60		104	85-115	1	20	06/07/13	
Calcium - Dissolved (1)	10	0.10	mg/L	10		102	85-115	0	20	06/07/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20		101	85-115	0	20	06/07/13	
Iron - Dissolved (1)	2.0	0.030	mg/L	2.0		98	85-115	0	20	06/07/13	
Magnesium - Dissolved (1)	9.9	0.10	mg/L	10		99	85-115	0	20	06/07/13	
Manganese - Dissolved (1)	0.20	0.010	mg/L	0.20		101	85-115	0	20	06/07/13	
Potassium - Dissolved (1)	10	2.0	mg/L	10		100	85-115	0	20	06/07/13	
Silica (SiO2) - Dissolved (1)	2.3	0.20	mg/L	2.1		105	85-115	1	20	06/07/13	
Silver - Dissolved (1)	0.098	0.010	mg/L	0.10		98	85-115	1	20	06/07/13	
Sodium - Dissolved (1)	9.9	1.0	mg/L	10		99	85-115	0	20	06/07/13	
Zinc - Dissolved (1)	0.21	0.050	mg/L	0.20		105	85-115	1	20	06/07/13	
Matrix Spike (A306084-MS3) EPA 200.7 - Quality Control						**Source: A3E2237-01**					
Aluminum - Dissolved (1)	0.21	0.050	mg/L	0.20	ND	104	70-130			06/07/13	
Boron - Dissolved (1)	3.6	0.10	mg/L	0.60	3.0	101	70-130			06/07/13	
Calcium - Dissolved (1)	740	0.10	mg/L	10	730	123	70-130			06/07/13	
Copper - Dissolved (1)	0.21	0.050	mg/L	0.20	ND	103	70-130			06/07/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	95	70-130			06/07/13	
Magnesium - Dissolved (1)	480	0.10	mg/L	10	470	125	70-130			06/07/13	
Manganese - Dissolved (1)	0.20	0.010	mg/L	0.20	ND	98	70-130			06/07/13	
Potassium - Dissolved (1)	23	2.0	mg/L	10	12	111	70-130			06/07/13	
Silica (SiO2) - Dissolved (1)	44	0.20	mg/L	2.1	42	106	70-130			06/07/13	
Silver - Dissolved (1)	0.097	0.010	mg/L	0.10	ND	97	70-130			06/07/13	
Zinc - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	87	70-130			06/07/13	
Matrix Spike (A306084-MS4) EPA 200.7 - Quality Control						**Source: A3E2398-01**					
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	94	70-130			06/07/13	
Boron - Dissolved (1)	0.63	0.10	mg/L	0.60	ND	105	70-130			06/07/13	
Calcium - Dissolved (1)	61	0.10	mg/L	10	51	96	70-130			06/07/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	101	70-130			06/07/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	97	70-130			06/07/13	
Magnesium - Dissolved (1)	19	0.10	mg/L	10	9.2	98	70-130			06/07/13	
Manganese - Dissolved (1)	0.20	0.010	mg/L	0.20	ND	99	70-130			06/07/13	
Potassium - Dissolved (1)	14	2.0	mg/L	10	4.2	100	70-130			06/07/13	
Silica (SiO2) - Dissolved (1)	28	0.20	mg/L	2.1	26	88	70-130			06/07/13	
Silver - Dissolved (1)	0.097	0.010	mg/L	0.10	ND	97	70-130			06/07/13	
Sodium - Dissolved (1)	40	1.0	mg/L	10	31	94	70-130			06/07/13	
Zinc - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	100	70-130			06/07/13	
Matrix Spike Dup (A306084-MSD3) EPA 200.7 - Quality Control						**Source: A3E2237-01**					
Aluminum - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	101	70-130	3	20	06/07/13	
Boron - Dissolved (1)	3.5	0.10	mg/L	0.60	3.0	97	70-130	1	20	06/07/13	
Calcium - Dissolved (1)	730	0.10	mg/L	10	730	NR	70-130	2	20	06/07/13	MS02 ***Low***
Copper - Dissolved (1)	0.21	0.050	mg/L	0.20	ND	103	70-130	0	20	06/07/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A306084				Analyst: NRE		Prepared: 06/06/2013					
Matrix Spike Dup (A306084-MSD3)	**EPA 200.7 - Quality Control**					**Source: A3E2237-01**					
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	95	70-130	1	20	06/07/13	
Magnesium - Dissolved (1)	480	0.10	mg/L	10	470	42	70-130	2	20	06/07/13	MS02 ***Low***
Manganese - Dissolved (1)	0.19	0.010	mg/L	0.20	ND	97	70-130	0	20	06/07/13	
Potassium - Dissolved (1)	23	2.0	mg/L	10	12	110	70-130	0	20	06/07/13	
Silica (SiO2) - Dissolved (1)	44	0.20	mg/L	2.1	42	84	70-130	1	20	06/07/13	
Silver - Dissolved (1)	0.096	0.010	mg/L	0.10	ND	96	70-130	0	20	06/07/13	
Zinc - Dissolved (1)	0.17	0.050	mg/L	0.20	ND	86	70-130	1	20	06/07/13	
Matrix Spike Dup (A306084-MSD4)	**EPA 200.7 - Quality Control**					**Source: A3E2398-01**					
Aluminum - Dissolved (1)	0.19	0.050	mg/L	0.20	ND	97	70-130	3	20	06/07/13	
Boron - Dissolved (1)	0.63	0.10	mg/L	0.60	ND	105	70-130	0	20	06/07/13	
Calcium - Dissolved (1)	61	0.10	mg/L	10	51	102	70-130	1	20	06/07/13	
Copper - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	101	70-130	0	20	06/07/13	
Iron - Dissolved (1)	1.9	0.030	mg/L	2.0	ND	97	70-130	1	20	06/07/13	
Magnesium - Dissolved (1)	19	0.10	mg/L	10	9.2	99	70-130	1	20	06/07/13	
Manganese - Dissolved (1)	0.20	0.010	mg/L	0.20	ND	100	70-130	1	20	06/07/13	
Potassium - Dissolved (1)	14	2.0	mg/L	10	4.2	101	70-130	1	20	06/07/13	
Silica (SiO2) - Dissolved (1)	29	0.20	mg/L	2.1	26	105	70-130	1	20	06/07/13	
Silver - Dissolved (1)	0.097	0.010	mg/L	0.10	ND	97	70-130	0	20	06/07/13	
Sodium - Dissolved (1)	40	1.0	mg/L	10	31	98	70-130	1	20	06/07/13	
Zinc - Dissolved (1)	0.20	0.050	mg/L	0.20	ND	102	70-130	2	20	06/07/13	
Blank (A306084-BLK1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	2.3	2.0	ug/L							06/10/13	B1.1
Arsenic - Dissolved (1)	ND	2.0	ug/L							06/10/13	
Barium - Dissolved (1)	ND	5.0	ug/L							06/10/13	
Beryllium - Dissolved (1)	ND	1.0	ug/L							06/10/13	
Cadmium - Dissolved (1)	ND	1.0	ug/L							06/10/13	
Chromium - Dissolved (1)	ND	10	ug/L							06/10/13	
Lead - Dissolved (1)	ND	5.0	ug/L							06/10/13	
Mercury - Dissolved (1)	ND	0.20	ug/L							06/10/13	
Molybdenum - Dissolved (1)	ND	10	ug/L							06/10/13	
Nickel - Dissolved (1)	ND	10	ug/L							06/10/13	
Selenium - Dissolved (1)	ND	2.0	ug/L							06/10/13	
Thallium - Dissolved (1)	ND	1.0	ug/L							06/10/13	
Vanadium - Dissolved (1)	ND	10	ug/L							06/10/13	
Blank Spike (A306084-BS1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	230	2.0	ug/L	200		113	85-115			06/10/13	
Arsenic - Dissolved (1)	200	2.0	ug/L	200		102	85-115			06/10/13	
Barium - Dissolved (1)	210	5.0	ug/L	200		104	85-115			06/10/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200		99	85-115			06/10/13	
Cadmium - Dissolved (1)	200	1.0	ug/L	200		98	85-115			06/10/13	
Chromium - Dissolved (1)	210	10	ug/L	200		107	85-115			06/10/13	
Lead - Dissolved (1)	200	5.0	ug/L	200		101	85-115			06/10/13	
Mercury - Dissolved (1)	4.6	0.20	ug/L	5.0		91	85-115			06/10/13	
Molybdenum - Dissolved (1)	210	10	ug/L	200		107	85-115			06/10/13	
Nickel - Dissolved (1)	210	10	ug/L	200		104	85-115			06/10/13	

Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A306084				Analyst: MAS		Prepared: 06/06/2013					
Blank Spike (A306084-BS1)	**EPA 200.8 - Quality Control**										
Selenium - Dissolved (1)	190	2.0	ug/L	200		96	85-115			06/10/13	
Thallium - Dissolved (1)	200	1.0	ug/L	200		99	85-115			06/10/13	
Vanadium - Dissolved (1)	230	10	ug/L	200		113	85-115			06/10/13	
Blank Spike Dup (A306084-BSD1)	**EPA 200.8 - Quality Control**										
Antimony - Dissolved (1)	220	2.0	ug/L	200		111	85-115	1	20	06/10/13	
Arsenic - Dissolved (1)	200	2.0	ug/L	200		100	85-115	1	20	06/10/13	
Barium - Dissolved (1)	200	5.0	ug/L	200		102	85-115	1	20	06/10/13	
Beryllium - Dissolved (1)	190	1.0	ug/L	200		96	85-115	3	20	06/10/13	
Cadmium - Dissolved (1)	200	1.0	ug/L	200		98	85-115	1	20	06/10/13	
Chromium - Dissolved (1)	210	10	ug/L	200		105	85-115	2	20	06/10/13	
Lead - Dissolved (1)	200	5.0	ug/L	200		101	85-115	1	20	06/10/13	
Mercury - Dissolved (1)	4.5	0.20	ug/L	5.0		90	85-115	1	20	06/10/13	
Molybdenum - Dissolved (1)	210	10	ug/L	200		104	85-115	3	20	06/10/13	
Nickel - Dissolved (1)	200	10	ug/L	200		100	85-115	4	20	06/10/13	
Selenium - Dissolved (1)	190	2.0	ug/L	200		95	85-115	1	20	06/10/13	
Thallium - Dissolved (1)	200	1.0	ug/L	200		98	85-115	1	20	06/10/13	
Vanadium - Dissolved (1)	220	10	ug/L	200		111	85-115	2	20	06/10/13	
Matrix Spike (A306084-MS1)	**EPA 200.8 - Quality Control**					**Source: A3E2237-01**					
Antimony - Dissolved (1)	220	2.0	ug/L	200	ND	111	70-130			06/10/13	
Arsenic - Dissolved (1)	230	2.0	ug/L	200	10	111	70-130			06/10/13	
Barium - Dissolved (1)	200	5.0	ug/L	200	12	96	70-130			06/10/13	
Beryllium - Dissolved (1)	190	1.0	ug/L	200	ND	97	70-130			06/10/13	
Cadmium - Dissolved (1)	180	1.0	ug/L	200	ND	88	70-130			06/10/13	
Chromium - Dissolved (1)	240	10	ug/L	200	22	109	70-130			06/10/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	92	70-130			06/10/13	
Mercury - Dissolved (1)	4.3	0.20	ug/L	5.0	0.23	81	70-130			06/10/13	
Molybdenum - Dissolved (1)	240	10	ug/L	200	ND	113	70-130			06/10/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	95	70-130			06/10/13	
Selenium - Dissolved (1)	1700	2.0	ug/L	200	1400	131	70-130			06/10/13	MS01 ***High***
Thallium - Dissolved (1)	170	1.0	ug/L	200	ND	87	70-130			06/10/13	
Vanadium - Dissolved (1)	230	10	ug/L	200	ND	116	70-130			06/10/13	
Matrix Spike (A306084-MS2)	**EPA 200.8 - Quality Control**					**Source: A3E2398-01**					
Antimony - Dissolved (1)	230	2.0	ug/L	200	ND	113	70-130			06/10/13	
Arsenic - Dissolved (1)	200	2.0	ug/L	200	ND	101	70-130			06/10/13	
Barium - Dissolved (1)	250	5.0	ug/L	200	50	99	70-130			06/10/13	
Beryllium - Dissolved (1)	220	1.0	ug/L	200	ND	109	70-130			06/10/13	
Cadmium - Dissolved (1)	200	1.0	ug/L	200	ND	98	70-130			06/10/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	105	70-130			06/10/13	
Lead - Dissolved (1)	200	5.0	ug/L	200	ND	100	70-130			06/10/13	
Mercury - Dissolved (1)	4.7	0.20	ug/L	5.0	ND	95	70-130			06/10/13	
Molybdenum - Dissolved (1)	210	10	ug/L	200	ND	105	70-130			06/10/13	
Nickel - Dissolved (1)	200	10	ug/L	200	ND	100	70-130			06/10/13	
Selenium - Dissolved (1)	190	2.0	ug/L	200	ND	94	70-130			06/10/13	
Thallium - Dissolved (1)	190	1.0	ug/L	200	ND	94	70-130			06/10/13	
Vanadium - Dissolved (1)	230	10	ug/L	200	ND	113	70-130			06/10/13	

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Metals Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual

Batch: A306084 Analyst: MAS Prepared: 06/06/2013

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Matrix Spike Dup (A306084-MSD1)	**EPA 200.8 - Quality Control**					**Source: A3E2237-01**					
Antimony - Dissolved (1)	220	2.0	ug/L	200	ND	110	70-130	1	20	06/10/13	
Arsenic - Dissolved (1)	230	2.0	ug/L	200	10	111	70-130	0	20	06/10/13	
Barium - Dissolved (1)	200	5.0	ug/L	200	12	94	70-130	1	20	06/10/13	
Beryllium - Dissolved (1)	200	1.0	ug/L	200	ND	98	70-130	1	20	06/10/13	
Cadmium - Dissolved (1)	170	1.0	ug/L	200	ND	87	70-130	1	20	06/10/13	
Chromium - Dissolved (1)	240	10	ug/L	200	22	107	70-130	1	20	06/10/13	
Lead - Dissolved (1)	180	5.0	ug/L	200	ND	91	70-130	1	20	06/10/13	
Mercury - Dissolved (1)	4.2	0.20	ug/L	5.0	0.23	78	70-130	3	20	06/10/13	
Molybdenum - Dissolved (1)	240	10	ug/L	200	ND	114	70-130	0	20	06/10/13	
Nickel - Dissolved (1)	190	10	ug/L	200	ND	95	70-130	1	20	06/10/13	
Selenium - Dissolved (1)	1600	2.0	ug/L	200	1400	120	70-130	1	20	06/10/13	
Thallium - Dissolved (1)	180	1.0	ug/L	200	ND	88	70-130	1	20	06/10/13	
Vanadium - Dissolved (1)	230	10	ug/L	200	ND	115	70-130	1	20	06/10/13	
Matrix Spike Dup (A306084-MSD2)	**EPA 200.8 - Quality Control**					**Source: A3E2398-01**					
Antimony - Dissolved (1)	230	2.0	ug/L	200	ND	113	70-130	0	20	06/10/13	
Arsenic - Dissolved (1)	210	2.0	ug/L	200	ND	103	70-130	2	20	06/10/13	
Barium - Dissolved (1)	250	5.0	ug/L	200	50	101	70-130	2	20	06/10/13	
Beryllium - Dissolved (1)	220	1.0	ug/L	200	ND	110	70-130	2	20	06/10/13	
Cadmium - Dissolved (1)	200	1.0	ug/L	200	ND	98	70-130	1	20	06/10/13	
Chromium - Dissolved (1)	210	10	ug/L	200	ND	107	70-130	2	20	06/10/13	
Lead - Dissolved (1)	200	5.0	ug/L	200	ND	98	70-130	2	20	06/10/13	
Mercury - Dissolved (1)	4.4	0.20	ug/L	5.0	ND	89	70-130	7	20	06/10/13	
Molybdenum - Dissolved (1)	220	10	ug/L	200	ND	110	70-130	4	20	06/10/13	
Nickel - Dissolved (1)	200	10	ug/L	200	ND	99	70-130	0	20	06/10/13	
Selenium - Dissolved (1)	190	2.0	ug/L	200	ND	97	70-130	3	20	06/10/13	
Thallium - Dissolved (1)	190	1.0	ug/L	200	ND	95	70-130	1	20	06/10/13	
Vanadium - Dissolved (1)	240	10	ug/L	200	ND	116	70-130	2	20	06/10/13	

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Radiological Quality Control Report

