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April 4, 2016

Lauri Kemper, Assistant Executive Officer
Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

RE: Desert View Dairy Amended CAO Comments

Thank you for the opportunity to comment on the Amended Cleanup and Abatement Order No. R6V-2008-0034A4-(Proposed) (proposed CAO), issued by the California Regional Water Quality Control Board, Lahontan Region (Water Board) on March 2, 2016. Our detailed technical comments are attached.

The CAO that this new order proposes to amend currently requires replacement water for domestic wells impaired by nitrate from the Desert View Dairy (DVD) and the responsible parties have readily complied with these requirements. Where there is well impairment caused by DVD discharges, the primarily responsible party, Paul Ryken, has provided replacement water for wells with nitrate above the maximum contaminant limits. Although PG&E did not operate the former DVD dairy, the purchase of this property was necessary for the purpose of facilitating remediation by achieving hydraulic containment of the chromium plume. As part of the remediation activities and hydraulic containment operations for chromium, PG&E's groundwater extraction continues to contain the majority of the nitrate and total dissolved solids (TDS) in groundwater in the vicinity of the former DVD and greater area. To date, more than 180 tons of nitrates have been removed from the aquifer.

In contrast to the currently applicable CAO, the proposed CAO would extend replacement water supply requirements to address regional groundwater impairments caused by salts (e.g. chloride, sulfate, and TDS) without a valid technical basis and without a scientific link to the DVD discharge. As detailed in the attached comments, regional sources of salts between the Mojave River recharge and the newly expanded affected area in the proposed CAO include 60 years of agricultural operations in the Hinkley Valley, localized groundwater impacts from septic systems, and the arid groundwater environment. The impacts of these various sources confounds the linkage of DVD discharge to domestic well impacts in the expanded affected area and the proposed CAO lacks a strong technical basis for requiring replacement water by the responsible parties for the DVD.

Salt impairment in this aquifer is best addressed on a regional basis through cooperation and collaboration among all contributing stakeholders. To that end, we believe this CAO should be

crafted in the context of an overall program for the Hinkley area and the Mojave River watershed. PG&E is committed to being a good partner in finding workable, long term solutions for the salts and other regional groundwater issues in the area. As an example, the Mojave Salt and Nutrient Management Plan provides a roadmap for a possible regional and collaborative solution.

As another potential solution for regional salt impacts, PG&E continues to believe that under sink reverse osmosis systems are one of the best tools we have. The units are simple to operate, typically easy to install, minimally invasive and disruptive, and can be maintained by a homeowner. Reverse osmosis can remove salts from water as well as other natural occurring constituents naturally occurring in the regional groundwater including arsenic, manganese, and uranium. The waste product (a brine) can be managed within the context of a homeowner's existing septic system. In contrast to the large brine volumes that would be generated by a whole house replacement water system, the volume of this brine at the under sink scale is small enough that it should not overwhelm a home septic system.

Again, thank you for the opportunity to comment on the proposed CAO. We look forward to working with the Water Board and other contributing stakeholders to find a long term solution for salts in the Hinkley area and Mojave River watershed.

Respectfully,

Kevin Sullivan

Enclosure: Pacific Gas and Electric Company's Comments on Amended Cleanup and Abatement Order (CAO) R6V-2008-0034A4-PROPOSED

4/4/2016

Pacific Gas and Electric Company's Comments on Amended Cleanup and Abatement Order (CAO) R6V-2008-0034A4-PROPOSED

Introduction

The California Regional Water Quality Control Board, Lahontan Region (Water Board) intends to issue a fourth amendment to the Cleanup and Abatement Order (CAO) R6V-2008-0034 to the Dischargers for dairy waste pollution in groundwater originating at the former Desert View Dairy (DVD). R6V-2008-0034A4-Proposed (the proposed CAO) was dated March 2, 2016, with comments on the proposed CAO requested by April 4, 2016. Previous amendments to CAO R6V-2008-0034 required replacement water for domestic wells affected by nitrate originating from the DVD, groundwater investigations, domestic well sampling and reporting. The Water Board proposes to amend the CAO a fourth time to:

1. Expand the affected area for the purposes of domestic well sampling and replacement water requirements
2. Add sampling for additional constituents of concern (chloride and sulfate) related to dairy wastes;
3. Require replacement drinking and cooking water supply (i.e., bottled water or equivalent) for all domestic wells in the revised affected area with concentrations above primary or secondary Maximum Contaminant Levels for constituents of concern;
4. Require a plan and schedule to provide whole house replacement water for all domestic wells in the revised affected area with constituents of concern above primary or secondary MCLs, and
5. Provide more specific reporting requirements for domestic wells.

PG&E is committed to continue ensuring that replacement drinking water is provided to domestic wells where nitrate as nitrogen (hereafter called nitrate) exceeds the maximum contaminant level (MCL) in areas where former DVD operations may have resulted in groundwater impacts. Additionally, although PG&E did not operate the former DVD dairy and purchased this property for the purpose of achieving hydraulic containment of the chromium plume, PG&E groundwater extraction continues to contain the majority of the nitrate and total dissolved solids (TDS) in groundwater in the vicinity of the former DVD and greater area as part of hydraulic containment operations for chromium. The approximate extent of the hydraulic containment area from PG&E's remedial extraction system is shown as a dashed blue line on Figures 1 through 4 attached to the comments discussed herein. From 2004 through December 2015, more than 181 tons of nitrates have been removed from the aquifer and treated by fodder crops as part of PG&E's chromium remediation efforts and this has continued into 2016.

General Comments

The amended CAO expands requirements for replacement water and proposes to expand the affected area without a technical basis. The proposed requirements in the amended CAO include adding additional analytes with secondary MCLs (SMCLs) that could trigger requirements to provide drinking and cooking replacement water and whole house replacement water, while expanding the affected area of groundwater impairment, even when these water quality impacts cannot be connected with historical DVD operations at all wells within the current or proposed affected areas. In particular:

1. As documented in the recently published Mojave Water Agency's Salt and Nutrient Management Plan, elevated concentrations of nitrate, TDS, chloride and sulfate from non DVD sources exist in regional groundwater, with TDS concentrations ranging from 618 to 771 milligrams per liter (mg/L) across the Centro subregion (Kennedy/Jenks Consultants and Todd Groundwater, December 2015). The amended CAO proposes concentrations triggering actions and the requirements for drinking/cooking replacement and/or whole house replacement water for constituents with SMCLs, including TDS, chloride and sulfate, which are too low when used alone to link the constituents to the discharge. Non DVD sources include more than 60 years of agricultural operations in the Hinkley Valley, localized groundwater impacts from septic systems, and the arid groundwater environment. Arid environments have little recharge occurring, so aquifers may naturally become enriched in salts such as chloride and sulfate (that contribute to TDS) as minerals in the aquifers slowly dissolve over time without recharge of low TDS water to dilute groundwater. All of these sources may collectively or individually result in concentrations of TDS, chloride and sulfate above SMCLs that cannot be linked to former DVD operations.

2. There is not a technical basis for the proposed expansion of the affected area (from Salinas Road to Sonoma Street) and for linking this area to the discharge. The slow groundwater velocity (estimated to be less than 100 feet per year) and limited extent of nitrate (limited to vicinity of Thompson Road) suggest groundwater impairment from former DVD operations (and other sources in the vicinity of the DVD) is limited to south of the maximum extent of the current affected area boundary at Salinas Road and relatively short distance north of Thompson Road downgradient of the former DVD.

3. Further, the proposed amendment to the CAO includes drinking/cooking and whole house replacement water requirements that are unprecedented and may be infeasible to implement without significant disruption to well owners, if adopted as currently proposed. There are technical challenges to treating TDS for the provision of whole house replacement water (WHRW). Reverse osmosis (RO) is the only practical alternative for significantly reducing TDS concentrations, and the use of this technology to provide WHRW in the Hinkley area poses a number of technical and environmental challenges.

The following provides a more detailed technical analysis of the comments listed above.

Comments on Background TDS, Chloride and Sulfate Concentrations in Proposed CAO

In the section Basis for Replacement Water Requirements for TDS Pollution, item 17 states (*emphasis ours):*

"Data reported in the 2013 Final Environmental Impact Report certified by the Water Board for PG&E's chromium cleanup shows that groundwater upgradient of the DVD (and other dairy or farming operations) generally contains constituents below the recommended SMCL for TDS. Data from PG&E's freshwater supply wells located to the south and east of the Compressor Station and upgradient of dairy or farming operations indicate that Hinkley Valley background groundwater quality for TDS is below the recommended SMCL (TDS concentrations range from 228 to 266 mg/L). *Therefore, background water quality for TDS in the Hinkley Valley, not affected by dairy or farming operation, is better (lower) than the recommended SMCL of 500 mg/L*."

PG&E believes that Item 17 of the CAO amendment identifies background concentrations for TDS in the Hinkley Valley from wells that may be representative of areas upgradient of all current and former dairy and farming operations in the Hinkley Valley, but that these groundwater conditions are not representative of groundwater quality in the 14,000 foot distance between the PG&E freshwater supply wells identified in item 17 and the former DVD for the following reasons:

1) The proposed CAO lists PG&E's freshwater supply wells (FW-01 through FW-04), located to the south and southeast of the Compressor Station near the Mojave River, as being representative of groundwater quality "upgradient of dairy and farming operations" and implies that background TDS water quality at the former DVD is below the SMCL (TDS concentrations range from 228 to 266 mg/L). The freshwater supply wells are unrepresentative of background water quality, because of their long screen lengths (screened from 150 to almost 400 feet below ground surface) that would be expected to dilute potentially higher TDS concentrations present in shallow groundwater (depth to water is generally less than 100 feet below ground surface). Additionally, the freshwater supply well water quality is not representative of water quality upgradient of the DVD and does not serve as a technical basis for the use of the SMCL of 500 mg/L for TDS as a threshold for requirement of replacement water for the following reasons:
    - The freshwater supply wells and the DVD are 14,000 feet apart. Sixty years of historical farming and confined animal operations across this distance have impacted groundwater quality upgradient (i.e., south of) the DVD. Aerial photographs from 1952 through 1994 show the consistent and widespread historical agricultural operations upgradient of and in the vicinity of the DVD, with farming evident beginning as early as 1944 (Attachment 1). Figures 1, 2, 3, and 4 show that most groundwater upgradient (south of Santa Fe Avenue) and cross-gradient (west of Serra Road, and east of Summerset Road) has concentrations above the SMCLs for TDS, chloride, and sulfate, and the nitrate MCL before it migrates towards the DVD. Many farming and confined animal operations between the freshwater supply wells and DVD continue today.
    - As shown on Figure 1 and in Attachment 2, the widespread historical agricultural practices beginning in the 1950s has resulted in numerous monitoring wells upgradient of the DVD that consistently show TDS concentrations above the upper SMCL of 1,000 mg/L. TDS concentrations of less than 300 mg/L from the PG&E freshwater supply wells is not representative of background TDS concentrations in the absence of DVD operations.

2) The "Upgradient of DVD" wells (EX-10, EX-17, MW-41A, and MW-76S) listed in the Basis for Replacement Water Requirements for Chloride and Sulfate Pollution, Table 2 item 20, are also an unrepresentative group of wells for estimation of background concentrations. In addition to the issues noted above for TDS, these wells (except for MW-41A) are located near PG&E's freshwater injection system where relatively low TDS concentration (less than 300 mg/L) water sourced from PG&E's freshwater supply wells has been injected since May 2010. The location of PG&E's freshwater injection wells are indicated with aqua well symbols southwest of the former DVD on Figures 2 and 3, with concentrations of chloride and sulfate for selected wells also posted.

    As shown on Figures 1, 2, and 3, groundwater results for wells EX-10, EX-17, and MW-76S all may be influenced by freshwater injection as indicated by generally lower TDS, chloride, and sulfate concentrations than areas south and southeast of the DVD. Therefore concentrations at the wells

listed as “Upgradient of the DVD” in the proposed CAO underestimate the concentrations of TDS, chloride and sulfate that would be present in the absence of dilution of previously higher concentrations by PG&E’s freshwater injection wells which have improved groundwater quality in this localized area. Figures 1, 2, and 3 show that the wells listed in Table 2 of the CAO include some of the lowest TDS, chloride and sulfate concentrations reported for wells upgradient of the former DVD, and that wells with concentrations exceeding the SMCLs for all of these parameters are widely present south, southeast, and east of the proposed affected area for the former DVD.

Further, monitoring well MW-41A (near Summerset Road and Santa Fe Avenue) is screened from 125 to 136 feet, which is approximately 40 feet below the water table. This well is located in an upgradient location southeast of the DVD, however concentrations of sulfate and chloride at this well also represent an underestimation of pre-existing shallow zone (water table) aquifer conditions. For example, as shown on Figures 2 and 3, MW-41S (adjacent to MW-41A and screened at the water table) has a chloride concentration of 177 mg/L and a sulfate concentration exceeding the SMCL (of 250 mg/L) at 365 mg/L. The chloride and sulfate concentrations of 90.3 and 124 mg/L, respectively, for MW-41A listed in the Prop CAO underestimate background concentrations at this monitoring well cluster.