Analyte	Result	RL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Date Analyzed	Qual
Batch: A306099				Analyst: KKC		Prepared: 06/06/2013					
Blank (A306099-BLK1) EPA 00-02 - Quality Control											
1.65 Sigma Uncertainty	ND		±							06/07/13	
Gross Alpha	ND	3	pCi/L							06/07/13	
MDA95	ND	0.00	pCi/L							06/07/13	
Blank Spike (A306099-BS1) EPA 00-02 - Quality Control											
Gross Alpha	31.2	3	pCi/L	30		104	80-120			06/07/13	
Blank Spike Dup (A306099-BSD1) EPA 00-02 - Quality Control											
Gross Alpha	27.3	3	pCi/L	30		91	80-120	13	50	06/07/13	
Matrix Spike (A306099-MS1) EPA 00-02 - Quality Control						**Source: A3E2152-01**					
Gross Alpha	108	3	pCi/L	120	3.31	87	70-130			06/07/13	
Matrix Spike (A306099-MS2) EPA 00-02 - Quality Control						**Source: A3E2398-03**					
Gross Alpha	134	3	pCi/L	120	31.5	85	70-130			06/07/13	
Matrix Spike Dup (A306099-MSD1) EPA 00-02 - Quality Control						**Source: A3E2152-01**					
Gross Alpha	92.7	3	pCi/L	120	3.31	75	70-130	15	50	06/07/13	
Matrix Spike Dup (A306099-MSD2) EPA 00-02 - Quality Control						**Source: A3E2398-03**					
Gross Alpha	117	3	pCi/L	120	31.5	71	70-130	13	50	06/07/13	

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Certificate of Analysis

06/13/2013

Notes:

- The Chain of Custody document and Sample Integrity Sheet are part of the analytical report.
- Any remaining sample(s) for testing will be disposed of one month from the final report date unless other arrangements are made in advance.
- Sample(s) received, prepared, and analyzed within the method specified criteria unless otherwise noted within this report.
- The results relate only to the samples analyzed in accordance with test(s) requested by the client on the Chain of Custody document. Any analytical quality control exceptions to method criteria that are to be considered when evaluating these results have been flagged and are defined in the data qualifiers section.
- All results are expressed on wet weight basis unless otherwise specified.
- All positive results for EPA Methods 504.1 and 524.2 require the analysis of a Field Reagent Blank (FRB) to confirm that the results are not a contamination error from field sampling steps. If Field Reagent Blanks were not submitted with the samples, this method requirement has not been performed.
- Results contained in this analytical report must be reproduced in its entirety.
- Samples collected by BSK Analytical Laboratories were collected in accordance with the BSK Sampling and Collection Standard Operating Procedures.
- BSK Analytical Laboratories certifies that the test results contained in this report meet all requirements of the NELAC Standards for applicable certified drinking water chemistry analyses unless qualified or noted in the Case Narrative.
- Analytical data contained in this report may be used for regulatory purposes to meet the requirements of the Federal or State drinking water, wastewater, and hazardous waste programs.
- J-value is equivalent to DNQ (Detected, not quantified) which is a trace value. A trace value is an analyte detected between the MDL and the laboratory reporting limit. This result is of an unknown data quality and is only qualitative (estimated). Baseline noise, calibration curve extrapolation below the lowest calibrator, method blank detections, and integration artifacts can all produce apparent DNQ values, which contribute to the un-reliability of these values.
- (1) - Residual chlorine and pH analysis have a 15 minute holding time for both drinking and waste water samples as defined by the EPA and 40 CFR 136. Waste water and ground water (monitoring well) samples must be field filtered to meet the 15 minute holding time for dissolved metals.
- * - This is not a NELAP accredited analyte.
- Summations of analytes (i.e. Total Trihalomethanes) may appear to add individual amounts incorrectly, due to rounding of analyte values occurring before or after the total value is calculated, as well as rounding of the total value.
- RL Multiplier is the factor used to adjust the reporting limit (RL) due to variations in sample preparation procedures and dilutions required for matrix interferences.

Certifications: **Please refer to our website for a copy of our Accredited Fields of Testing for each certificattion.**

State of California - ELAP	1180	State of Nevada	CA000792009A
State of California - ELAP (Rancho Cordova)	2435	State of Hawaii	04227CA
State of California - NELAP	04227CA	State of Oregon	4017
State of Washington	C997	State of Oregon - NWTPH	4021

Definitions and Flags for Data Qualifiers

mg/L:	Milligrams/Liter (ppm)	MDL:	Method Detection Limit	MDA95:	Min. Detected Activity
mg/Kg:	Milligrams/Kilogram (ppm)	RL:	Reporting Limit: DL x Dilution	MPN:	Most Probable Number
µg/L:	Micrograms/Liter (ppb)	ND:	None Detected at RL	CFU:	Colony Forming Unit
µg/Kg:	Micrograms/Kilogram (ppb)	pCi/L:	Picocuries per Liter	Absent:	Less than 1 CFU/100mLs
%:	Percent Recovered (surrogates)	RL Mult:	RL Multiplier	Present:	1 or more CFU/100mLs
NR:	Non-Reportable				

MS02 Matrix spike recovery was low; the associated blank spike recovery was acceptable.

MS01 Matrix spike recovery was high; the associated blank spike recovery was acceptable.

DL01	Sample required dilution due to matrix or high concentration of non-target analyte.
B1.1	Analyte detected in associated method blank. No material impact on reported result as sample is ND for this parameter.

1414 Stanislaus Street Fresno, CA 93706 (559) 497-2888 FAX (559) 485-6935 www.bsklabs.com

An Employee-Owned Company | Analytical Testing | Construction Observation
Environmental Engineering | Geotechnical Engineering | Materials Testing

A3E2284

AMEC E&I

AMECG253

05302013

Turnaround: Standard
Due Date: 06/13/2013

CHAIN-OF-CUSTODY RECORD 16.6 FRE 15994

PROJECT NAME: Westside Water Districts

DATE:

PAGE OF

PROJECT NUMBER: FR121604Y3A.0004

RESULTS TO: Gary Kramer

TURNAROUND TIME: Standard

SAMPLE SHIPMENT METHOD: Drop off at Lab

LABORATORY NAME: BSK

LABORATORY ADDRESS: 1414 Stanislaus St Fresno, CA

LABORATORY CONTACT: Renea Rangell

LABORATORY PHONE NUMBER: 559-497-2888

CLIENT INFORMATION: AMEC 1281 E. Alluvial Ave Suite 101 Fresno CA 93720-2659

REPORTING REQUIREMENTS: AMEC Geomatrix EDD Deliverable

A3E2284 05/30/2013

AMECG2535 10 NO

SAMPLERS (SIGNATURE):

	DATE	TIME	SAMPLE NUMBER	ANALYSES: See Attached List of Analyses Table 1	CONTAINER TYPE AND SIZE	Soil (S), Water (W) Vapor (V), or Other	Filtered	Preservative Type	Cooled	MS/MSD	No. of Containers	ADDITIONAL COMMENTS
1	5/30/13	10:35	W-021	X X X		W	N		X		3	Lab to Filter
2	↓	11:30	W-022	X X X		W	N		X		3	↓

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE: [signature]	5/30/13	14:19	SIGNATURE:		
PRINTED NAME: Gary L. Kramer			PRINTED NAME:		
COMPANY: AMEC			COMPANY:		
SIGNATURE: [signature] Call	5/30/13	1449	SIGNATURE:		
PRINTED NAME: Lafey Cobb			PRINTED NAME:		
COMPANY: BSK			COMPANY:		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		

TOTAL NUMBER OF CONTAINERS:

SAMPLING COMMENTS: For any questions call Gary Kramer
- Lab Filter samples for dissolved metals
- High EC may be present. EC Range 6000-10000 umhos/cm
- Bill AMEC for sample analysis. Results to Gary Kramer
See Attached for Detailed Analysis List

1281 East Alluvial Ave., Suite 101
Fresno, California 93720-2659
Tel 559.264.2535 Fax 559.264.7431

amec

BW/wet

TABLE 1
WESTSIDE WATER DISTRICTS PROJECT ANALYTICAL LIST
FR1216043A.0004

Constituent	EPA/Standard Method
Chloride, Fluoride, Sulfate, Nitrate, Nitrite	EPA 300.0
Dissolved Metals: Aluminum, Boron, Calcium, Cadmium, Chromium, Copper, Iron, Magnesium, Manganese, Potassium, Sodium, Silica	EPA 200.7
Dissolved Metals Antimony, Arsenic, Barium, Beryllium, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc.	EPA 200.8
Sodium Adsorption Ratio, Exchangeable Sodium Percentage, Total Cations, Total Anions, Cation/Anion Balance, Langelier Saturation Index	Calculated
Specific Conductance	SM 2510 B
Total Dissolved Solids	SM 2540 C
Alkalinity as CaCO3: Bicarbonate, Carbonate, Hydroxide, Total	SM 2320 B
Hardness	SM 2340 B
Kjeldahl Nitrogen as Nitrogen	EPA 351.2
Gross Alpha	EPA 00--02
pH	SM 4500-H+B

A3E2284
AMECG2535

05/30/2013
10

Sample Integrity

BSK Bottles: Yes No Page 1 of 1

COC Info

Was temperature within range? Chemistry ≤ 6°C Micro < 10°C	Yes No NA	Were correct containers and preservatives received for the tests requested?	Yes No NA
If samples were taken today, is there evidence that chilling has begun?	Yes No NA	Were there bubbles in the VOA vials? **(Volatiles Only)**	Yes No NA
Did all bottles arrive unbroken and intact?	Yes No	Was a sufficient amount of sample received?	Yes No
Did all bottle labels agree with COC?	Yes No	Do samples have a hold time <72 hours?	Yes No
Was sodium thiosulfate added to CN sample(s) until chlorine was no longer present?	Yes No NA	Was PM notified of discrepancies? PM: By/Time:	Yes No NA

Bottles Received

"—" means preservation/chlorine checks are either N/A or are performed in the lab

250ml(A) 500ml(B) 1Liter(C) 40ml VOA(V)	Checks	Passed?	1-2					
Bacti $Na_2S_2O_3$	—	—						
None (P) White Cap	—	—	1C					
Cr6 Buffer (P) Blue Cap	pH 9-9.5	Y N						
HNO_3 (P) Red Cap	—	—	1C					
H_2SO_4 (P) Yellow Cap	pH ≤ 2	Y N	1A					
NaOH (P) Green Cap	Cl, pH ≥12	Y N						
NaOH + ZnAc (P)	pH ≥ 9	Y N						
Dissolved Oxygen 300ml (g)	—	—						
None (AG) 608/8081/8082, 625, 632/8321, 8151, 8270	—	—						
H_2SO_4 (AG) Yellow Label O&G, Diesel	—	—						
$Na_2S_2O_3$ 1 Liter (Brown P) 549	—	—						
$Na_2S_2O_3$ (AG) Blue Label 547, 515, 525, 548	—	—						
$Na_2S_2O_3$ (AG) Blue Label THMs 524.2 or 524.3	—	—						
$Na_2S_2O_3$ (CG) Blue Label 504, 505	—	—						
$Na_2S_2O_3$ + MCAA (CG) Orange Label 531	pH = 3	Y N						
NH_4Cl (AG) Purple Label 552	—	—						
EDA (AG) Brown Label DBPs	—	—						
Ascorbic + Maleic (AG) Lt Green Label 524.3	—	—						
HCL (CG) 524.2,BTEX,Gas, MTBE, 8260/624	—	—						
Buffer pH 4 (CG)	—	—						
None (CG)	—	—						
H_3PO_4 (CG) Salmon Label	—	—						
Other:								
Asbestos 1Liter Plastic w/ Foil	—	—						
Low Level Hg / Metals Double Baggie	—	—						
Bottled Water	—	—						
Clear Glass Jar: 250 / 500 / 1 Liter	—	—						
Soil Tube Brass / Steel / Plastic	—	—						
Tedlar Bag / Plastic Bag	—	—						

Ohc 5/30/13

Split

	Container	Preservative	Date/Time/Initials		Container	Preservative	Date/Time/Initials
S P				S P			
S P				S P			

Comments

Labeled by: lmo @ 1611 Labels checked by: M @ 16:21 RUSH Paged by: ______ @

APPENDIX E

Soil Texture Maps

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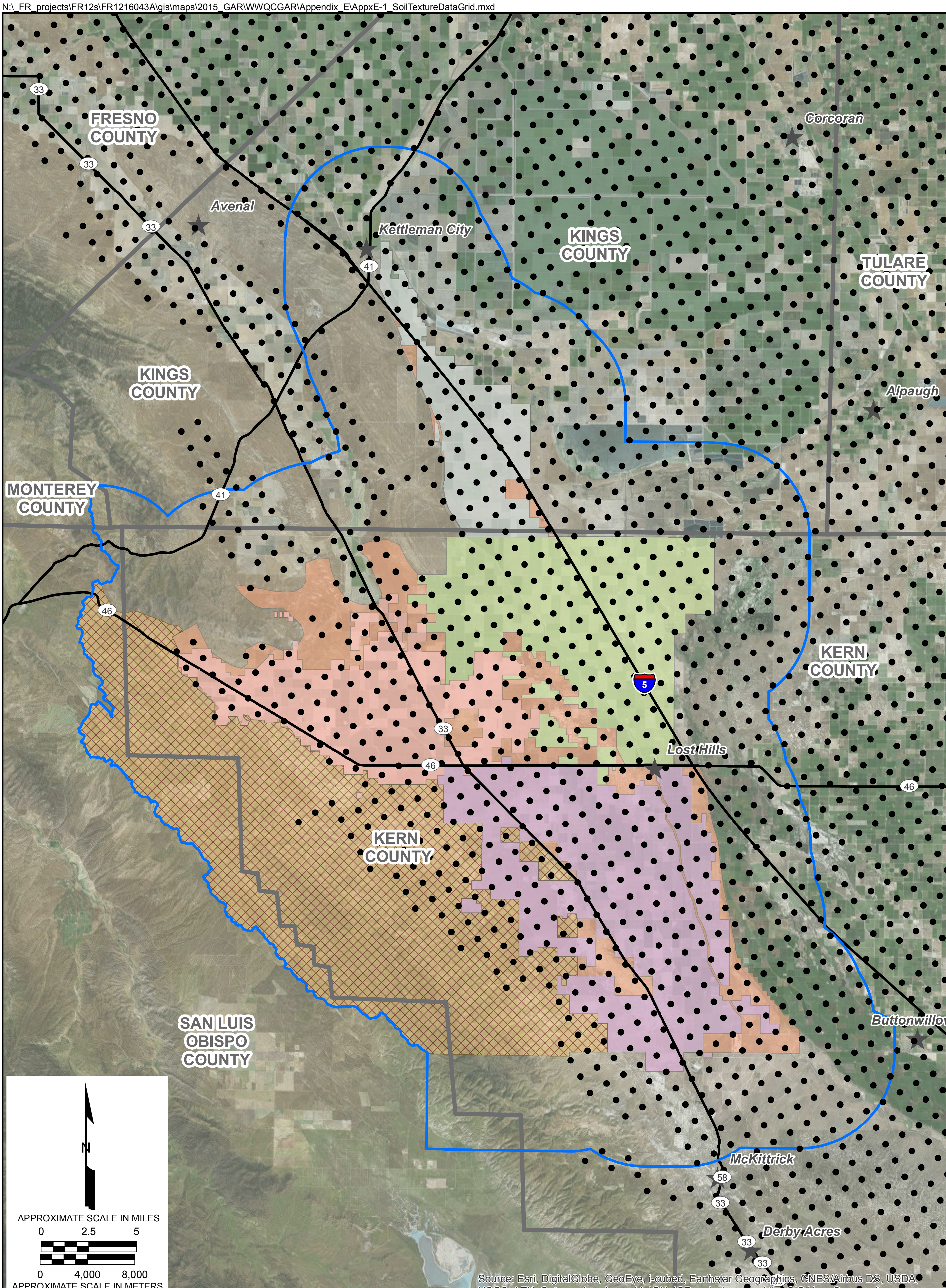


Explanation

- Soil texture data point
- Major community location
- County boundary
- Major roads
- Study area

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District
- Other coalition members
- Western Supplemental Area

Note:
Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.