3) The background concentration of TDS in Hinkley groundwater downgradient (and cross-gradient) of the DVD is higher than the 500 mg/L concentration proposed to require replacement water in the proposed CAO. Figure 1 shows TDS concentrations for PG&E monitoring and selected domestic supply wells in the vicinity and downgradient of the DVD, while Figure 4 shows nitrate (where available) for these same wells. The distribution of TDS greater than the SMCL on Figure 1 (blue dots) is markedly greater than the distribution of nitrate greater than the MCL of 10 mg/L, indicted with a purple dashed line on Figure 1, and shown on Figure 4. The northern extent of nitrate greater than the MCL of 10 mg/L is currently estimated to end around Thompson and Mountain View Roads, however, the most northwestern extent of wells with TDS greater than the upper SCMCL of 1,000 mg/L extends north of Salinas Road up to Mountain General Road (north of the proposed expanded affected area).

   Groundwater affected by the former DVD operations (and other historical confined animal operation sources) should contain elevated concentrations of both TDS and nitrate greater than or nearing the MCL of 10 mg/L (as indicated by the currently high concentrations for both of these constituents in the DVD area shown on Figures 1 and 4); however, this is not observed in the proposed revised affected area. Nitrate concentrations are much less than the MCL of 10 mg/L where wells have TDS concentrations exceeding the SMCLs of 500 or 1,000 mg/L. For example domestic wells 15-05, 15-06 and 15-08 north of Salinas Road and east of Serra Road (within the proposed affected area) have TDS concentrations greater than 700 mg/L but nitrate concentrations of 3 mg/L or less. Additionally, four domestic supply wells (15-02, 15-03, 15-15, and 15-16) west of Serra Road and north of Salinas Road (west of the proposed affected area) show TDS concentrations greater than 1,000 mg/L; included in this well list is 15-02 where a TDS concentration of 1,979 mg/L is present although nitrate was not detected above laboratory reporting limits (other well samples were not analyzed for nitrate). These low levels of nitrate suggest that the TDS in the northern Hinkley Valley is unlikely to have originated from the former DVD operations and show that other

significant sources of TDS are present. These data also indicate that TDS concentrations above the proposed 500 mg/L SMCL for TDS are insufficient to link the TDS to the dischargers for the purpose of triggering water replacement. The reason that TDS is observed to be present at concentrations greater than the SMCLs over a much greater area than nitrate may include the following or a combination of these factors:

- Agricultural farming has been occurring in the greater DVD area and upgradient since the 1940s (Attachment 1), however, the former DVD Dairy operations did not begin until 1981. TDS originating from agricultural operations in the greater area surrounding the former DVD in the 1950s through 1970s may have migrated downgradient of the DVD in advance of the TDS originating from former DVD operations.
- Arid groundwater systems may become naturally enriched in salts (which form TDS) due to infrequent recharge. Hinkley aquifers primarily require recharge from the Mojave River for replenishment, and the Mojave River flows infrequently limiting recharge to Hinkley groundwater. Because the Mojave River is the primary source of recharge, Hinkley groundwater becomes progressively older with distance from the Mojave River, and the older groundwater becomes, the more likely it is to become enriched in minerals such as sodium, chloride and sulfate resulting in naturally occurring TDS above the SMCL of 500 mg/L. As shown on Figure 1 most wells west and north of the proposed affected area contain TDS concentrations exceeding 500 mg/L, with some wells exceeding the SMCL of 1,000 mg/L.
- Most Hinkley residences contain septic systems. Leachates from septic tanks may result in localized areas with concentrations of chloride, sulfate, and TDS above their SMCLs, and nitrate above its MCL.
- If nitrate in groundwater originated from the former DVD operations, it may have started to percolate towards groundwater and then move northward when DVD operations began in 1981. Since nitrate and TDS are both generated during confined animal operations, wells with TDS originating from the DVD should also contain nitrate in the absence of denitrification. However, groundwater of the northern Hinkley Valley is not naturally reducing, therefore nitrate in groundwater is not expected to attenuate with distance as it travels in the aquifer due to denitrification. As a result, TDS and nitrate should move at comparable rates from where they originate. However, TDS concentrations exceeding the SMCL are present much further downgradient than nitrate, suggesting that groundwater moves very slowly and again that there are other sources of TDS in the northern Hinkley Valley than the former DVD operations.

4) Groundwater affected by the DVD has not likely travelled as far north as the TDS in groundwater above 500 mg/L. As shown in particle tracks generated from groundwater flow modeling provided in Figures A3 and A9 in Attachment 4, approximately 1,000 feet of groundwater movement is predicted to occur over a 10 year period north of Thompson Road. This indicates a slow groundwater velocity of approximately 100 feet per year in the absence of PG&E's remedial groundwater extraction. Additionally, an average groundwater velocity of approximately 126 feet per year is estimated based on the groundwater gradient for the northern Hinkley Valley as shown on Figure 3-3 in Attachment 3, with much slower groundwater movement possible (ARCADIS, 2016). Historically groundwater flow was likely comparable to these estimates because the aerial

photographs in Attachment 1 show very little agricultural activities occurring north of Thompson Road in the past while extensive farming was occurring during the past 60 years or more south of Thompson Road. With PG&E groundwater extraction occurring (which has been occurring since 2004 and is currently happening) groundwater movement is estimated to be significantly slower north of Thompson Road (on the order of 10 feet per year), as shown on Figures A4 and A14 of Attachment 4. The flow modeling results and the extent of nitrate greater than the MCL of 10 mg/L (limited to Thompson Road and vicinity) corroborate each-other in that groundwater flow is slow in the northern Hinkley Valley, and that PG&E's remedial extraction operations further reduce the rate of groundwater flow northward from the DVD.

In summary, PG&E's remedial groundwater extraction for chromium containment and historical groundwater extraction for farming in the greater DVD area appears to have reduced groundwater flow to a rate of 100 feet per year or less. Nitrate exceeding the MCL of 10 mg/L is generally limited to the vicinity of Thompson Road, which is approximately 2,700 feet downgradient of the former DVD. Conservatively estimating that nitrate was released from the former DVD beginning in the early 1980s (with limited time for percolation through the vadose zone to groundwater), and that nitrate has traveled approximately 3,000 feet (a little north of Thompson Road) during this time (36 years), a groundwater velocity of 83 feet per year is calculated. A groundwater migration rate of 100 feet per year suggests that it would take approximately 55 years for groundwater originating at the former DVD to reach Salinas Road (5,500 feet from the former DVD), and 82 years to reach Sonoma Street (8,200 feet from the former DVD). These estimates support the observed distribution of TDS and nitrate, in that 1,000 mg/L TDS is present in the vicinity of Salinas Road, from non DVD sources and that nitrate greater than the MCL of 10 mg/L is limited to the vicinity of Thompson Road and originated from former DVD and/or other confined animal operations in this area beginning in the 1980s.

Comments on Technical Challenges of Proposed CAO Requirement to Provide Whole House Replacement Water for TDS above SMCLs

RO is the only practical alternative for significantly reducing TDS concentrations, and the use of this technology to provide WHRW in the Hinkley area poses a number of technical and environmental challenges. First, an RO system sized to provide treated water for residential whole-house flows would require a significantly larger footprint than the ion exchange (IX) units utilized in conjunction with the former WHRW program for chromium under CAO R6V-2011-0005A2. RO systems are also more operationally complex, necessitating more frequent service calls at the inconvenience to the homeowner. Depending on the well water quality, pretreatment chemicals (e.g., acid for pH adjustment and/or scale inhibitors) may also be required, necessitating undesirable chemical storage on a homeowner's property. RO systems are also more energy-intensive than IX treatment. In addition, recoveries for smaller scale (i.e., residential) RO systems are generally low; consequently, the amount of water pumped from a homeowner's well could increase by 50 percent or more, potentially compromising the ability of lower yield wells to satisfy household demand.

Moreover, the only feasible means of concentrate disposal in the Hinkley area is discharge to the homeowner's septic system, and the substantial increase in flow due the low RO recovery could exceed the system's rated capacity. Environmental water quality is also an important consideration. For residential household use, only a small amount the total treated water (i.e., containing low TDS, chloride, sulfate, and/or nitrate) is removed from the water cycle via consumption (drinking). Other

used household water (e.g., from laundry, sinks, showers, and toilets) is drained to the septic system, where it would be combined with the RO concentrate. This combined flow would have water quality that is very similar to the source well, albeit slightly degraded due to the waste associated with the household drain water; thus, the percolated water from the septic system would be returned to the environment without substantially altering the concentrations of TDS and other constituents.

References

Arcadis. 2016. *Fourth Quarter 2015 Groundwater Monitoring Report and Domestic Well Sampling Results, Site-wide Groundwater Monitoring Program, Pacific Gas and Electric Company, Hinkley Compressor Station, Hinkley, California*. February 10.

Kennedy/Jenks Consultants and Todd Groundwater. 2015. *Mojave Salt and Nutrient Management Plan*. December.

Attachments

Figure 1 Total Dissolved Solids Concentrations for Selected Monitoring and Domestic Wells

Figure 2 Dissolved Chloride Concentrations for Selected Monitoring and Domestic Wells

Figure 3 Dissolved Sulfate Concentrations for Selected Monitoring and Domestic Wells

Figure 4 Nitrate as Nitrogen Concentrations for Selected Monitoring and Domestic Wells

Attachment 1 Aerial Photographs

Attachment 2 Nitrate and Total Dissolved Solids Maps

Attachment 3 Groundwater Contour Maps

Attachment 4 Particle Track Modeling

FIGURES

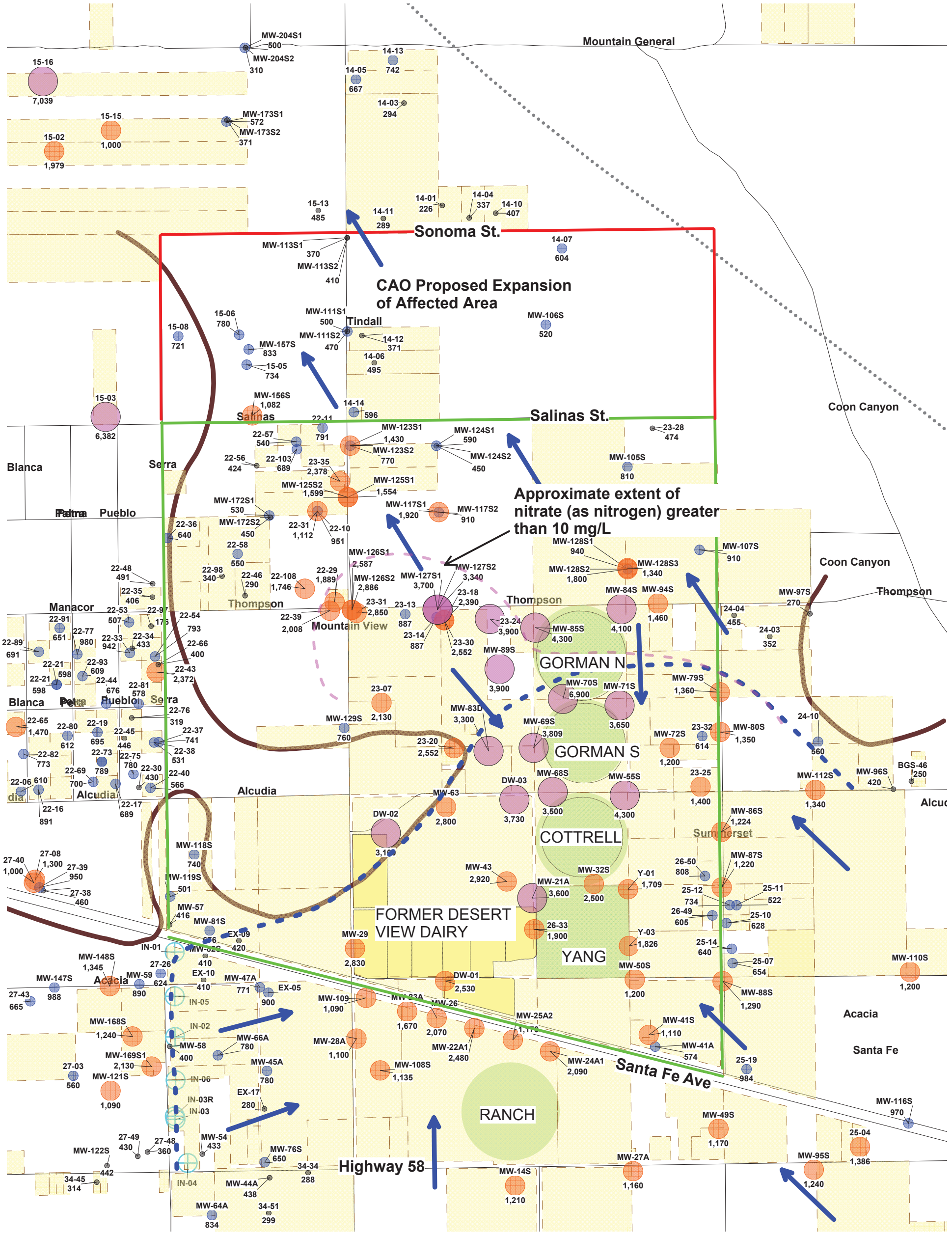


FIGURE 1
TOTAL DISSOLVED SOLIDS CONCENTRATIONS FOR SELECTED MONITORING AND DOMESTIC WELLS

Note: Data posted is the most recent total dissolved solids (TDS) data available in PG&E database. Data posted includes lab and field measured TDS. All concentrations in milligrams per liter (mg/L). The secondary maximum contaminant level for TDS is 500 mg/L, with an upper concentration of 1,000 mg/L.

TDS (mg/L)

- 0 to 500
- 500 to 1,000
- 1,000 to 3,000
- 3,000 to 10,000

N

0 2000 4000

Legend

- Approximate Limits of Saturated Alluvium
- PG&E Owned Property
- PG&E Freshwater Injection Well
- CAO Affected Area
- General Groundwater Flow Direction
- Approximate Capture Zone of PG&E Chromium Remediation Extraction Wells

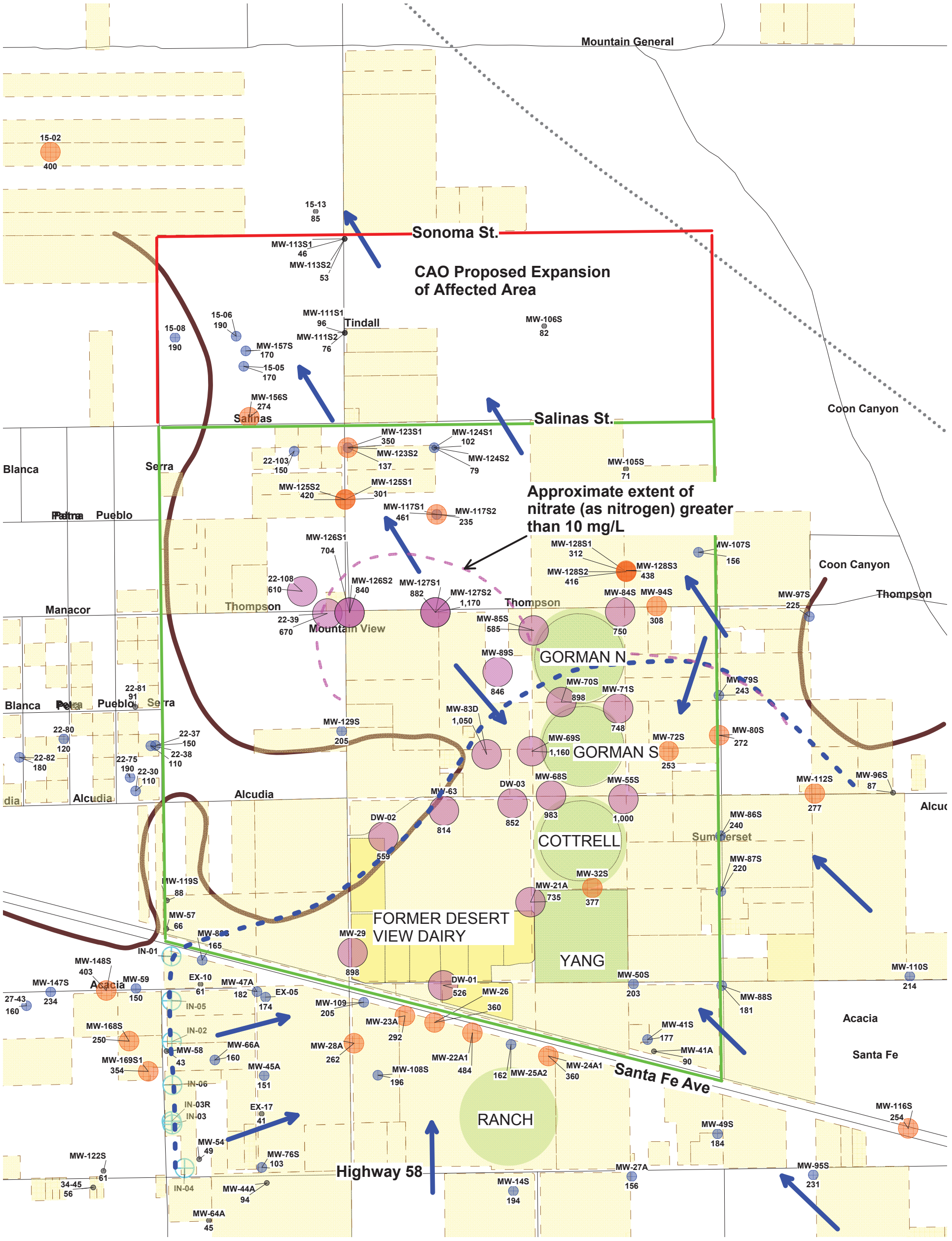


FIGURE 2
DISSOLVED CHLORIDE FOR SELECTED MONITORING AND DOMESTIC WELLS

Dissolved Chloride (mg/L)

- 0 to 100
- 100 to 250
- 250 to 500
- 500 to 1,500

Legend

- Approximate Limits of Saturated Alluvium
- PG&E Owned Property
- PG&E Freshwater Injection Well
- CAO Affected Area
- General Groundwater Flow Direction
- Approximate Capture Zone of PG&E Chromium Remediation Extraction Wells

Note:
Data posted is the most recent chloride data available in the PG&E database. All concentrations in milligrams per liter (mg/L).
250 mg/L is the reccomended secondary maximum contaminant level (SMCL). 500 mg/L is the upper SMCL.

N

0 2000 4000

FIGURE 3
DISSOLVED SULFATE FOR SELECTED MONITORING AND DOMESTIC WELLS

Note:
Data posted is the most recent chloride data available in the PG&E database. All concentrations in milligrams per liter (mg/L).
250 mg/L is the reccomended secondary maximum contaminant level (SMCL). 500 mg/L is the upper SMCL.

Dissolved Sulfate (mg/L)

- 0 to 100
- 100 to 250
- 250 to 500
- 500 to 3,000

N

0 2000 4000

Legend

- Approximate Limits of Saturated Alluvium
- PG&E Owned Property
- PG&E Freshwater Injection Well
- CAO Affected Area
- General Groundwater Flow Direction
- Approximate Capture Zone of PG&E Chromium Remediation Extraction Wells

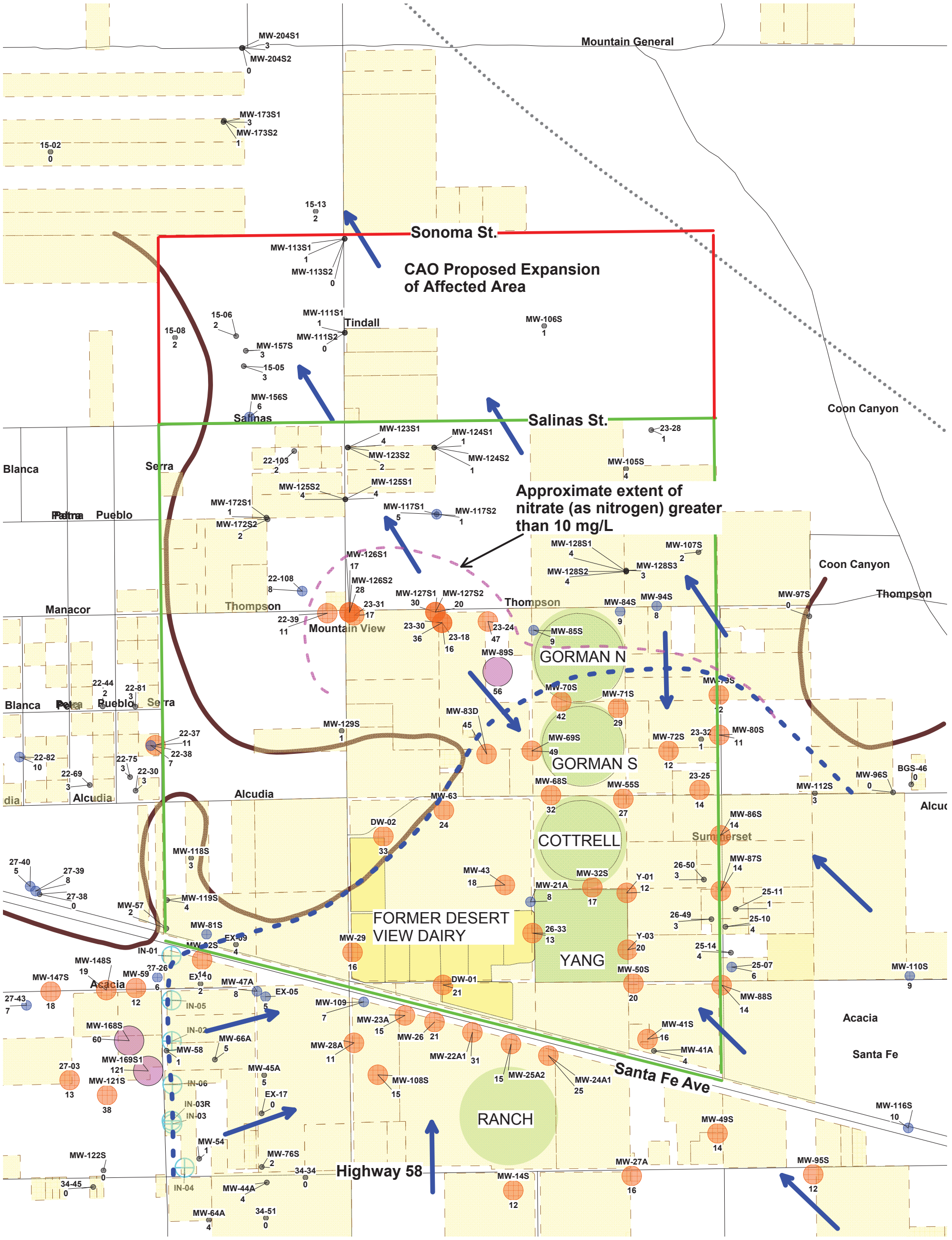


FIGURE 4
NITRATE AS NITROGEN FOR SELECTED MONITORING AND DOMESTIC WELLS

Nitrate (as Nitrogen) (mg/L)

- 0 to 5
- 5 to 10
- 10 to 50
- 50 to 200

Legend

- Approximate Limits of Saturated Alluvium
- PG&E Owned Property
- PG&E Freshwater Injection Well
- CAO Affected Area
- General Groundwater Flow Direction
- Approximate Capture Zone of PG&E Chromium Remediation Extraction Wells

Note:
Data posted is the most recent nitrate as nitrogen data available in the PG&E database.
All concentrations in milligrams per liter (mg/L).
The maximum contaminant level for nitrate (as nitrogen) is 10 mg/L.

N

0 2000 4000

ATTACHMENT 1 AERIAL PHOTOGRAPHS

Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

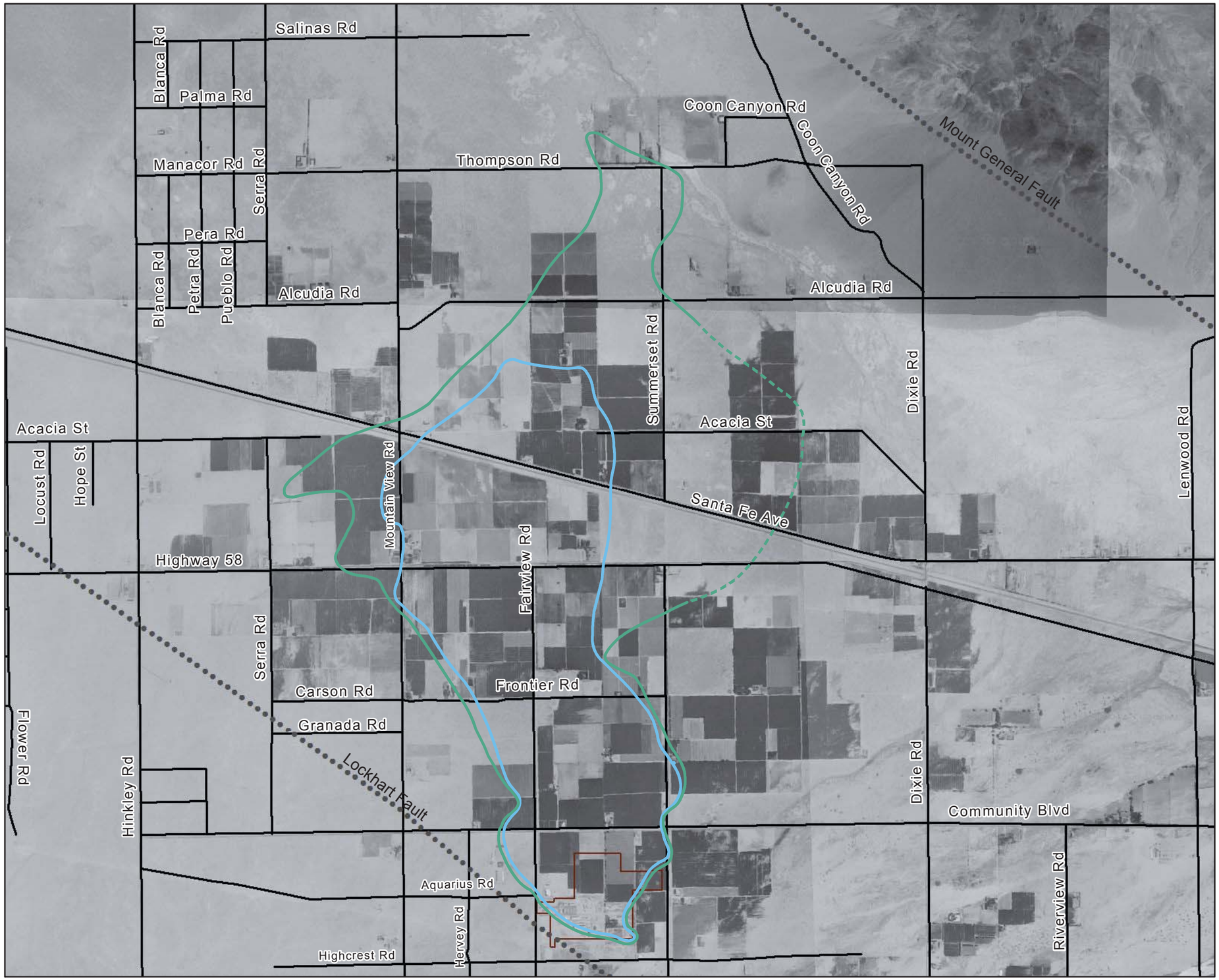
Notes:
1) Aerial imagery from USGS 1944

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-1
1944
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