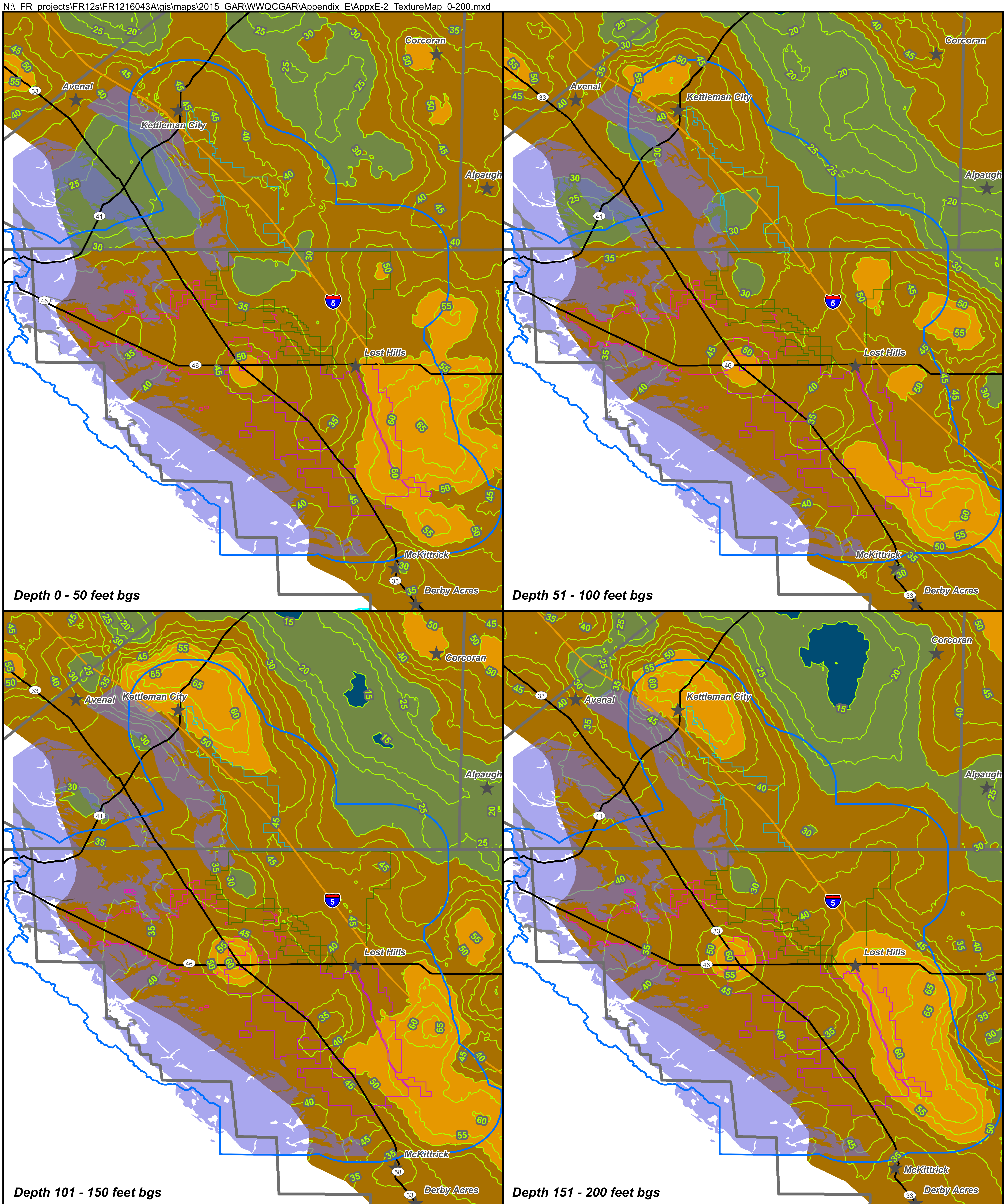
Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE DATA GRID
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

amec foster wheeler

Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-1

N:_FR_projects\FR12s\FR1216043A\gis\maps\2015_GAR\WWQCGAR\Appendix_E\AppxE-2_TextureMap_0-200.mxd



Explanation

- Major community location
- Study area
- County boundary
- Major road
- 40 Contour of percent coarse grained sediments, 5 percent interval

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
SURFACE TO 200 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

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Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-2

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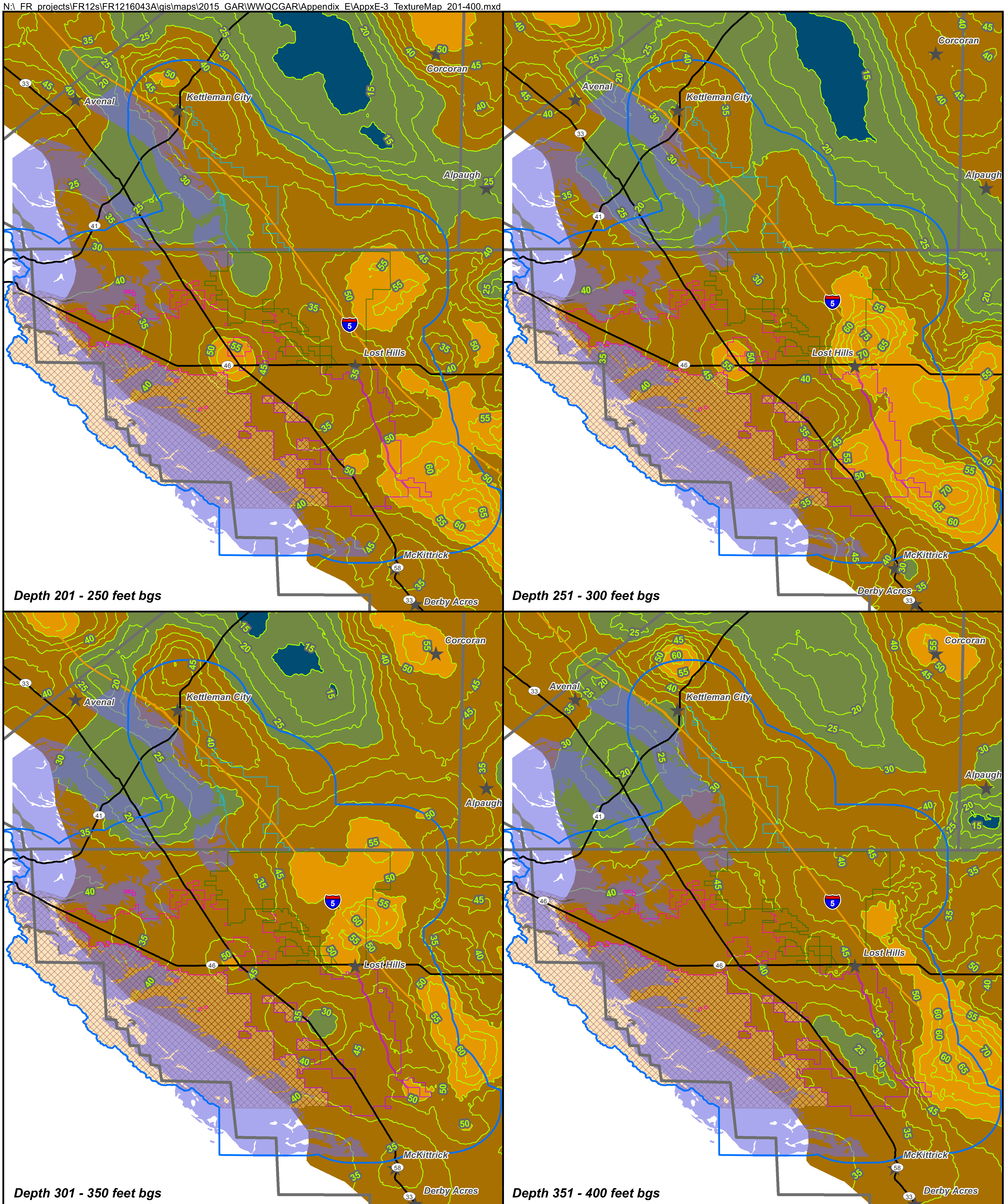

Explanation

- ★ Major community location
- Study area
- County boundary
- Major road
- Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

- 0 - 15: Lean clay/silt
- 15.1 - 30: Lean clay/silt with sand
- 30.1 - 50: Sandy lean clay/silt
- 50.1 - 85: Silty/clayey sand
- 85.1 - 100: Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
201 TO 400 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

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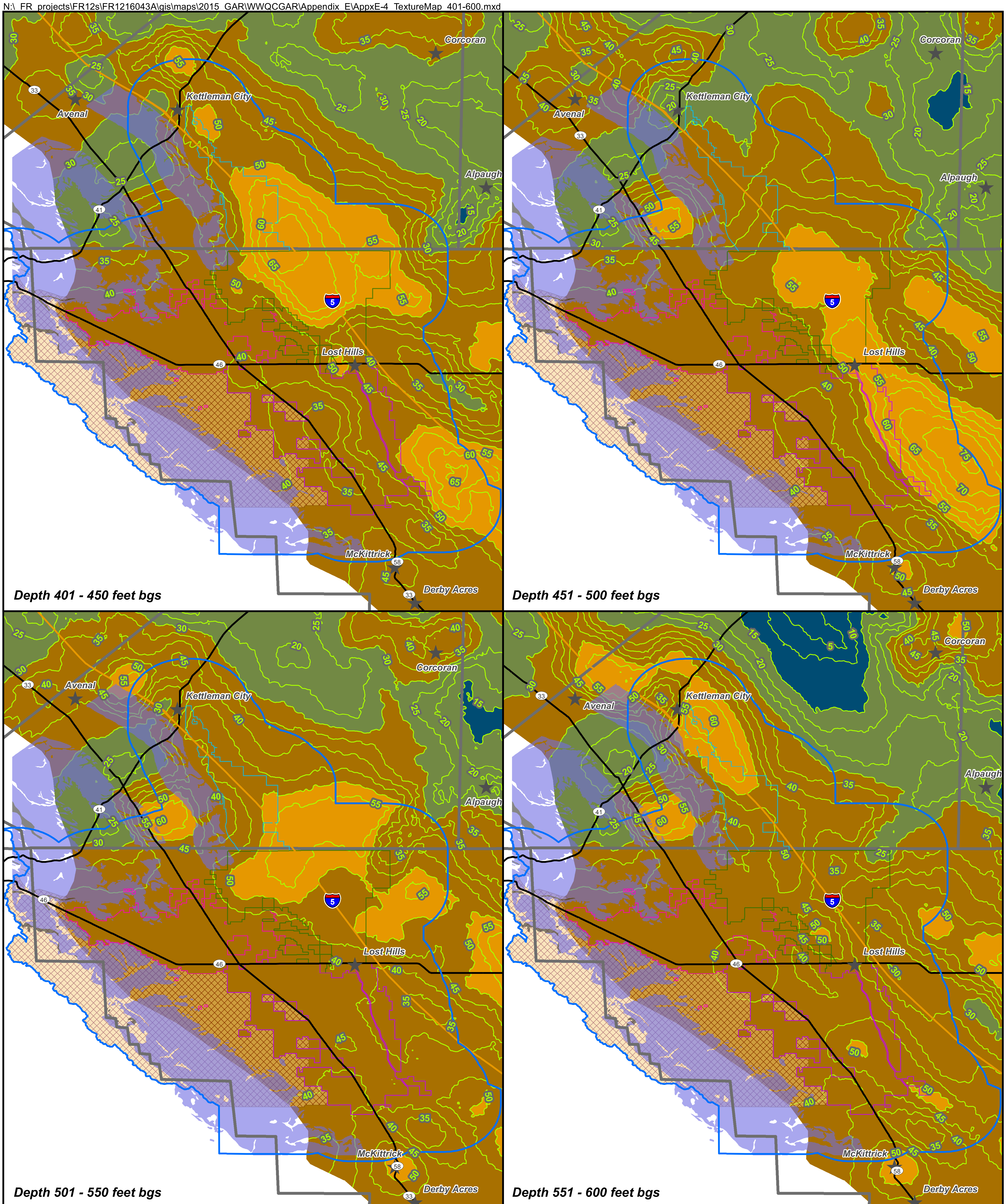
Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-3

N:_FR_projects\FR12s\FR1216043A\gis\maps\2015_GAR\WWQCGAR\Appendix_E\AppxE-4_TextureMap_401-600.mxd



Explanation

- ★ Major community location
- Study area
- County boundary
- Major road
- 40 Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

0 - 15	Lean clay/silt
15.1 - 30	Lean clay/silt with sand
30.1 - 50	Sandy lean clay/silt
50.1 - 85	Silty/clayey sand
85.1 - 100	Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL SHOWING PERCENT COARSE GRAINED MATERIAL 401 TO 600 FEET BGS
Westside Districts and Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

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Date: 05/21/2015	Project No.: FR1216043A	Figure E-4
Submitted By: GLK	Drawn By: GLK	

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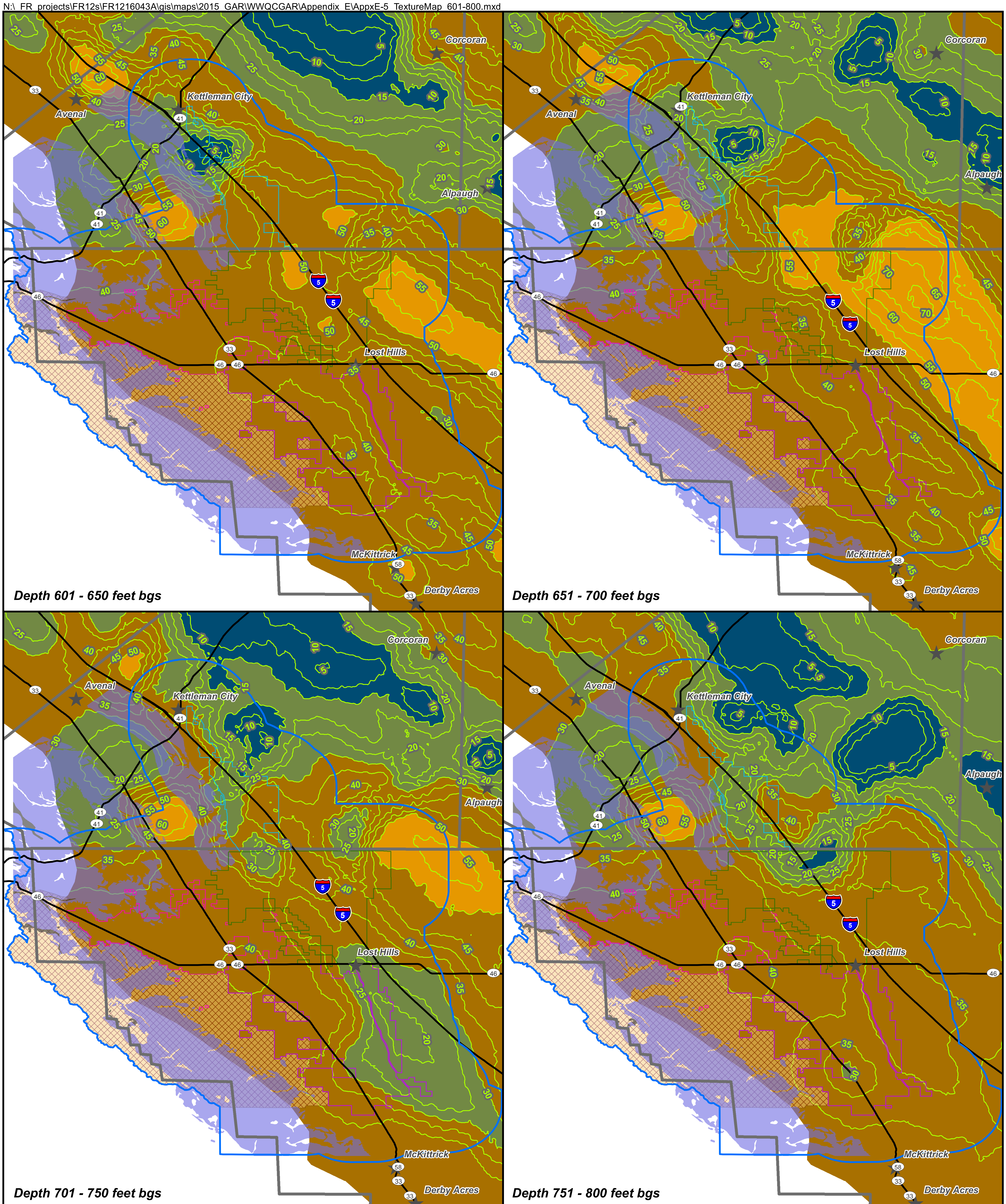

Explanation

- ★ Major community location
- Study area
- County boundary
- Major road
- Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
601 TO 800 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

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Date: 05/21/2015	Project No.: FR1216043A	Figure E-5
Submitted By: GLK	Drawn By: GLK	