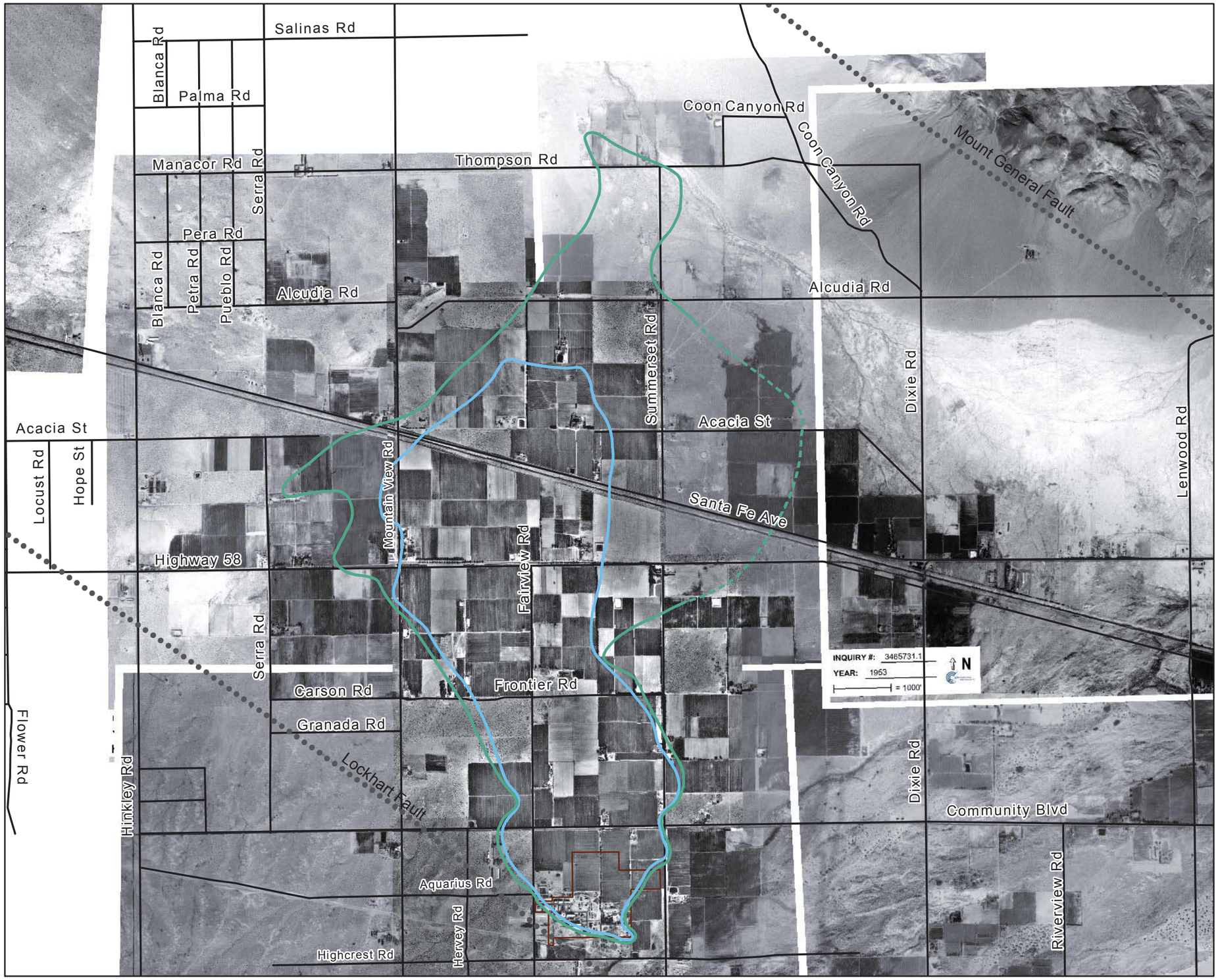
Notes:
1) Aerial imagery from USGS 1952

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-2
1952
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1953

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-3
1953
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

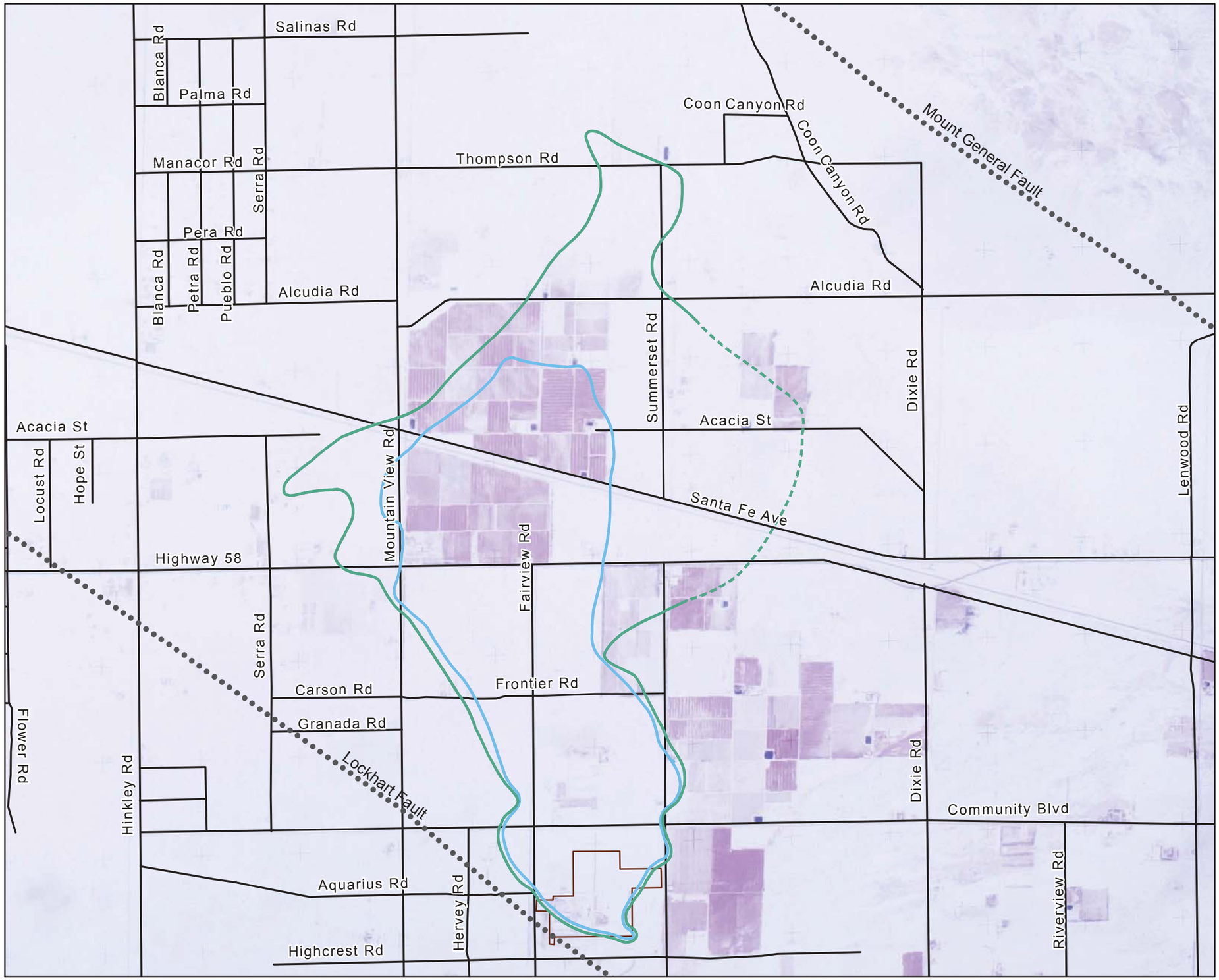
Notes:
1) Aerial imagery from USGS 1954

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-4
1954
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

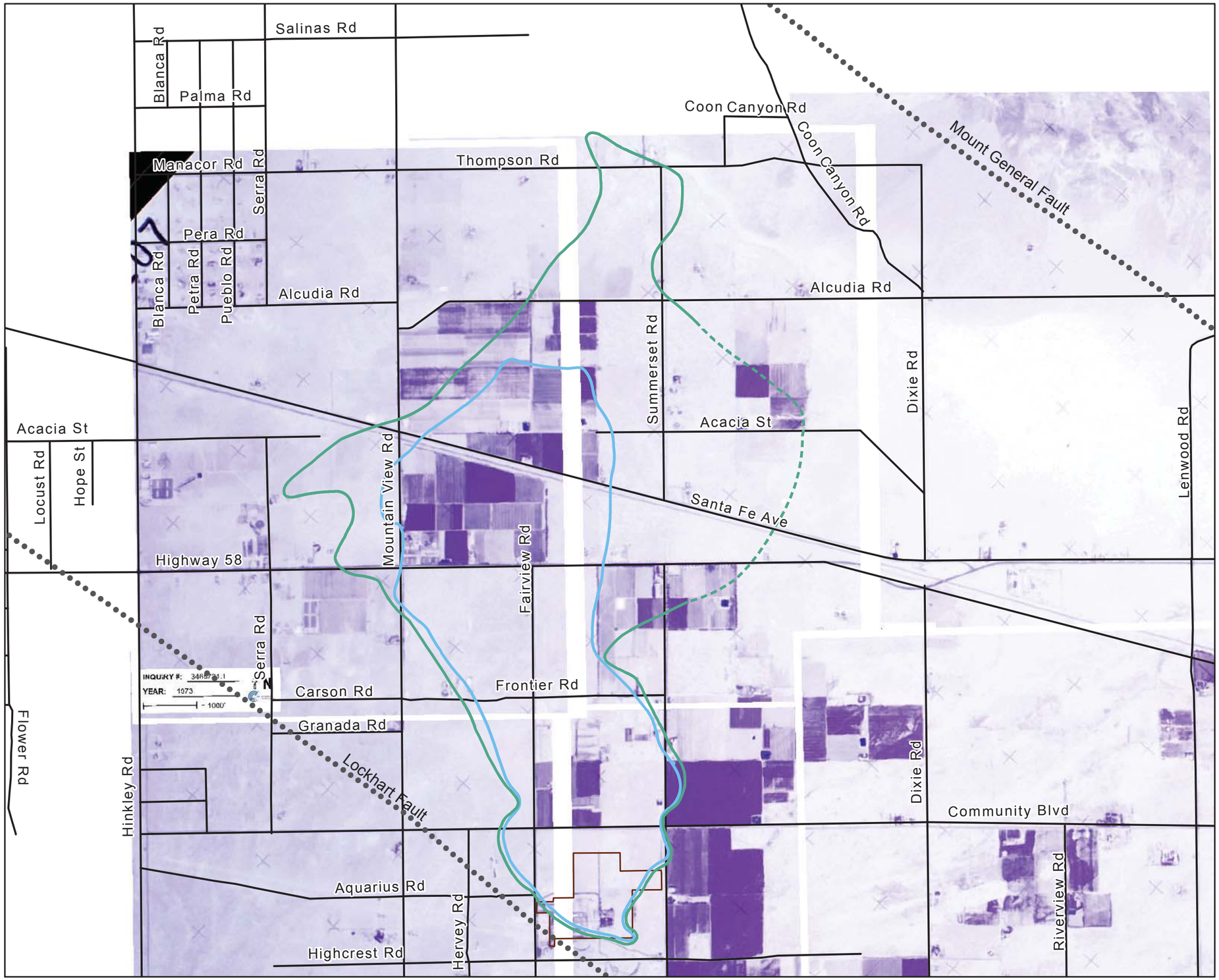
Notes:
1) Aerial imagery from USGS 1971

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-5
1971
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1973

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-6
1973
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