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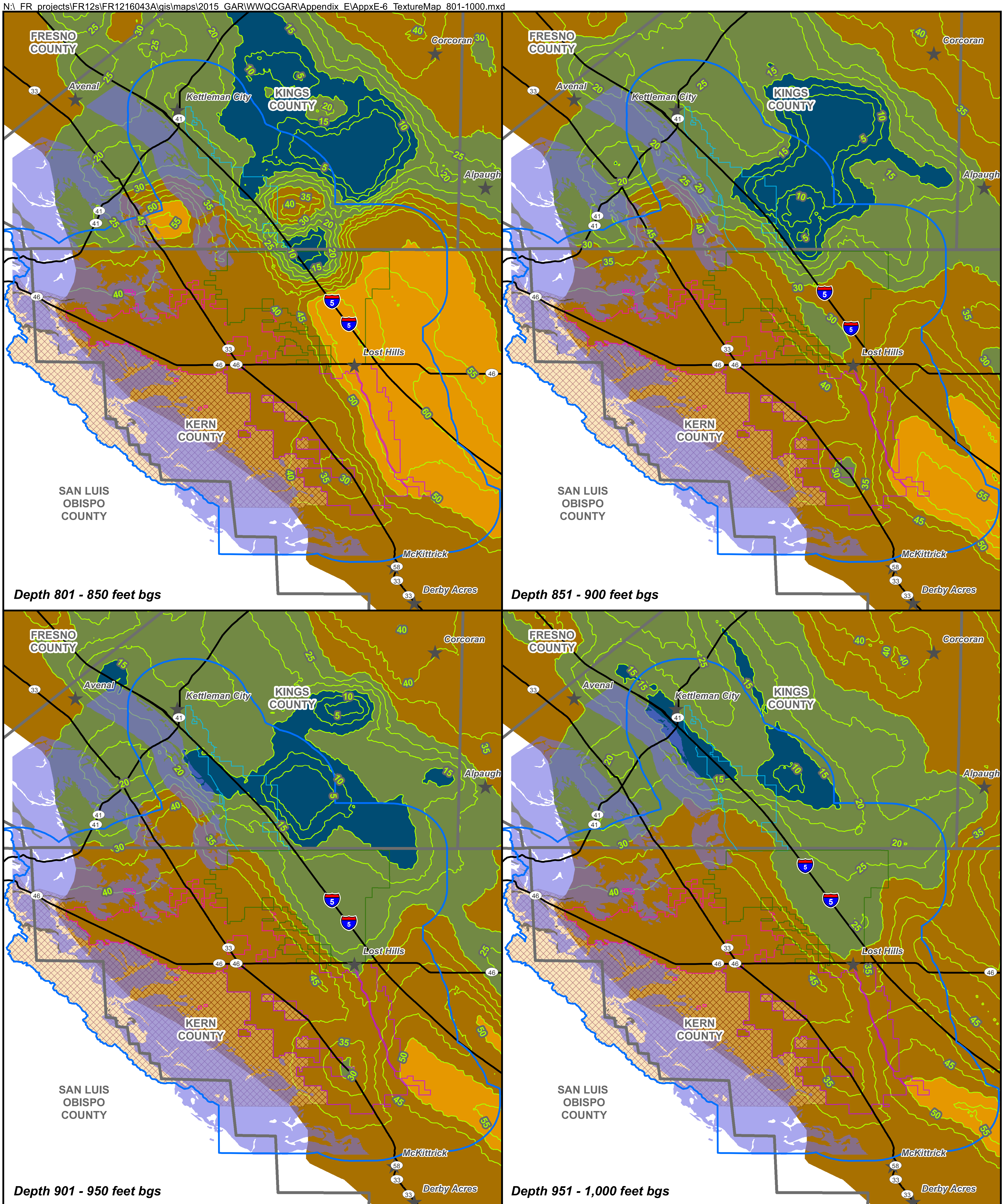

Explanation

- Major community location
- Study area
- County boundary
- Major road
- Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL SHOWING PERCENT COARSE GRAINED MATERIAL 801 TO 1,000 FEET BGS
Westside Districts and Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

amec foster wheeler

Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-6

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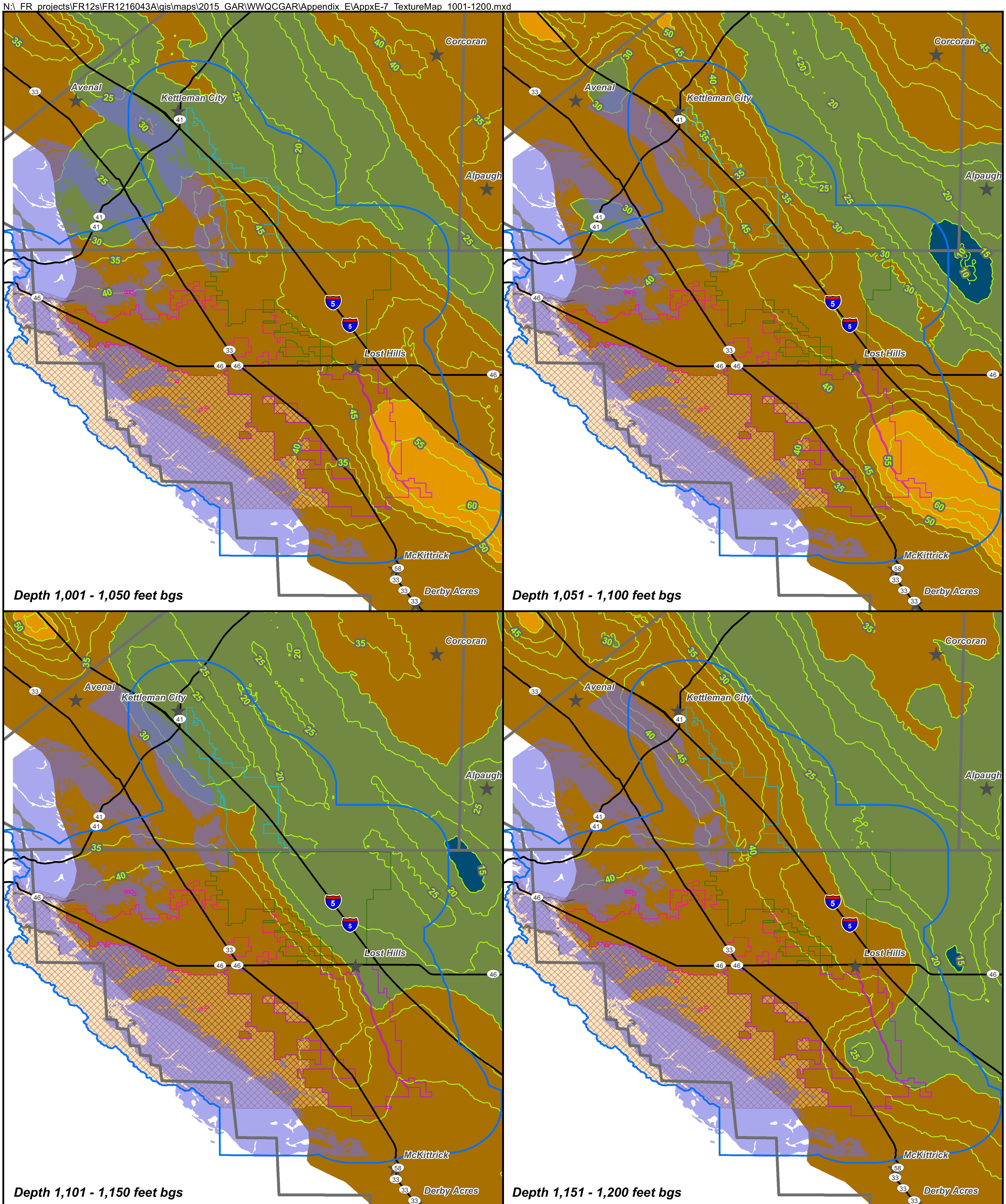

Explanation

- Major community location
- Study area
- County boundary
- Major road
- Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Aerial extent of Franciscan Formation
- Undifferentiated formation

Texture Map (percent coarse grained)

- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:

1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
1,001 TO 1,200 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

amec foster wheeler

Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-7

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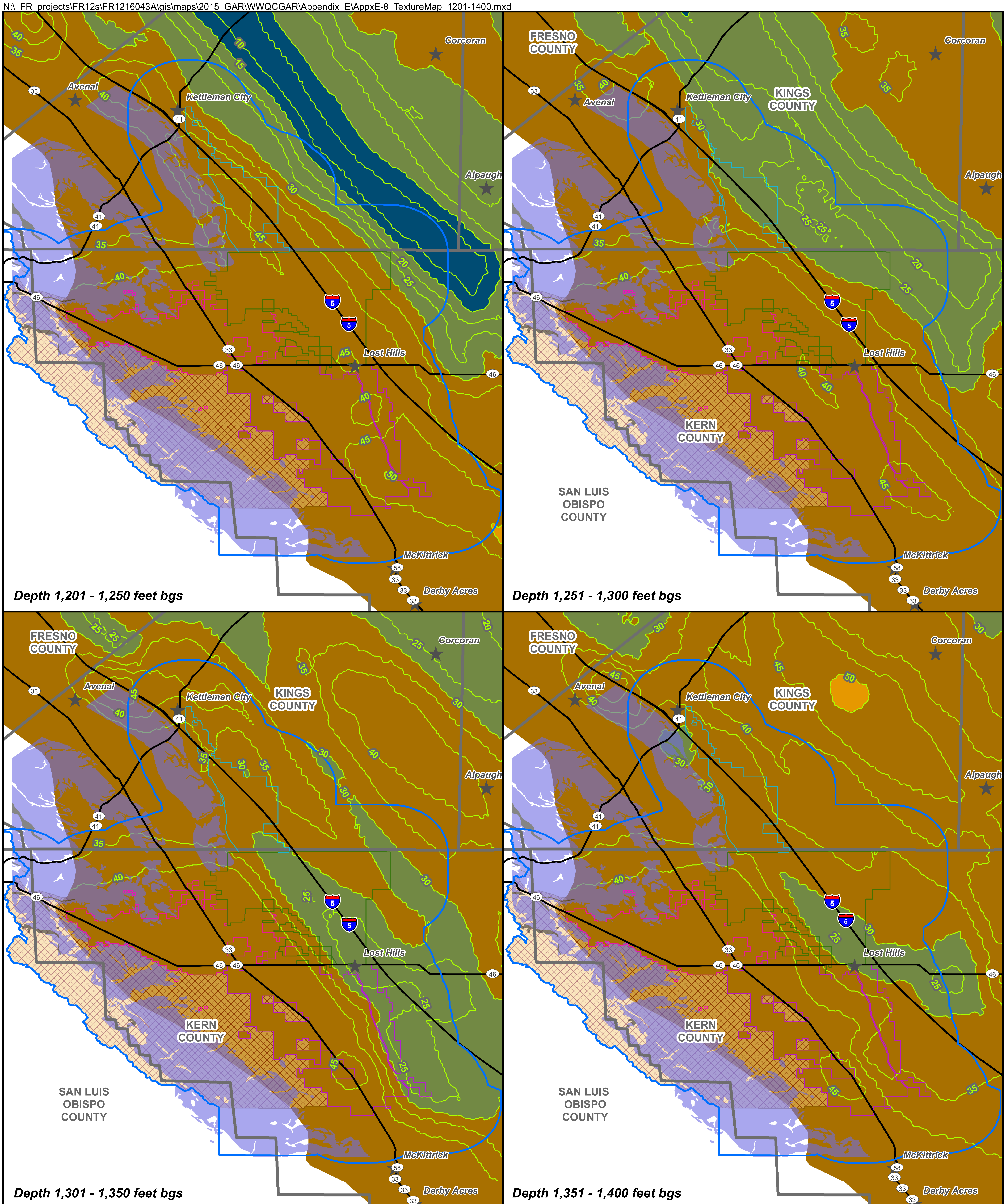

Explanation

- ★ Major community location
- Study area
- County boundary
- Major road
- 40 Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary

- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology

- Aerial extent of marine formations
- Undifferentiated formation
- Aerial extent of Franciscan Formation

Texture Map (percent coarse grained)

- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
1,201 TO 1,400 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

amec foster wheeler

Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-8

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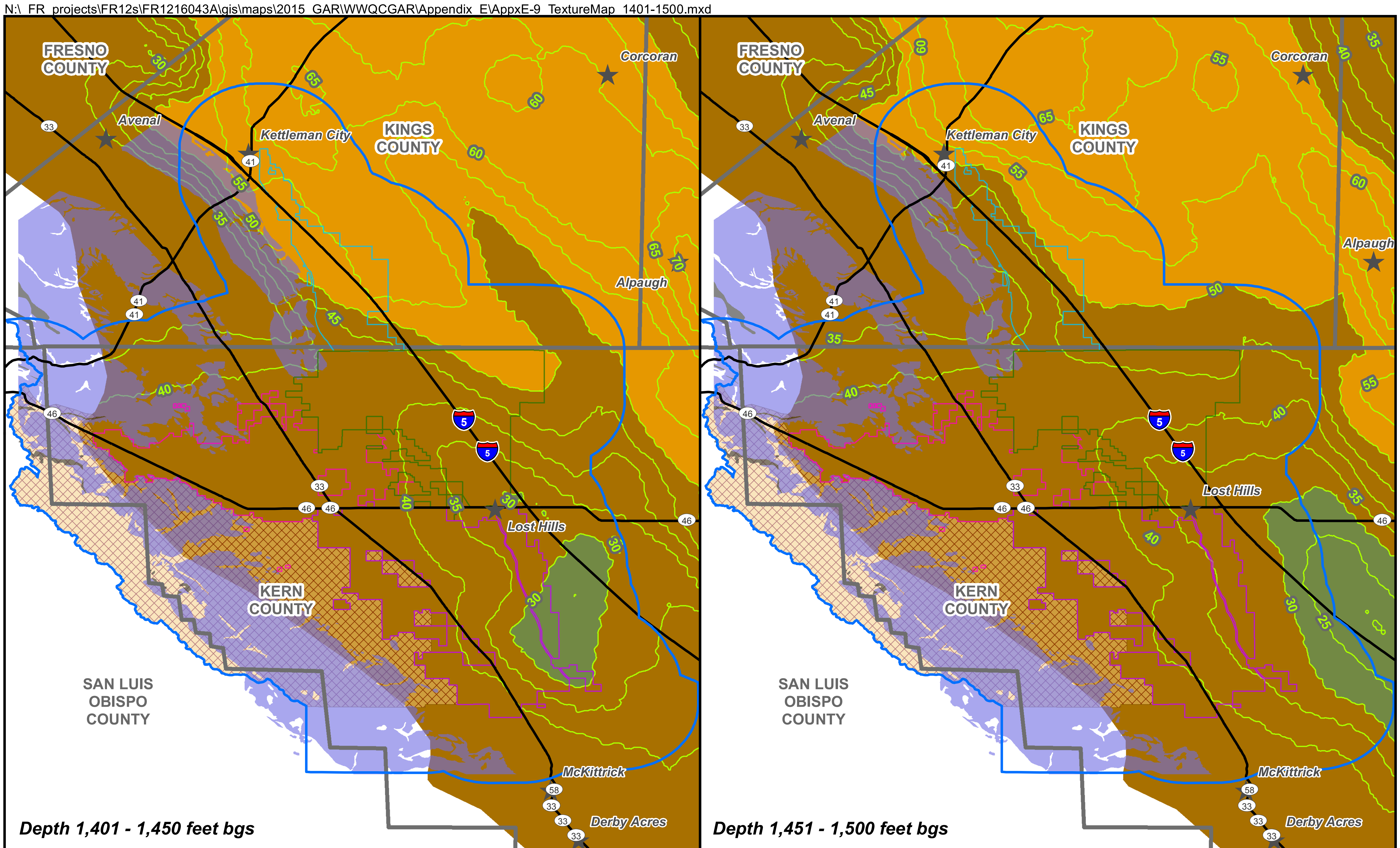

Explanation
- ★ Major community location
- Study area
- County boundary
- Major road
- 40 Contour of percent coarse grained sediments, 5 percent interval
- Western Supplemental Area

District Boundary
- Belridge Water Storage District
- Berrenda Mesa Water District
- Dudley Ridge Water District
- Lost Hills Water District

Regional Geology
- Aerial extent of marine formations
- Undifferentiated formation
- Aerial extent of Franciscan Formation

Texture Map (percent coarse grained)
- 0 - 15 Lean clay/silt
- 15.1 - 30 Lean clay/silt with sand
- 30.1 - 50 Sandy lean clay/silt
- 50.1 - 85 Silty/clayey sand
- 85.1 - 100 Poorly graded sand/gravels

Notes:
1. Tabular soil texture data obtained from USGS Professional Paper-1766, published 2012.
2. bgs = below ground surface.

Basemap modified from ESRI online shared content, aerial imagery web mapping services.

SOIL TEXTURE MAPS BY DEPTH INTERVAL
SHOWING PERCENT COARSE GRAINED MATERIAL
1,401 TO 1,500 FEET BGS
Westside Districts and
Western Supplemental Area
Westside Water Quality Coalition
Kern and Kings Counties, California

amec foster wheeler

Date: 05/21/2015	Project No.: FR1216043A	Figure
Submitted By: GLK	Drawn By: GLK	E-9