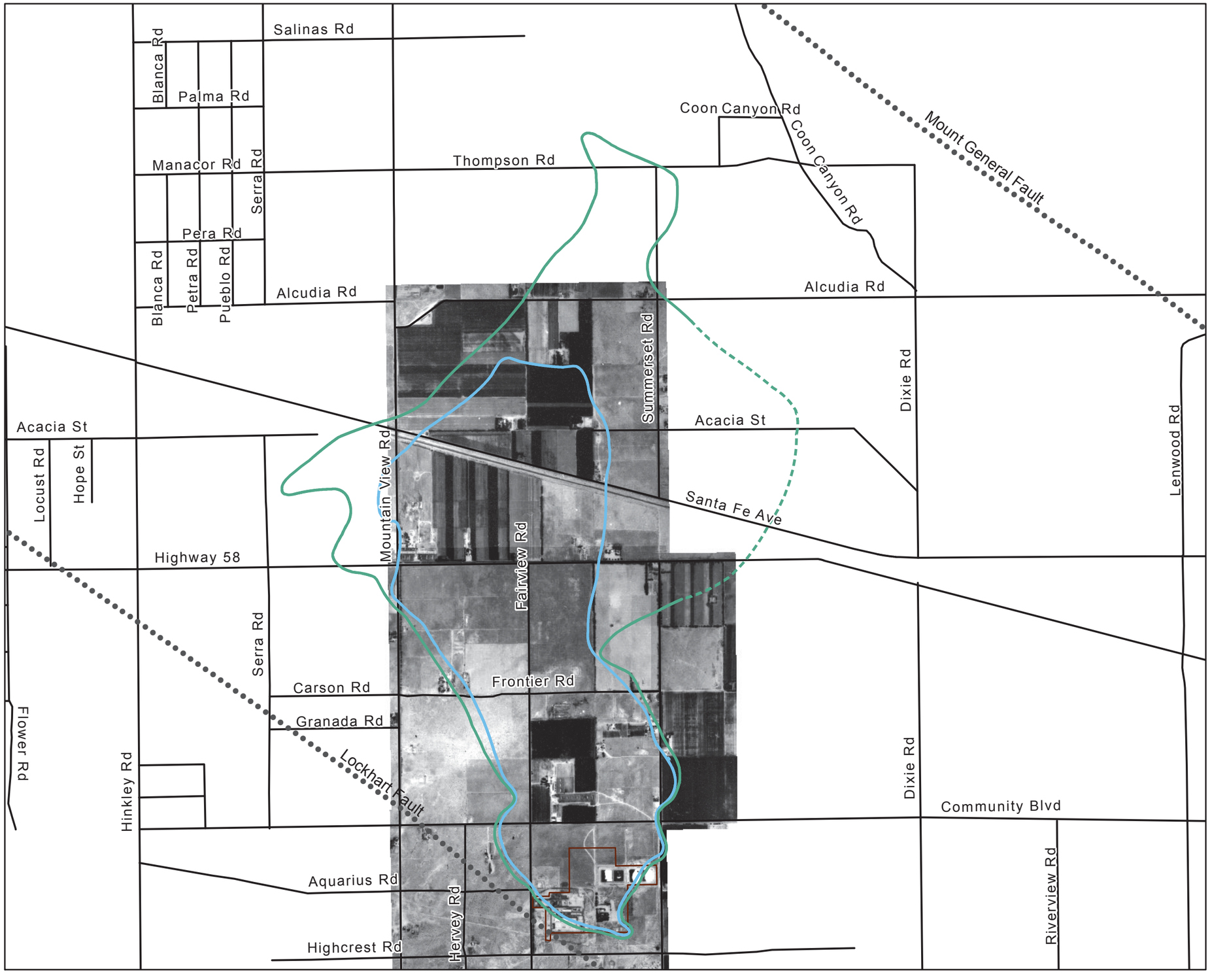
Notes:
1) Aerial imagery from USGS 1975

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-7
1975
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1978

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-8
1978
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1980
µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-9
1980
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Legend

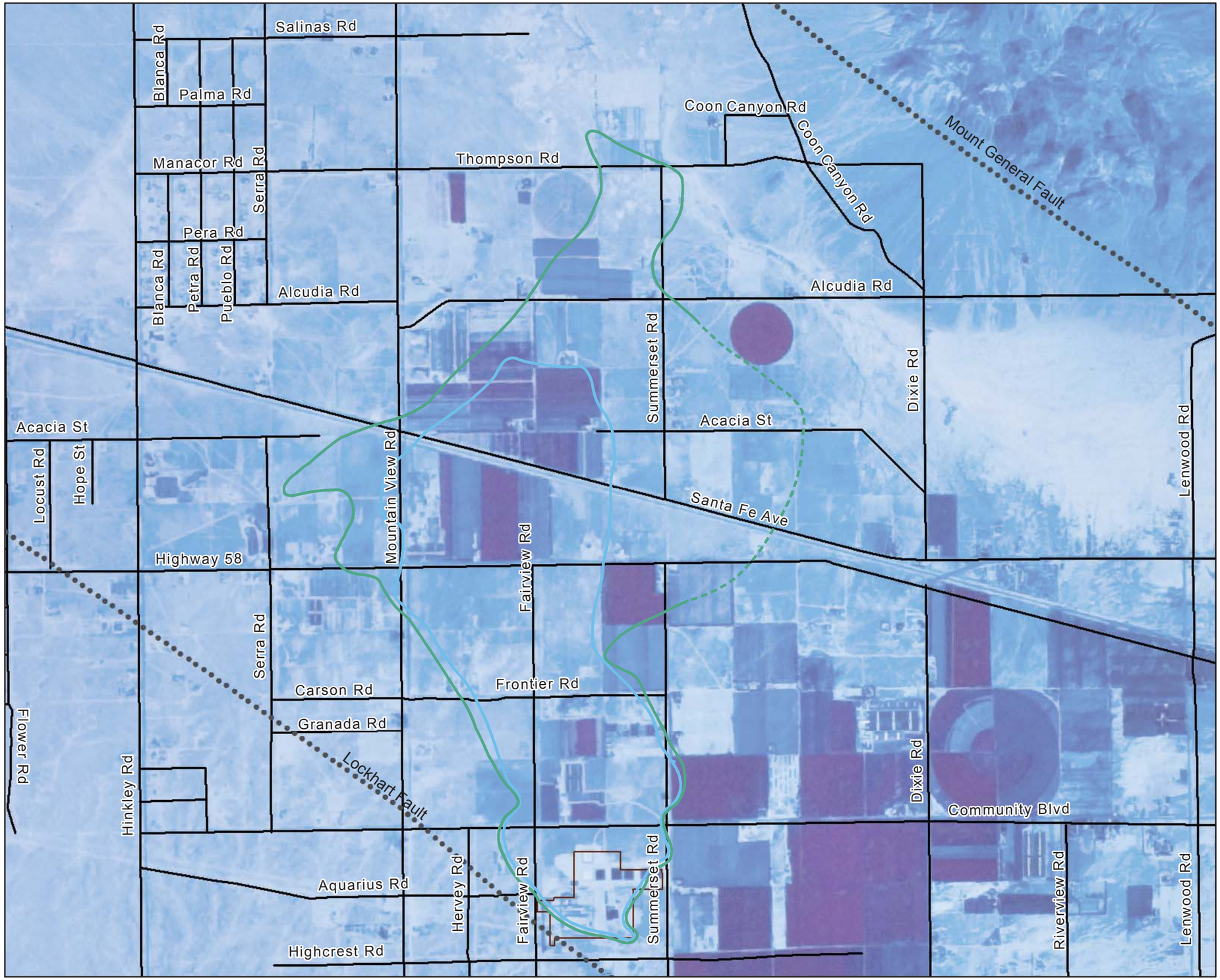
- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1983
µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-10
1983
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1984

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-11
1984
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

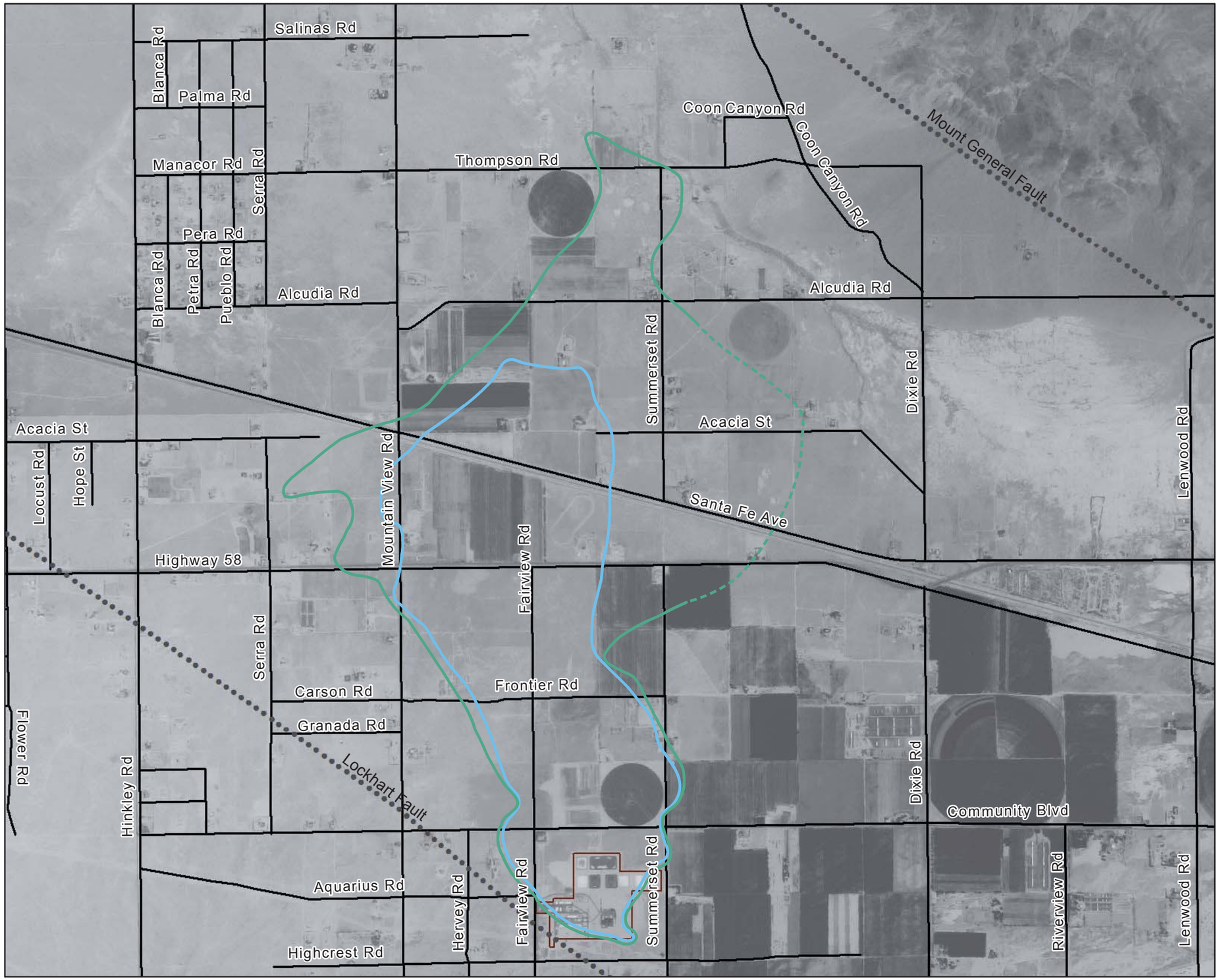
Notes:
1) Aerial imagery from USGS 1989

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

N

0 4,000
Feet

FIGURE A-12
1989
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA



Legend

- Approximate outline of Cr(VI) or Cr(T) in the Upper Aquifer exceeding 3.1 and 3.2 µg/L, respectively, Fourth Quarter 2013.
- Approximate 10-µg/L outline of Cr(V I) or Cr(T) concentrations in th e Upper Aquifer, Fourth Quarter 2013.
- Approximate Trace of Concealed Fault (Stamos et al., 2001)
- PG&E Compressor Station

Notes:
1) Aerial imagery from USGS 1994

µg/L = micrograms per liter
Cr(VI) = Hexavalent chromium
Cr(T) = Total Dissolved Chromium

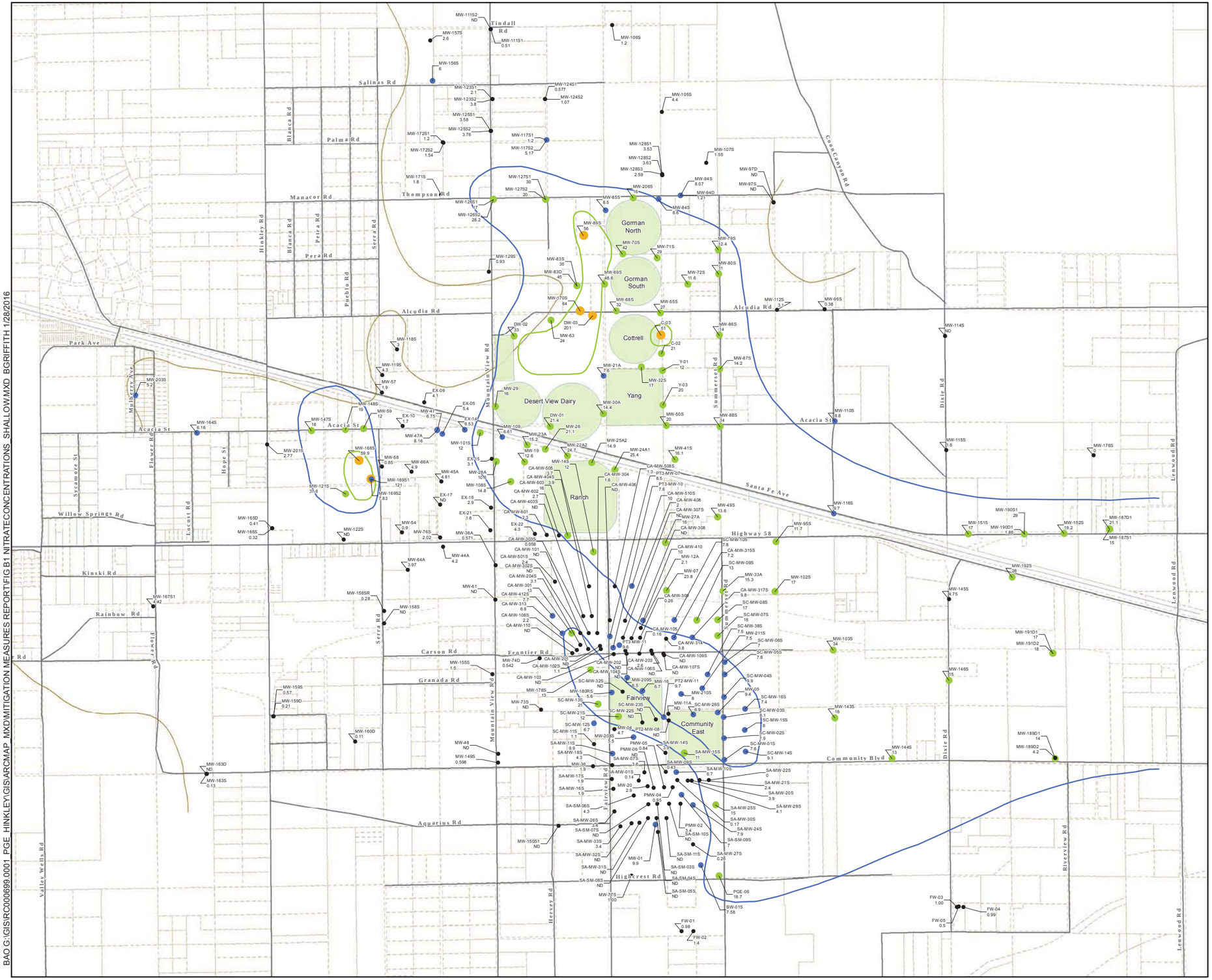
N

0 4,000
Feet

FIGURE A-13
1994
HINKLEY AREA NITRATE DATA SUMMARY AND DISTRIBUTION THROUGH FOURTH QUARTER 2013
PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

ATTACHMENT 2 NITRATE AND TOTAL DISSOLVED SOLIDS MAPS

BAO G:\GIS\RC000699.0001_PGE_HINKLEY\GIS\ARCMAP_MXD\MITIGATION MEASURES REPORT\FIG B1 NITRATECONCENTRATIONS_SHALLOW.MXD BGRIFFITH 1/28/2016



LEGEND

- Approximate limit of saturated alluvium in shallow zone of Upper Aquifer
- Approximate 10 mg/L Isoconcentration Contour
- Approximate 50 mg/L Isoconcentration Contour
- Agricultural Treatment Unit

Nitrate (as nitrogen) value in milligrams per liter (mg/L)

- 0 to ≤ 5 mg/L
- >5 to ≤ 10 mg/L
- >10 to ≤ 50 mg/L
- > 50 mg/L

N

0 2,300 4,600 6,900

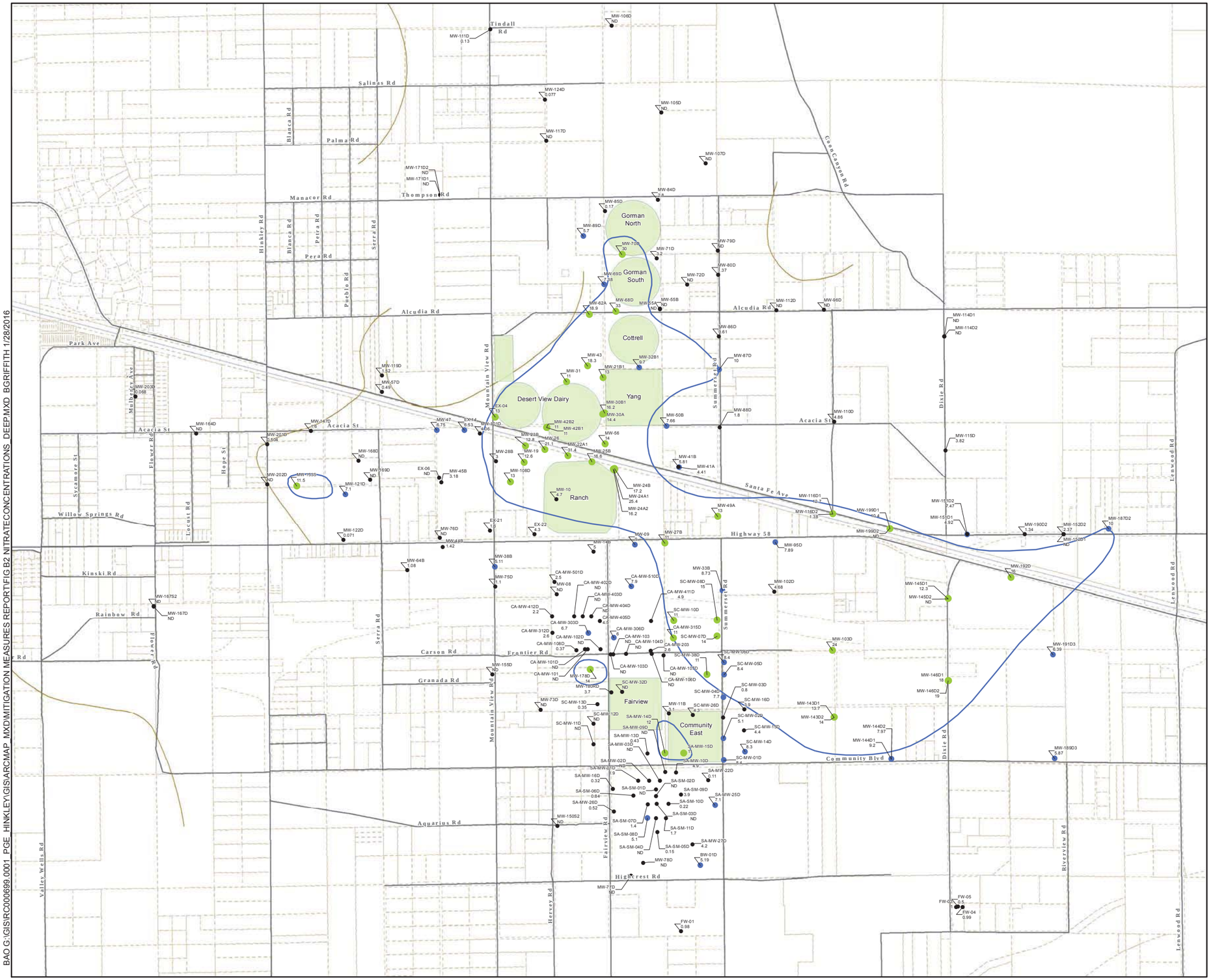
Feet

FIGURE B1
NITRATE (AS NITROGEN) CONCENTRATIONS IN SHALLOW ZONE OF THE UPPER AQUIFER, MOST RECENT SAMPLE RESULT 2011 THROUGH 2015

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

ARCADIS

BAO G:\GIS\RC000699.0001_PGE_HINKLEY\GIS\ARCMAP_MXD\MITIGATION MEASURES REPORT\FIG B2 NITRATECONCENTRATIONS_DEEP.MXD BGRIFFITH 1/28/2016



LEGEND

- Approximate limit of saturated alluvium in deep zone of Upper Aquifer
- Agricultural Treatment Unit
- Approximate 10 mg/L Isoconcentration Contour

Nitrate (as nitrogen) value in milligrams per liter (mg/L)

- 0 to ≤ 5 mg/L
- >5 to ≤ 10 mg/L
- >10 to ≤ 50 mg/L

N

0 2,300 4,600 6,900

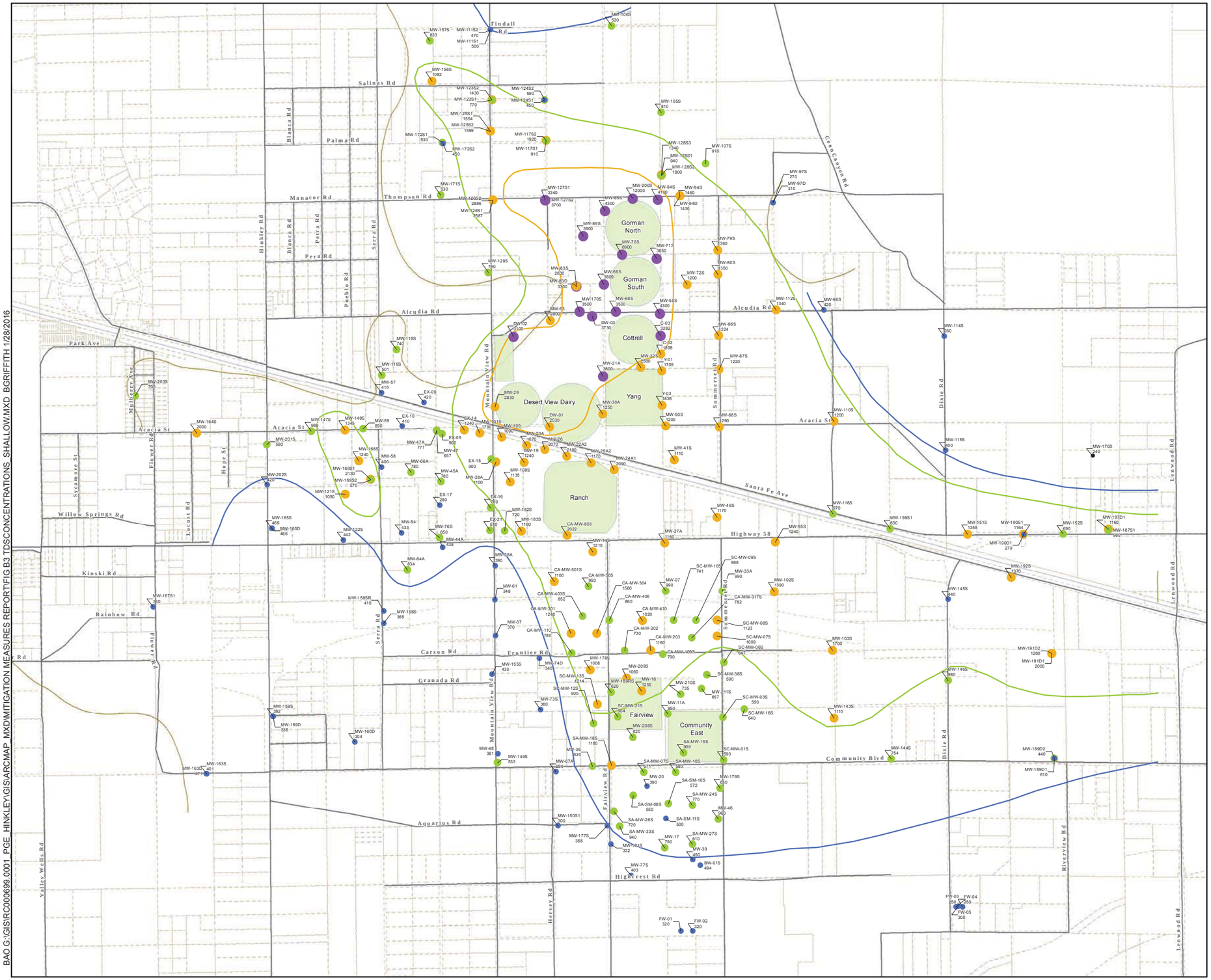
Feet

FIGURE B2
NITRATE (AS NITROGEN) CONCENTRATIONS IN DEEP ZONE OF THE UPPER AQUIFER, MOST RECENT SAMPLE RESULT 2011 THROUGH 2015

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

ARCADIS

BAO G:\GIS\RC000699.0001_PGE_HINKLEY\GIS\ARCMAP_MXD\MITIGATION MEASURES REPORT\FIG B3 TDSCONCENTRATIONS_SHALLOW.MXD BGRIFFITH 1/28/2016



LEGEND

- Approximate limit of saturated alluvium in shallow zone of Upper Aquifer
- Agricultural Treatment Unit
- Approximate 500 mg/L Isoconcentration Contour
- Approximate 1000 mg/L Isoconcentration Contour
- Approximate 3000 mg/L Isoconcentration Contour

TDS value in milligrams per liter (mg/L)

- 0 to ≤ 100 mg/L
- >100 to ≤ 500 mg/L
- >500 to ≤ 1,000 mg/L
- >1,000 to < 3,000 mg/L
- ≥ 3,000 mg/L

Notes:
TDS = Total Dissolved Solids

N

0 2,300 4,600 6,900

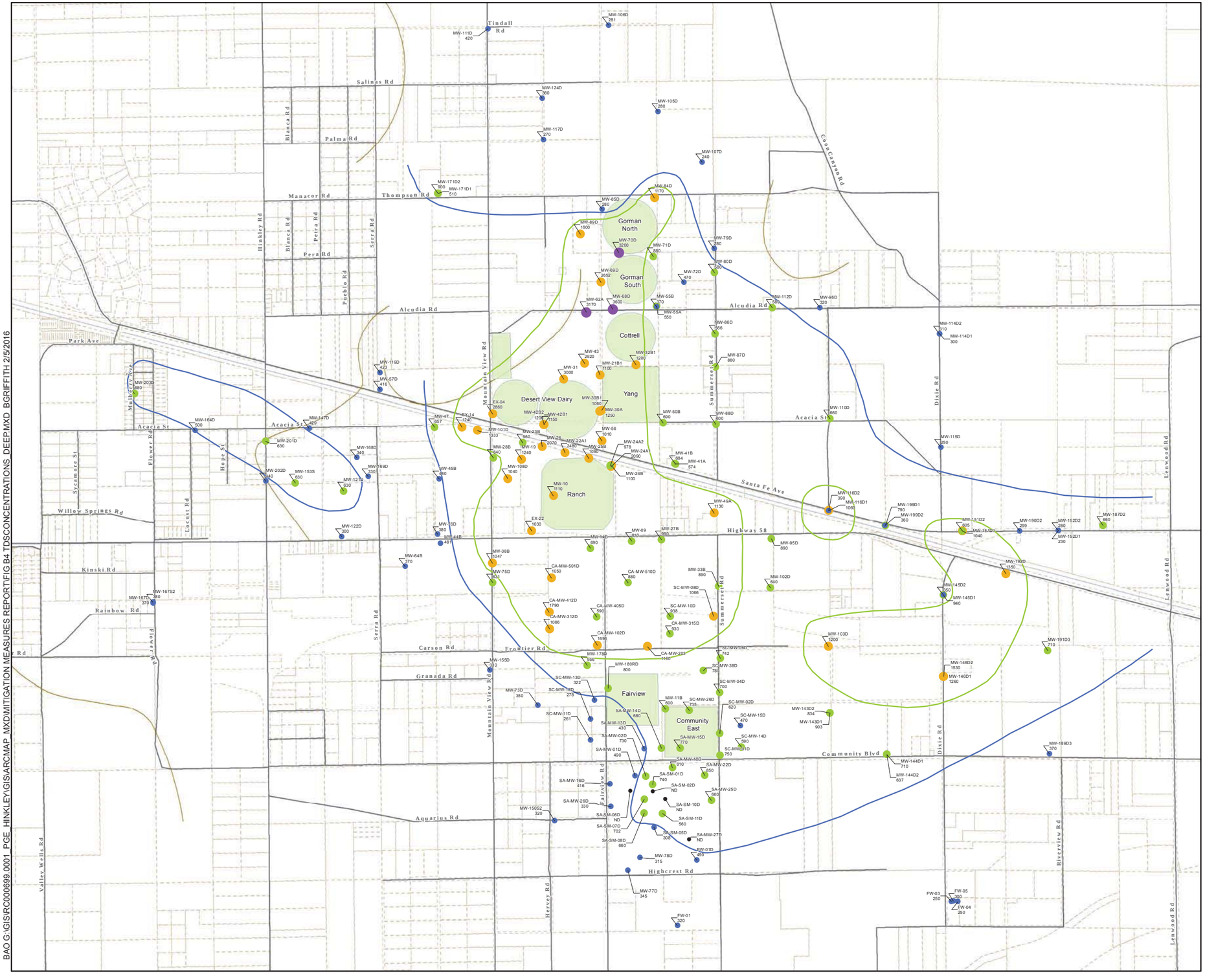
Feet

FIGURE B3
TDS CONCENTRATIONS IN SHALLOW ZONE OF THE UPPER AQUIFER, MOST RECENT SAMPLE RESULT 2011 THROUGH 2015

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

ARCADIS

BAO G:\GIS\RC000699.0001 PGE HINKLEY\GIS\ARCMAP MXD\MITIGATION MEASURES REPORT\FIG B4 TDSCONCENTRATIONS_DEEP.MXD BGRIFFITH 2/5/2016



LEGEND

- Approximate limit of saturated alluvium in deep zone of Upper Aquifer
- Agricultural Treatment Unit
- Approximate 500 mg/L Isoconcentration Contour
- Approximate 1000 mg/L Isoconcentration Contour

TDS value in milligrams per liter (mg/L)

- 0 to ≤ 100 mg/L
- >100 to ≤ 500 mg/L
- >500 to ≤ 1,000 mg/L
- >1,000 to < 3,000 mg/L
- ≥ 3,000 mg/L

Notes:
TDS = Total Dissolved Solids

N

0 2,300 4,600 6,900

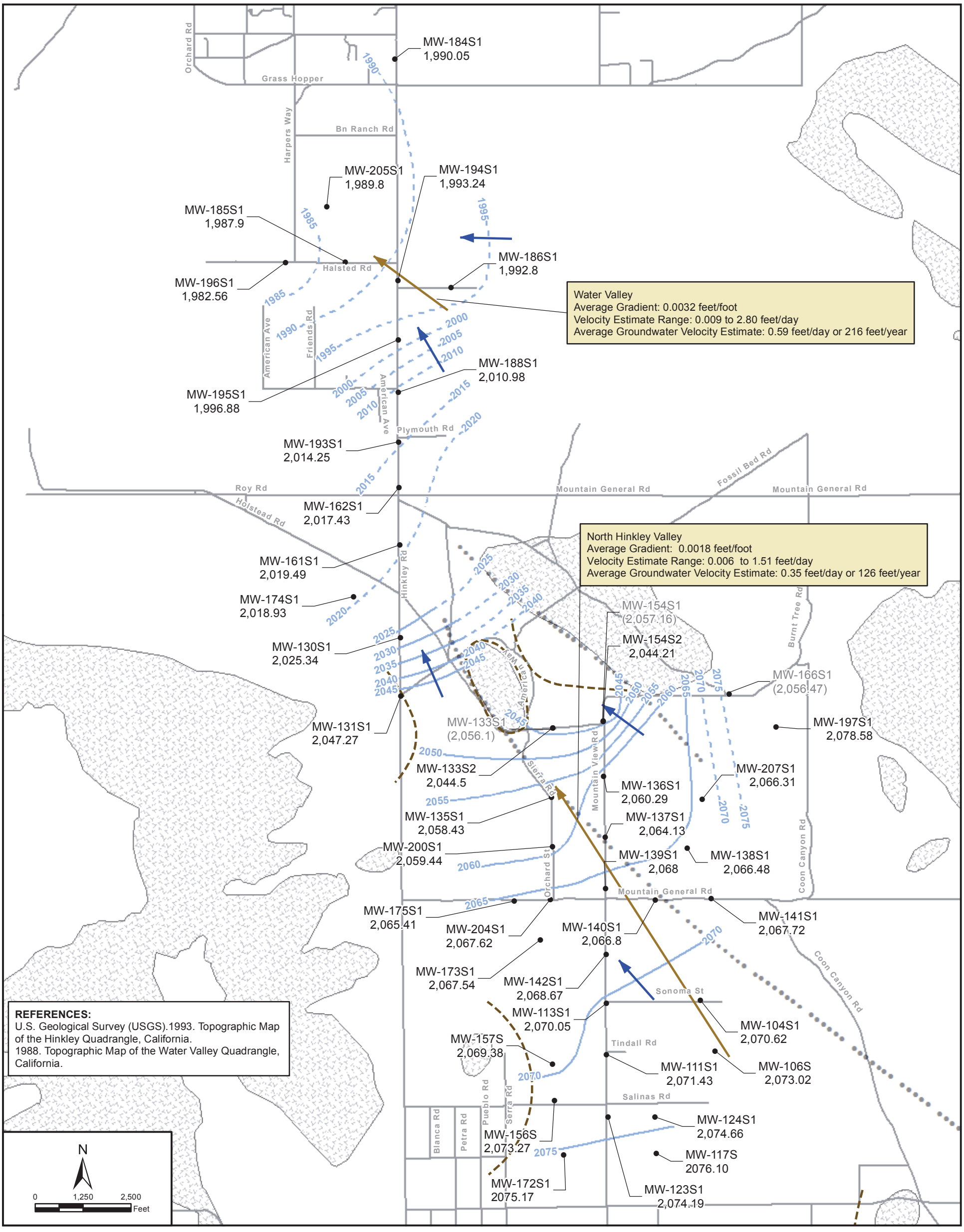
Feet

FIGURE B4
TDS CONCENTRATIONS IN DEEP ZONE OF THE UPPER AQUIFER, MOST RECENT SAMPLE RESULT 2011 THROUGH 2015

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

ARCADIS

ATTACHMENT 3 GROUNDWATER MAPS



REFERENCES:

U.S. Geological Survey (USGS).1993. Topographic Map of the Hinkley Quadrangle, California.
1988. Topographic Map of the Water Valley Quadrangle, California.

LEGEND:

- Monitoring Wells
- Approximate Limit of Upper Aquifer
- Approximate location of fault trace is inferred and there is no surface expression (Stamos et al., 2001)
- Potentiometric elevation contours (dashed where inferred)
- Average Groundwater Gradient
- General groundwater flow direction
- Bedrock Exposed at Ground Surface

MW-207S1 Well ID
2,066.31 Groundwater Elevation
(2056.47) Groundwater elevation not used in contouring

Groundwater elevations were derived from manual water level measurements taken October 6 through October 16, 2015. Wells screened near the water table (S and S1) were preferentially used for contouring except for MW-133S1 and MW-154S1.

FIGURE 3-3
GROUNDWATER ELEVATIONS IN THE UPPER AQUIFER, NORTH HINKLEY VALLEY AND WATER VALLEY, FOURTH QUARTER 2015

FOURTH QUARTER 2015 GROUNDWATER MONITORING
REPORT AND DOMESTIC WELL RESULTS
SITE-WIDE GROUNDWATER MONITORING PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

Area of 1-foot Contours

West Hinkley Valley
Average Gradient: 0.0071 foot/foot
Velocity Estimate Range: 0.02 to 0.93 foot/day
Average Groundwater Velocity Estimate: 0.29 foot/day or 107 feet/year

East Hinkley Valley
Average Gradient: 0.0025 foot/foot
Velocity Estimate Range: 0.01 to 5.30 feet/day
Average Groundwater Velocity Estimate: 1.40 feet/day or 511 feet/year

LEGEND:
- Monitoring Well
- Extraction Well Operated for More Than 4 Days in October 2015
- Inactive Groundwater Extraction Well
- Freshwater Injection Well
- Potentiometric Elevation Contour
- General Groundwater Flow Direction
- Average Groundwater Gradient
- Approximate Limit of Saturated Alluvium
- Approximate Location of Fault Trace is Inferred and There is No Surface Expression (Stamos et al., 2001)
- Estimated Capture Zone
- In Situ Reactive Zone
- Agricultural Treatment Unit (ATU)

NOTES:
1. Groundwater elevation contours represent the hydraulic gradient in the shallow zone of the Upper Aquifer. The shallow wells of nested completions (wells designated "A" or "S") were preferentially used for contouring. In all cases, the screened interval of the well was taken into account.
2. Groundwater level measurements for wells without an asterisk "*" are manual water level measurements collected between October 6 through November 6, 2015. Groundwater elevations marked with an asterisk "*" are the averages of pressure transducer data collected at 30-minute intervals from October 1 through October 31, 2015.

WORKS CITED:
Stamos, C.L., P. Martin, T. Nishikawa, and B.F. Cox. 2001. *Simulation of Ground-Water Flow in the Mojave River Basin, California*. U.S. Geological Survey Water-Resources Investigations Report 01-4002, Version 3. Prepared in cooperation with the Mojave Water Agency.

MW-169S1 Well ID
2,093.72 Groundwater elevation

N
0 660 1,320 Feet

FIGURE 3-1
GROUNDWATER ELEVATION CONTOURS IN THE SHALLOW ZONE OF THE UPPER AQUIFER, SOUTH HINKLEY VALLEY, FOURTH QUARTER 2015

FOURTH QUARTER 2015 GROUNDWATER MONITORING REPORT AND DOMESTIC WELL RESULTS
SITE-WIDE GROUNDWATER MONITORING PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

R:\PGEHINKLEY20000353\MAPFILES\2015\GMP\Q4\FIG3-1_4Q15_GMP_GWE_UUA_C_SIZED.MXD 1/28/2016

CRITIGEN

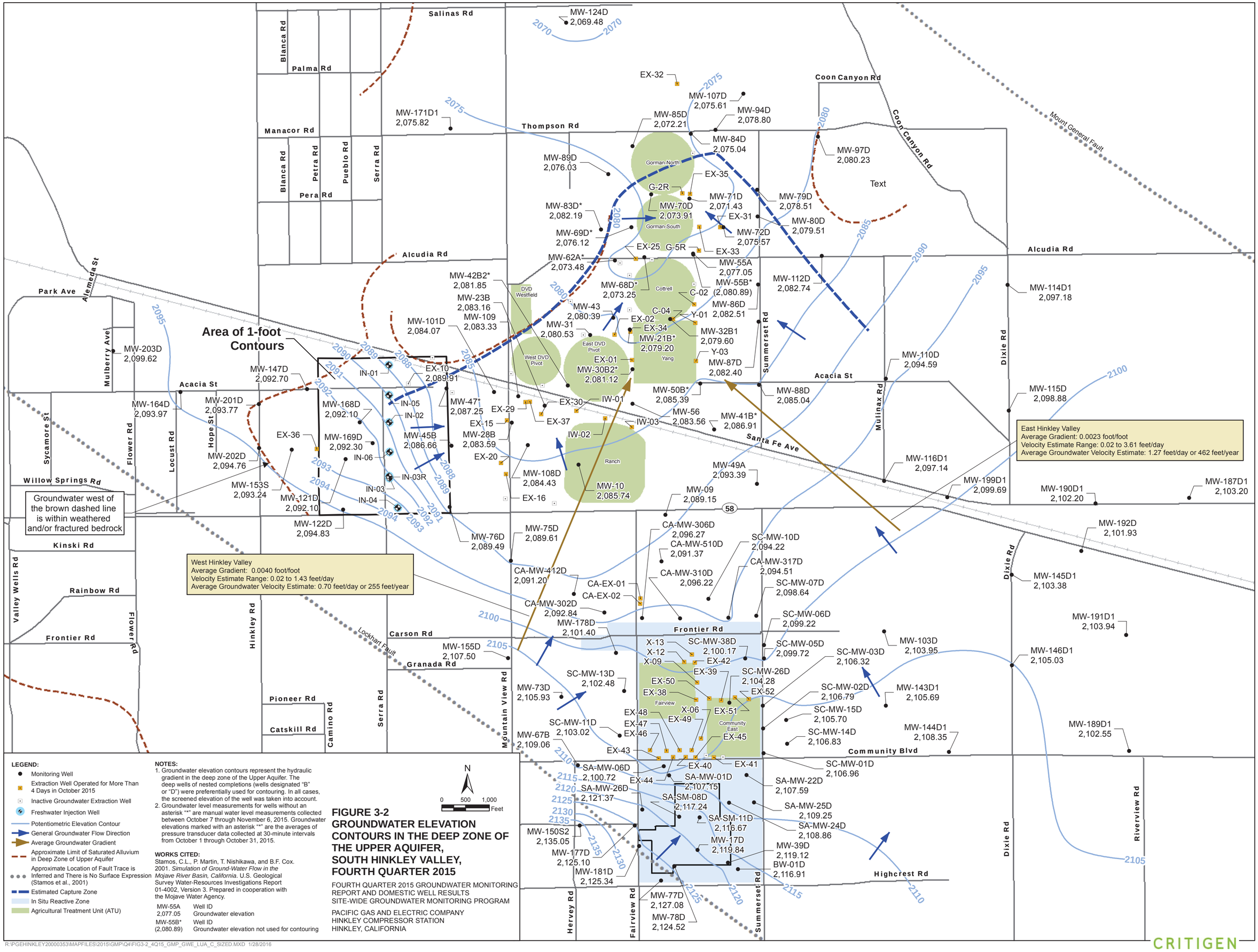


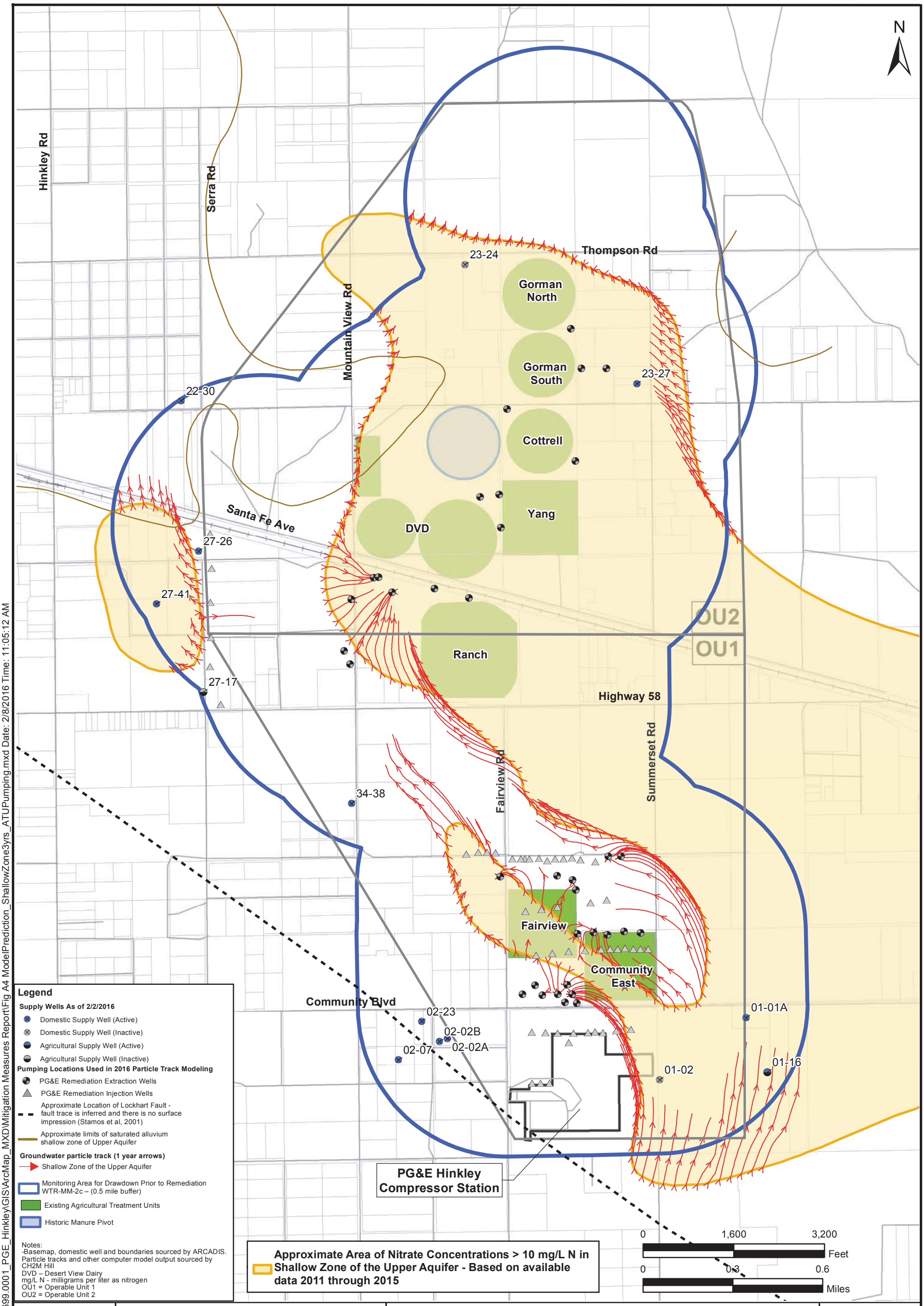
FIGURE 3-2
GROUNDWATER ELEVATION CONTOURS IN THE DEEP ZONE OF THE UPPER AQUIFER, SOUTH HINKLEY VALLEY, FOURTH QUARTER 2015

FOURTH QUARTER 2015 GROUNDWATER MONITORING REPORT AND DOMESTIC WELL RESULTS
SITE-WIDE GROUNDWATER MONITORING PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY
HINKLEY COMPRESSOR STATION
HINKLEY, CALIFORNIA

R:\PGEHINKLEY20000353\MAPFILES\2015\GMP\Q4\FIG3-2_4Q15_GMP_GWE_LUA_C_SIZED.MXD 1/28/2016

ATTACHMENT 4 PARTICLE TRACK MODELING



Drafter: BCG Path: G:\GIS\RC000699.0001_PGE_Hinkley\GIS\ArcMap_MXD\Mitigation Measures Report\Fig A4 ModelPrediction_ShallowZone3yrs_ATUPumping.mxd Date: 2/8/2016 Time: 11:05:12 AM

Program Manager Lisa Cope	ARCADIS 100 Montgomery Street, Suite 300 San Francisco, California 94104 Tel: 415 374 2744 Fax: 415 374 2745 www.arcadis-us.com	Model Prediction for Movement of Groundwater from Existing 10 mg/L-N Nitrate Areas, Shallow Zone of Upper Aquifer, with ATU Pumping, 3 Years (2016 through 2018) Pacific Gas and Electric Company Hinkley, California	Project Number RC000699.0117
Project Manager Jenifer Beatty			Date 2/8/2016
Task Manager Margaret Gentile			Figure **A4**

N

Hinkley Rd

Serra Rd

Mountain View Rd

Thompson Rd

23-24

Gorman North

Gorman South

23-27

22-30

Cottrell

Yang

DVD

Santa Fe Ave

27-26

27-41

OU2

OU1

Ranch

27-17

Highway 58

34-38

Fairview Rd

Summerset Rd

Fairview

Community East

Community Blvd

02-23

02-02B

02-02A

02-07

01-01A

01-16

01-02

PG&E Hinkley Compressor Station

Approximate Area of TDS Concentrations > 500 mg/L in Shallow Zone of the Upper Aquifer - Based on available data 2010 through 2014

0 1,600 3,200 Feet

0 0.3 0.6 Miles

Legend

Supply Wells As of 2/2/2016

- Domestic Supply Well (Active)
- Domestic Supply Well (Inactive)
- Agricultural Supply Well (Active)
- Agricultural Supply Well (Inactive)
- Approximate Location of Lockhart Fault - fault trace is inferred and there is no surface impression (Stamos et al, 2001)
- Approximate limits of saturated alluvium shallow zone of Upper Aquifer

Groundwater particle track (1 year arrows)

- Shallow Zone of the Upper Aquifer
- Monitoring Area for Drawdown Prior to Remediation WTR-MM-2c – (0.5 mile buffer)
- Existing Agricultural Treatment Units
- Historic Manure Pivot

Notes:
-Basemap, domestic well and boundaries sourced by ARCADIS.
Particle tracks and other computer model output sourced by CH2M Hill
DVD – Desert View Dairy
mg/L – milligrams per liter
TDS - Total Dissolved Solids
OU1 = Operable Unit 1
OU2 = Operable Unit 2

Drafter: BCG Path: G:\GIS\RC000699.0001_PGE_HinkleyGIS\ArcMap_MXD\Mitigation Measures Report\Fig A9 ModelPrediction_ShallowZone10yrs_500TDSnoPGEPumping.mxd Date: 2/8/2016 Time: 11:12:52 AM

Program Manager Lisa Cope	ARCADIS 100 Montgomery Street, Suite 300 San Francisco, California 94104 Tel: 415 374 2744 Fax: 415 374 2745 www.arcadis-us.com	Model Prediction for Movement of Groundwater from Existing 500 mg/LTDS Areas, Shallow Zone of Upper Aquifer, 10 Years without PGE Pumping (2014 through 2023) Pacific Gas and Electric Company Hinkley, California	Project Number RC000699.0117
Project Manager Jenifer Beatty			Date 2/8/2016
Task Manager Margaret Gentile			Figure **A9**

N

Hinkley Rd

Serra Rd

Mountain View Rd

Thompson Rd

23-24

Gorman North

Gorman South

23-27

22-30

Cottrell

Yang

DVD

Santa Fe Ave

27-26

27-41

27-17

Ranch

OU2

OU1

Highway 58

Fairview Rd

Summerset Rd

34-38

Fairview

Community East

Community Blvd

02-23

02-02B

02-02A

02-07

01-01A

01-02

01-16

PG&E Hinkley Compressor Station

Approximate Area of TDS Concentrations > 1,000 mg/L in Shallow Zone of the Upper Aquifer - Based on available data 2011 through 2015

Legend

Supply Wells As of 2/2/2016

- Domestic Supply Well (Active)
- Domestic Supply Well (Inactive)
- Agricultural Supply Well (Active)
- Agricultural Supply Well (Inactive)

Pumping Locations Used in 2016 Particle Track Modeling

- PG&E Remediation Extraction Wells
- PG&E Remediation Injection Wells
- Approximate Location of Lockhart Fault - fault trace is inferred and there is no surface impression (Stamos et al, 2001)
- Approximate limits of saturated alluvium shallow zone of Upper Aquifer

Groundwater particle track (1 year arrows)

- Shallow Zone of the Upper Aquifer
- Deep Zone of the Upper Aquifer
- Brown Clay or Intermediate Zone, where present
- Monitoring Area for Drawdown Prior to Remediation WTR-MM-2c – (0.5 mile buffer)
- Existing Agricultural Treatment Units
- Historic Manure Pivot

Notes:
-Basemap, domestic well and boundaries sourced by ARCADIS.
Particle tracks and other computer model output sourced by CH2M Hill
DVD – Desert View Dairy
mg/L – milligrams per liter
TDS - Total Dissolved Solids
OU1 = Operable Unit 1
OU2 = Operable Unit 2

0 1,600 3,200 Feet

0 0.3 0.6 Miles

Drafter: BCG Path: G:\GIS\RC000699.0001_PGE_Hinkley\GIS\ArcMap_MXD\Mitigation Measures Report\Fig A14 ModelPrediction_ShallowZone3yrs_1000TDS_ATUPumping.mxd Date: 2/8/2016 Time: 11:15:20 AM

Program Manager	Lisa Cope
Project Manager	Jenifer Beatty
Task Manager	Margaret Gentile

ARCADIS
100 Montgomery Street, Suite 300
San Francisco, California 94104
Tel: 415 374 2744
Fax: 415 374 2745
www.arcadis-us.com

Model Prediction for Movement of Groundwater from Existing 1,000 mg/L TDS Areas, Shallow Zone of Upper Aquifer, with ATU Pumping, 3 Years (2016 through 2018)

Pacific Gas and Electric Company
Hinkley, California

Project Number	RC000699.0117
Date	2/8/2016
Figure	A14